

ELEVATOR

FIELD

Embodiments described herein relate generally to an elevator in which a camera for capturing the movement of a user of the elevator is provided in a car.

BACKGROUND

It is publicly known that the movement of a user of an elevator is captured by providing a camera in a board provided above a car of the elevator.

It takes time to install the camera because the camera is connected to a separate control device with wires and the capture signals of the camera are processed by the control device.

To overcome this problem, the present application provides an elevator for easily installing a camera.

SUMMARY

According to one embodiment, an elevator comprising: a board provided above a door device of a car, and comprising an outer wall facing a hall side, an inner wall facing inside of the car, and a bottom wall connecting the outer wall and the inner wall and comprising a window portion; and a camera device provided in an upper portion of the window portion, and capturing the hall from the window portion in a state where a door of the door device is open, wherein the camera device comprises a camera substrate on which a camera is mounted, an image processing unit and an interface unit in a housing, the housing comprises a base to which the camera substrate and the units are secured, a lens hole in which a lens of the camera is provided is formed in the base, and a center of the lens hole is located in a center of the base in a width direction, and is located at an eccentric position in a longitudinal direction.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view showing the general structure of an elevator according to a first embodiment.

5 FIG. 2 is a perspective illustration when the elevator shown in FIG. 1 is seen from the interior side of a car.

FIG. 3 is a longitudinal sectional view of a board on which a camera device is mounted.

10 FIG. 4 is a perspective illustration showing the overview of the camera device.

FIG. 5 is a perspective illustration showing a state in which the cover of the camera device shown in FIG. 4 is removed.

15 FIG. 6 is a perspective illustration in which the camera device shown in FIG. 5 excluding an interface unit is seen from the opposite direction of FIG. 5.

FIG. 7 is a plan view of a base to which a camera substrate is secured.

20 FIG. 8 is a perspective illustration when the base is seen from above.

FIG. 9 is a perspective illustration when the base is seen from the bottom.

25 FIG. 10 is a perspective illustration in which a car with a left single opening door device on which the camera device shown in FIG. 4 is mounted is seen from the inside of the car.

30 FIG. 11 is a perspective illustration in which a car with a right single opening door device on which the camera device shown in FIG. 4 is mounted is seen from the inside of the car.

DETAILED DESCRIPTION

Embodiments will be described hereinafter with reference to the accompanying drawings. As shown in
35 FIG. 1, the elevator 1 comprises a car 5 which stops at

a hall 3 on an arbitrary floor. In this specification, for the sake of convenience, the interior side of the car may be called "inside", and the hall side may be called "outside". The upper and lower sides are
5 defined based on the direction of gravity.

The elevator 1 determines the movement of a person who is present near the hall 3 based on image information obtained by a camera 7 (see FIG. 3), and performs the open/close control of a door device 9 on
10 the hall 3 side and a door device 11 on the car 5 side. In FIG. 1, the angle of view of the camera 7 is illustrated by one-dot chain line A. As shown in FIG. 2, in the elevator 1 of the present embodiment, the door devices 9 and 11 comprise center opening doors
15 8 and 8.

As shown in FIG. 1 and FIG. 2, a board 13 is provided above the door device 11 of the car 5, and a camera device 15 is provided in the board 13.

As shown in FIG. 3, the board 13 comprises an
20 outer wall 13a facing the hall side, an inner wall 13b facing the inside of the car 5 and a bottom wall 13c connecting the outer wall 13a and the inner wall 13b. The camera device 15 is provided on the bottom wall 13c.

25 A window portion 13d is provided in the bottom wall 13c, specifically, at a position at which the ends of the right and left doors 8 and 8 (see FIG. 2) bump against each other when they are closed. The window portion 13d is formed by fitting a transparent resinous
30 material 17 in a through hole.

Height H1 of the upper end of the outer wall 13a is lower than the position of the illumination window 14 (described later) of the camera device 15.

As shown in FIG. 4, the camera device 15 comprises
35 a base 15a, a one-side cover 15b and an other-side

cover 15c, and forms a housing 16 with the base 15a,
the one-side cover 15b and the other-side cover 15c.
An opening and closing cover 12 for connecting a
terminal of an external device to a connector 37
5 (described later) is provided in the upper portion of
the one-side cover 15b. The illumination window 14
which lights up when the camera device 15 operates is
provided in the side portion of the one-side cover 15b.

As shown in FIG. 5 and FIG. 6, a camera substrate
10 19 (see FIG. 6), an image processing unit 35 and an
interface unit 31 are provided in the base 15a.

Here, the camera substrate 19 and its fixing
portion are explained.

As shown in FIG. 3, the camera 7 comprising a
15 downward-pointing lens 7a is mounted on the bottom
surface of the camera substrate 19.

As shown in FIG. 7, the camera substrate 19 has a
rectangular shape in plan view, and comprises a pair of
one-side corner portions 19a, a pair of other-side
20 corner portions 19b and a pair of side portions 19c
located between the one-side corner portions 19a and
the other-side corner portions 19b. The one-side
corner portions 19a and 19a are curved in a concave
shape in accordance with the shape of the step portions
25 (described later) of corner supporting portions 21 (see
B of FIG. 7). It should be noted that B of FIG. 7
indicates the one-side corner portion 19a of the camera
substrate 19 in a state excluding a fastener 25.
Further, C of FIG. 7 indicates a side supporting
30 portion 23 in a state excluding the fastener 25.

As shown in FIG. 6, the camera substrate 19 is
secured to the pair of corner supporting portions 21
and 21 and the pair of side supporting portions 23 and
23 provided upright in the base 15a by the fasteners 25
35 for securing the camera substrate 19 from above,

respectively. The fasteners 25 are, for example, screws or bolts. In the base 15a, direct-contact portions 27 and 27 which are directly in contact with the other-side corner portions 19b and 19b of the camera substrate 19 are provided on the opposite side of the pair of corner supporting portions 21 and 21 with respect to the pair of side supporting portions 23 and 23.

As shown in FIG. 8, the corner supporting portions 21 and 21 and the side supporting portions 23 and 23 are cylindrical members protruding from the base 15a, and integrally formed in the base 15a.

The distal ends of the pair of corner supporting portions 21 and 21 comprise step portions 21a on sides facing each other. Each step portion 21a is dented from the distal end of a corresponding corner supporting portion 21, and forms a fan-shape in plan view (see FIG. 7). In the present embodiment, each step portion 21a has a fan-shape of approximately 90°.

The XY direction of the camera substrate 19 is positionally determined by distance X1 between the ends 26 and 26 of the facing step portions 21a in the longitudinal direction between the two corner supporting portions 21 and 21 and distance Y1 between the end 30 of the step portion 21a of each one-side corner supporting portion 21 in the width direction and a corresponding direct-contact portion 27. The height direction (Z direction) is positionally determined by distance Z1 between the inner surface 28 of the base 15 and the bottom surface 24 of the step portion 21a of each of the two corner supporting portions 21 and 21 / the bottom surface 24 of the step portion 23a of each of the two side supporting portions 23 and 23.

The depth of each step portion 21a and 23a is less than the thickness of the camera substrate 19.

As shown in FIG. 7, interval M between the centers of the two corner supporting portions 21 and 21 is different from interval N between the centers of the two side supporting portions 23 and 23. Specifically, interval N is greater than interval M. In this structure, the shape formed by the pair of corner supporting portions 21 and 21 and the pair of side supporting portions 23 and 23 is a trapezoid. The structure in which interval N is different from interval M results from the relationships in which the corner supporting portions 21 and 21 support the one-side corner portions 19a and 19a of the camera substrate 19, and the pair of side supporting portions 23 and 23 supports the side portions 19c of the camera substrate 19.

Now, this specification explains a lens hole 29 in which the lens 7a of the camera 7 is provided in the base 15a.

As shown in FIG. 8 and FIG. 9, in the base 15a, the lens hole 29 is formed so as to correspond to the attachment position of the camera substrate 19. As shown in FIG. 9, the center 29a of the lens hole 29 is located at the center position $W/2$ in width W of the base 15a. The center 29a of the lens hole 29 is eccentric with respect to longitudinal direction L of the base 15a. Distance $L1$ from the center 29a of the lens hole 29 to an end 20 in the longitudinal direction is less than distance $L2$ to the other end 22 in the longitudinal direction.

Distance $L1$ is a distance (specified distance) in which, in the case of a single opening door, the lens hole 29 is provided at an appropriate position with respect to the door end frame of the door when the camera device 15 is set in the board 13 and the end 20 of the base 15a in the camera device 15 is fit with the

end of the board 13.

Now, this specification explains the image processing unit 35 and the interface unit 31 provided within the camera device 15. As shown in FIG. 5, the image processing unit 35 is configured by a circuit substrate 35a and various modules 36 provided in the circuit substrate 35a, and further, the interface unit 31 is configured by a circuit substrate 31a and various modules 36 provided in the circuit substrate 31a.

The image processing unit 35 is attached to the base 15a such that the surface of the circuit substrate 35a is perpendicularly and vertically provided. The connector 37 is provided in the upper end portion of the image processing unit 35. As shown in FIG. 6, an auxiliary member 39 is attached to the rear surface of the circuit substrate 35a. The connector 37 is used to connect a USB flash drive or other terminals used by a worker at the time of maintenance and inspection.

The output/input signals of the camera 7 (see FIG. 3) are input to the image processing unit 35 such that the image processing unit 35 performs image processing. A processed image is transmitted to an elevator system which controls the drive of the elevator via the interface unit 31.

The interface unit 31 is attached over the upper side of the camera substrate 19 and the rear side of the image processing unit 35 in a state where the surface of the circuit substrate 31a is transversely provided parallel to the inner surface 28 (see FIG. 8) of the base 15a. The interface unit 31 communicates with the elevator system. The interface unit 31 transmits the data or signal received from the elevator system to the image processing unit 35. The interface unit 31 transmits the data or signal received from the image processing unit 35 to the elevator system. In

the circuit substrate 31a, light emitting elements 34 are provided at positions corresponding to the illumination window 14, and light up when the image processing unit 31 operates.

5 This specification explains how to assemble and install the camera device 15.

 The camera device 15 is assembled by, as shown in FIG. 7 and FIG. 8, arranging the one-side corner portions 19a and 19a of the camera substrate 19 (see
10 FIG. 7) in the step portions 21a of the pair of corner supporting portions 21 and 21, arranging the facing side portions 19c and 19c of the camera substrate 19 in the step portions 23a of the pair of side supporting portions 23 and 23, and bringing the other-side corner
15 portions 19b and 19b into direct contact with the direct-contact portions 27 and 27.

 Subsequently, as shown in FIG. 6, the fasteners 25 are attached from above to the corner supporting portions 21 and 21 and the side supporting portions 23 and 23. The corresponding one-side corner portions 19a and 19a and side portions 19c (see FIG. 7) of the
20 corresponding camera substrate 19 are fastened by the heads 25a of the fasteners 25 to be secured.

 Subsequently, as shown in FIG. 6, the auxiliary member 39 is attached to the circuit substrate 35a of
25 the image processing unit 35. In a state where the surface of the circuit substrate 35a is vertically provided, the auxiliary member 39 is secured to the auxiliary member supporting portions 42 of the base 15a
30 with fasteners 44.

 Subsequently, as shown in FIG. 5, the circuit substrate 31a of the interface unit 31 is arranged above the camera substrate 19 such that the surface of the circuit substrate 31a is transversely provided in
35 the substrate supporting portions 39 (see FIG. 8) and

the substrate supporting portion 45 (see FIG. 8) integrally formed in the base 15a. In this state, the circuit substrate 31a is fastened by fasteners 41, 41 and 47 (see FIG. 6) to be secured.

5 Ultimately, as shown in FIG. 4, the one-side cover 15b and the other-side cover 15c are secured to the base 15a.

Now, this specification explains how to install the camera device 15 in the board 13.

10 As shown in FIG. 2, when the doors of the elevator are center opening doors, the window portion 13d (see FIG. 3) is provided substantially in the center of the doors in the opening and closing direction in the bottom wall 13c of the board 13. The lens hole 29 of
15 the camera device 15 is provided at the bump position of the doors. The base 15a of the camera device 15 is secured to the bottom wall 13c of the board 13 with securing tools such as bolts.

As shown in FIG. 10, in the case of left single
20 opening (when seen from the interior side of the car), in a state where the end 20 in which the center 29a of the eccentric lens hole 29 in the longitudinal direction are on the short side from the end of the longitudinal direction (see FIG. 9) is provided on the
25 left side, the end 20 is arranged at the left end of the board 13 and secured with securing members such as bolts. In this way, in the camera device 15, the lens hole 29 is secured to a position of specified distance L1 from a door end frame 51.

30 As shown in FIG. 11, in the case of right single opening (when seen from the interior side of the car), the camera device 15 is horizontally 180° inverted with respect to the case of left single opening shown in FIG. 10. In a state where the end 20 in which the
35 center of the eccentric lens hole 29 in the

longitudinal direction is on the short side from the end of the longitudinal direction (see FIG. 9) is provided on the right side, the end 20 is arranged at the right end of the board 13 and secured with securing members such as bolts. In this way, in the camera device 15, the lens hole 29 is secured to a position of specified distance L1 from the door end frame 51.

Now, this specification explains the functional effects of the embodiment.

As shown in FIG. 6, according to the above embodiment, the camera substrate 19 can be attached to the base 15a by placing, in the step portions 21a of the corner supporting portions (supporting portions) 21 and 21 provided in the base 15a (see FIG. 8), the one-side corner portions (edges) 19a and 19a of the camera substrate 19, and securing the camera substrate 19 with the fasteners 25 (see FIG. 6). Thus, the camera 7 can be easily installed. In addition, unlike the prior art, there is no need to form an insertion hole for a securing tool in the camera substrate 19. Thus, the process is easy.

As the camera substrate 19 is secured to the corner supporting portions (supporting portions) 21 and 21 and the side supporting portions 23 with the heads 25a of the fasteners 25, the load on the camera substrate 19 can be reduced, thereby preventing the increase in the size of the substrate.

As shown in FIG. 7, since the camera substrate 19 is secured by receiving the one-side corner portions 19a and 19a with the corner supporting portions 21 and 21 of the base 15a, receiving the side portions 19c with the side supporting portions 23 of the base 15a, and fastening them by the heads 25a of the fasteners 25 (see FIG. 6), the camera substrate 19 can be firmly secured for the swing, etc., of the car 5.

As shown in FIG. 8, the step portions 21a of the corner supporting portions 21 and 21 are the steps formed on the sides facing each other and having a fan-shape in plan view. The step portions 21a can positionally determine the XYZ direction by defining the positions of the ends 26 and 26 in the X direction and the positions of the ends 30 in the Y direction, and defining height Z1 of the bottom wall 24 of each step portion 21a. In this way, a worker does not need to adjust the position on site when installing the camera 7. The camera substrate 19 can be secured in an assembling plant. Thus, the working hours on site can be reduced. Further, at the time of a failure or maintenance, the camera substrate 19 can be easily replaced.

As shown in FIG. 7, distance M between the two corner supporting portions 21 and 21 is different from distance N between the two side supporting portions 23 and 23, thereby forming a trapezoidal shape as a whole. Substantially the rectangular camera substrate 19 can be arranged such that its one-side corner portions 19a and 19a correspond to the space between the corner supporting portions 21 and 21 (the upper side of the trapezoid), and such that the camera substrate 19 is dropped between the corner supporting portions 21 and 21 and the side supporting portions 23 and 23. In this way, the camera substrate 19 can be easily attached. In the camera substrate 19, the shapes of the one-side corner portions 19a and 19a are different from those of the other-side corner portions 19b and 19b. The shapes of the one-side corner portions 19a and 19a coincide with those of the step portions 21a of the corner supporting portions 21 and 21. As these structures can be easily confirmed, it is possible to prevent the camera substrate 19 from being attached to an incorrect

position.

Since the camera device 15 integrally comprises the camera substrate 19 on which the camera 7 is mounted, the image processing unit 35, and the
5 interface unit 31, the camera 7 can be easily installed by attaching the camera device 15 to the board 13.

As shown in FIG. 9, the center 29a of the lens hole 29 of the camera is located in the center of the base 15a in width direction W, and is located at an
10 eccentric position in longitudinal direction L. Thus, the lens hole 29 can be located on the door end side in either case, by, in the case of left single opening doors (when seen from the inside of the car) as shown in FIG. 10, providing the longitudinal end 20 side so
15 as to be matched with the left end of the board 13, and in the case of right single opening doors (when seen from the inside of the car) as shown in FIG. 11, 180° inverting the camera device 15 in the longitudinal direction and matching the longitudinal end 20 side
20 with the right end of the board 13. This structure is convenient as it corresponds to both left single opening type car and right single opening type car.

As shown in FIG. 3, the connector 37 provided in the image processing unit 35 is provided in the upper
25 portion of the camera device 15. Therefore, when the camera device 15 is set in the board 13, an external device such as a USB flash drive used at the time of maintenance and inspection can be connected from the upper side of the board 13. Thus, the connection can
30 be easily conducted.

As shown in FIG. 5, the circuit substrate 35a of the image processing unit 35 comprises the connector 37 at the upper end in a state where the surface is
vertically provided. Thus, the force applied when an
35 external device such as a USB flash drive is connected

to the connector 37 is received in the circuit substrate 35a which is vertically provided. In this way, the damage to the circuit substrate 35a can be prevented.

5 While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms;
10 furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or
15 modifications as would fall within the scope and spirit of the inventions.

 For example, in the above embodiment, the structure in which the two side supporting portions 23 (see FIG. 6) are provided so as to face each other may
20 be modified. A single side supporting portion 23 may be provided, or three or four side supporting portions 23 may be provided. Alternatively, the side supporting portions 23 may be provided at positions supporting the sides on the sides facing the corner supporting
25 portions 21 and 21.

CLAIMS

1. An elevator comprising:

a board provided above a door device of a car, and

5 comprising an outer wall facing a hall side, an inner wall facing inside of the car, and a bottom wall connecting the outer wall and the inner wall and comprising a window portion; and

a camera device provided in an upper portion of the window portion, and capturing the hall from the window portion in a

10 state where a door of the door device is open, wherein

the camera device comprises a camera substrate on which a camera is mounted, an image processing unit and an interface unit in a housing,

15 the housing comprises a base to which the camera substrate and the units are secured,

a lens hole in which a lens of the camera is provided is formed in the base,

a center of the lens hole is located in a center of the base in a width direction of the base,

20 a distance from the center of the lens hole to one end is less than a distance from the center of the lens hole to the other end in a longitudinal direction of the base, and

the distance from the center of the lens hole to the one end is a specified distance in which, in a case where the door device opens one of right and left doors, the lens hole is provided at an appropriate position with respect to a door end frame of the door when the one end of the base is provided at a door opening side end of the board, and in a case where the door device opens the other one of right and left doors, the lens hole is provided at the appropriate position with respect to the door end frame of the door when the camera device is horizontally inverted and the one end of the base is provided at

25

30

the door opening side end of the board.

2. The elevator of claim 1, wherein a circuit substrate and a connector for connecting an external device are provided in the image processing unit, and the connector is provided in an upper portion of the housing.

3. The elevator of claim 2, wherein a surface of the circuit substrate of the image processing unit is vertically provided, and the connector is attached to an upper end of the circuit substrate.