

ESCALATOR MONITORING APPARATUS, METHOD FOR INSTALLING THE
ESCALATOR MONITORING APPARATUS, AND DEVICE FOR INSTALLING THE
ESCALATOR MONITORING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001]

The present invention relates to an escalator monitoring apparatus which is suitable to photographically record how passengers are riding on an escalator, a method for installing the escalator monitoring apparatus, and a device for installing the escalator monitoring apparatus.

2. Description of the Background Art

[0002]

Some background-art escalator arrangement structures have protection units for preventing passengers from getting caught. Each protection unit is provided in a narrow-angle portion formed between a moving handrail of one escalator placed with an inclination between upper and lower floors in a building and a ceiling of the building or in a narrow-angle portion formed between a moving handrail of one of a plurality of escalators provided crosswise in side view and a bottom portion of another of the escalators. Each protection unit has a structure in which a cylinder having a predetermined diameter is provided

in a front end portion of the protection unit so that the cylinder can inform a passenger of danger and prevent the passenger from being injured when the passenger collides with the cylinder of the protection unit.

[0003]

An accident that a passenger falls down or gets caught to tumble down the stairs for some reason may occur in an escalator included in such an escalator arrangement structure. In consideration of such a possibility, there has been proposed an escalator monitoring apparatus in which a monitoring camera is provided to take pictures of the state of an escalator which is being used by passengers, while a sensor is provided to detect vibration of the protection unit so that pictures can be recorded for a predetermined period around the time when the sensor detects the vibration of the protection unit (see JP-A-2002-114475).

[0004]

In addition, in an escalator included in such an escalator arrangement structure, a passenger leaning out of a moving handrail may be not aware of a narrow-angle portion approaching the passenger till the passenger touches a protection unit. In order to prevent a significant accident from occurring in such a case, a safety system for an escalator has been proposed, in which the protection unit can be recognized in advance due

to a detector suspended in front of the protection unit and supported by an elastic body (see JP-UM-A-61-154278).

[0005]

In addition, there is a monitoring camera for an escalator included in such an escalator arrangement structure, in which a pole with a predetermined height is provided erectly on a platform of each of upper and lower portions of the escalator, and the camera is internally received in the pole to photographically record how passengers are riding on the escalator (see JP-A-2006-206283).

[0006]

Further, there is a protection unit made from acrylic resin and installed in such a narrow-angle portion. The protection unit is formed out of a cylinder and a trapezoidal plate. Reinforcing portions are pasted on the front and back of an upper end side of the plate. Each reinforcing portion is formed out of an acrylic resin plate with a predetermined thickness and a predetermined height. The plate including the reinforcing portions is inserted into a groove portion formed in the cylinder to enhance the strength against a torsional force applied to the cylinder (see JP-A-2003-20186).

[0007]

In the aforementioned escalator monitoring apparatus according to the background art, wiring of a signal line to

be connected to the sensor for detecting vibration of the protection unit is required to be extended to a control unit of the camera so that there is a problem that installation expense increases due to wiring work on the building side.

[0008]

In addition, the camera is required to be placed on a ceiling or a wall of the building. Since the place where the camera can be attached is limited, there is a problem that a good viewing field of the camera cannot be secured. When the ceiling or the wall has a special structure such as a double height structure, a glass wall surface finishing structure, a ceiling special finishing structure, etc., there is a problem that the camera cannot be placed.

[0009]

In addition, in order to provide the pole erectly, there is a problem that time or expenditure is required for building engineering works such as excavating a floor on the building side, fixing the pole or laying a wiring duct underground. There is another problem that the pole may interfere with a traffic line of passengers. There is a further problem that passengers may feel peeped and ill as the passengers are photographed upward from below.

[0010]

Further, there is a phenomenon that light of a lighting

system in the building enters the camera so that an essential part of an image becomes difficult to see due to reflected glare of the light in the image.

[0011]

Furthermore, due to the plate longitudinally inserted into the cylinder in the protection unit, there is a problem that the camera cannot be internally received in an upper portion of the cylinder.

SUMMARY OF THE INVENTION

[0012]

A first object of the present invention is to provide an escalator monitoring apparatus in which a camera for taking pictures about how passengers are riding on an escalator can be placed, removed or adjusted easily and which gives no sense of illness to the passengers.

[0013]

A second object of the present invention is to provide an escalator monitoring apparatus in which a camera for taking pictures about how passengers are riding on an escalator is hardly influenced by light inside or outside a building, and whose design is excellent.

[0014]

A third object of the present invention is to provide

a method for installing an escalator monitoring apparatus in which a camera for taking pictures about how passengers get on an escalator can be placed, removed or adjusted easily.

[0015]

A fourth object of the present invention is to provide a device for installing an escalator monitoring apparatus in which a camera can be attached into a cylinder of a protection unit.

[0016]

In order to attain the forgoing first object, first and second configurations of the present invention provides an escalator monitoring apparatus provided in an escalator arrangement structure having a protection unit disposed in a narrow-angle portion, the protection unit having a cylinder in a front position thereof to prevent passengers from getting caught in the narrow-angle portion, the narrow-angle portion being a narrow-angle portion formed between a moving handrail of one escalator placed with an inclination and a ceiling of a building or a narrow-angle portion formed between a moving handrail of one escalator and a bottom portion of another escalator disposed crosswise and adjacently thereto, the escalator monitoring apparatus including a camera which is received inside the cylinder; and a support member which supports the camera on a vertical line from a central portion of the

cylinder. The escalator monitoring apparatus may further includes a camera mounting plate which has a hole with a predetermined diameter in a central portion thereof and a plurality of mounting holes provided at predetermined angle intervals and on a circumference with a predetermined radius from a center thereof, a U-shaped mounting member which is provided erectly with predetermined-length foot portions opposed to each other around the predetermined-diameter hole, and a camera support portion which is provided in a central portion of a horizontal plane with the camera mounting plate in the mounting member.

[0017]

In this manner, the camera is received inside the cylinder of the protection unit disposed in a narrow-angle portion of an escalator. Thus, the monitoring camera can be mounted in the best position to monitor ascending/descending conditions of passengers without being affected by the ceiling of the building or the structure of the wall. In addition, pictures are taken from a position near an intermediate portion of the escalator. Thus, even if a picture is taken upward, the camera cannot have an enough angle to peep, and no influence is given to the traffic line of the passengers.

[0018]

In addition, the support member for supporting the camera

is provided on a vertical line from the central portion of the cylinder independently of the protection unit. Thus, the camera can be suspended alone. In addition, the horizontal viewing angle of the camera can be changed by changing the position of the mounting hole of the mounting jig when the camera is mounted.

[0019]

In order to attain the foregoing second object, third and fourth configurations of the invention provides an escalator monitoring apparatus further including a cover piece which covers an inner circumferential surface of the cylinder from an upper surface of the cylinder at least to a lower end portion of the camera mounting plate, and which has at least a length extending to a lower end portion of the camera mounting plate from a projection point where light emitted downward from an upper end portion of a viewing field of the camera in the cylinder is projected on the viewing field side of the camera in the cylinder, the cover piece being flexible and covering almost half a circumference of the cylinder on an opposite side to the viewing field of the camera. The cover piece may be formed out of a T-shaped or L-shaped opaque film and provided with at least one hole in a position corresponding to a hole provided in an upper portion of the cylinder when an upper side of the cover piece is set on the same plane as an upper end surface

of the cylinder.

[0020]

In this manner, the cover piece suppresses light from being reflected by the inner wall of the cylinder and entering the viewing angle of the camera. It is therefore possible to reduce reflected glare in an image picked up by the camera.

[0021]

In order to attain the third object, a fifth configuration of the invention provides a method for installing an escalator monitoring apparatus in an escalator arrangement structure having a protection unit disposed in a narrow-angle portion, the protection unit having a cylinder in a front position thereof to prevent passengers from getting caught in the narrow-angle portion, the narrow-angle portion being a narrow-angle portion formed between a moving handrail of one escalator placed with an inclination and a ceiling of a building or a narrow-angle portion formed between a moving handrail of one escalator and a bottom portion of another escalator disposed crosswise and adjacently thereto, a camera being mounted to be received inside the cylinder, the method including the steps of: placing a support member, from which the camera should be suspended, between the moving handrail and the ceiling of the building or in the bottom portion of the adjacent escalator; adjusting a viewing field of the camera; aligning a cover piece with a

horizontal viewing angle of the camera and inserting the cover piece into the cylinder to touch an inner circumferential surface of the cylinder; supporting a rear portion support portion of the protection unit; receiving the camera inside the cylinder; and supporting a front portion support portion of the protection unit.

[0022]

In this manner, the camera is suspended from the attached support member, the viewing field of the camera is adjusted, the cover piece is inserted into the cylinder correspondingly to the adjusted viewing field, the rearmost portion of the protection unit is then supported, the camera is inserted into the cylinder, and the front portion of the protection unit is supported. Thus, the viewing field of the camera can be adjusted as the camera is left suspended. In addition, the cover piece can be disposed in the optimum position to avoid the influence of light. Thus, no work of adjustment is required after the camera is inserted into the cylinder of the protection unit.

[0023]

In order to attain the fourth object, sixth to eighth configurations of the invention provides a device for installing an escalator monitoring apparatus, including a protection unit which is disposed in a narrow-angle portion and which is formed out of a cylinder disposed in a front position thereof and a

trapezoidal plate behind the cylinder to prevent passengers from getting caught in the narrow-angle portion and to allow a camera to be received inside the cylinder, the narrow-angle portion being a narrow-angle portion formed between a moving handrail of one escalator placed with an inclination and a ceiling of a building or a narrow-angle portion formed between a moving handrail of one escalator and a bottom portion of another escalator disposed crosswise and adjacently thereto; wherein the protection unit includes: a notch portion which is formed in the plate to extend with a predetermined width and a predetermined length from a terminal point surrounded by a side of the plate parallel to the ceiling of the building or the bottom portion of the escalator and a side corresponding to a lower bottom of the trapezoidal shape of the plate; and a groove portion which is provided in a longitudinal direction of the cylinder to have a dimension as large as a thickness of the plate; and the cylinder and the plate are bonded with each other in a state where the side corresponding to the lower bottom of the plate has been inserted into the groove portion and the side corresponding to the lower bottom has been brought into contact with an inner surface of the cylinder opposed to the groove portion. The width of the notch portion may be made as large as the sum of an inner diameter of the cylinder and a thickness of the cylinder, and the length of the notch portion

may be set so that the notch portion can be located at least at a lower end of a viewing field of the camera when the camera is disposed in a predetermined position and a vertical viewing angle of the camera is adjusted and optimized. The groove portion may be set to be at least as long as the side corresponding to the lower bottom of the plate excluding the notch portion.

[0024]

In this manner, a space portion can be provided in the upper portion of the cylinder of the protection unit so that the camera can be mounted in the space portion.

[0025]

According to the first and second configurations of the invention, the camera is received inside the cylinder of the protection unit disposed in a narrow-angle portion of an escalator. Thus, the camera can pick up pictures in the best position where ascending/descending conditions of passengers can be monitored. In addition, faith of the passengers as to the angle of the camera can be obtained.

[0026]

In addition, the camera is suspended independently of the protection unit, while the horizontal viewing angle of the camera can be changed by changing the position of the mounting hole provided in the mounting jig when the camera is mounted. Thus, the camera can be adjusted easily and quickly.

[0027]

According to the third and fourth configurations of the invention, the cover piece suppresses light from being reflected by the inner surface of the cylinder and entering the viewing angle of the camera, so as to reduce reflected glare of the light in an image picked up by the camera. It is therefore possible to provide an explicit picture. In addition, since the cover piece covers the range from the upper end portion of the cylinder to the lower end portion of the mounting jig, it is possible to hide the camera, the mounting jig, a cable, etc. Thus, it is possible to provide a monitoring apparatus which is superior in design.

[0028]

In addition, when at least one hole provided in the cover piece is aligned with the hole provided in the cylinder, the cover piece can be adjusted in a desirable viewing angle position of the camera. Thus, the camera can be adjusted quickly.

[0029]

According to the fifth configuration of the invention, the viewing field of the camera can be adjusted as the camera is left suspended. In addition, the cover piece can be disposed in the optimum position of the viewing field of the camera so that adjustment in the condition that the camera is placed can be carried out accurately and quickly.

[0030]

According to the sixth to eighth configurations of the invention, the camera can be received inside the cylinder of the protection unit. Thus, the camera can pick up pictures in a position close to passengers of the escalator without making the passengers aware of the existence of the camera.

BRIEF DESCRIPTION OF THE DRAWINGS

[0062]

Fig. 1 is a side view showing an overall configuration of a first embodiment of an escalator monitoring apparatus according to the present invention;

Fig. 2 is a side view of a protection unit portion with a main portion enlarged view, showing a mounting state of a camera in the escalator monitoring apparatus according to the present invention;

Fig. 3 is a main portion perspective view showing a structure of the protection unit as a device for installing the escalator monitoring apparatus according to the present invention;

Fig. 4 is a perspective view for explaining the configuration of the escalator monitoring apparatus according to the present invention; and

Fig. 5 is a flow chart showing the procedure of installing

the escalator monitoring apparatus according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0031]

An embodiment relating to an escalator monitoring apparatus, a method for installing the escalator monitoring apparatus, and a device for installing the escalator monitoring apparatus according to the invention will be described with reference to the drawings.

[0032]

Fig. 1 is a side view showing an overall configuration of a first embodiment of an escalator monitoring apparatus according to the present invention; Fig. 2 is a side view of a protection unit portion with a main portion enlarged view, showing a mounting state of a camera in the escalator monitoring apparatus according to the present invention; Fig. 3 is a main portion perspective view showing a structure of the protection unit as a device for installing the escalator monitoring apparatus according to the present invention; Fig. 4 is a perspective view for explaining the configuration of the escalator monitoring apparatus according to the present invention; and Fig. 5 is a flow chart showing the procedure of installing the escalator monitoring apparatus according to

the present invention.

[0033]

In Figs. 1-5, an escalator 1 is placed lying between a first floor 2 and a second floor 3. The escalator 1 has a balustrade 5 supporting a moving handrail 4 to be held by passengers, an outer deck 6 retaining the balustrade 5 from its outside, and a control unit 7 for the escalator 1. In a narrow-angle portion 8D formed between the moving handrail 4 and a first floor ceiling 8 provided under the second floor 3, a movable protection unit 9 and a fixed protection unit 10 are disposed in order to prevent passengers from getting caught in the narrow-angle portion 8D. As soon as a passenger touches the movable protection unit 9, the movable protection unit 9 can shake to make the passenger aware of danger. The fixed protection unit 10 is fixed firmly.

[0034]

The movable protection unit 9 is constituted by a trapezoidal plate 9A made from acrylic resin and a cylinder 9B made from acrylic resin with a predetermined diameter. The cylinder 9B is bonded with the plate 9A. A dome-type camera 11 is inserted into an upper portion of the cylinder 9B. The camera 11 is suspended from the first floor ceiling 8.

[0035]

In addition, a connector 11A for a power supply and a

video signal is provided in the center of the top portion of the camera 11. A cable 12 is removably connected to the connector 11A. Not-shown screws are screwed down to a plurality of not-shown threaded holes provided in the top portion of the camera 11 respectively so as to fasten a mounting jig 13.

[0036]

The mounting jig 13 is provided with a camera mounting plate 13A and a U-shaped mounting member 13B welded with each other. A not-shown hole with a predetermined diameter is provided in the central portion of the camera mounting plate 13A. A plurality of holes 13Aa are provided to avoid contact with the connector 11A and arranged at predetermined angle intervals on a circumference whose diameter does not exceed the diameter of the camera 11. The mounting member 13B has a pair of foot portions 13Ba with a predetermined length. The foot portions 13Ba are located in opposed positions around the not-shown hole in the central portion of the camera mounting plate 13A. A camera support portion 13Bc is provided in a central portion of a horizontal plane of the mounting member 13B. Here, when the position where the not-shown threaded holes provided in the top portion of the camera 11 are fastened to the holes 13Aa of the camera mounting plate 13A is changed, the horizontal viewing angle of the camera 11 can be changed.

[0037]

In addition, a mounting bracket 14 to which the camera 11 and the movable protection unit 9 will be mounted is attached to the narrow-angle portion 8B of the first floor ceiling 8. The mounting bracket 14 has support portions 14a, 14b and 14c. The support portions 14a and 14b are provided correspondingly to a distance between a rear portion mounting hole 9Aa and a cylinder-side mounting hole 9Ab provided in an upper portion of the plate 9A of the movable protection unit. The rear portion mounting hole 9Aa serves as a rear portion support portion. The cylinder-side mounting hole 9Ab serves as a front portion support portion. The support portion 14c is provided to extend from the support portion 14b and to be as long as the length of the central portion of the cylinder-side mounting hole 9Ab and the cylinder 9B. The rear mounting hole 9Aa and the cylinder-side mounting hole 9Ab of the movable protection unit 9 are attached to the support portions 14a and 14b through suspension rings 15A respectively. The camera 11 is suspended by the support portion 14c, a suspension ring 15B and the camera support portion 13B.

[0038]

Here, the mounting bracket 14 provided with the support portions 14a, 14b and 14c has been described. However, the support portion 14c may be provided in another mounting bracket 14. Even when the support portion 14c is attached to another

mounting bracket than the mounting bracket for the movable protection unit 9, it will go well if the support portion 14c for supporting the camera 11 is located on a vertical line extending from the central portion of the cylinder 9B.

[0039]

In this manner, the camera 11 can be mounted in addition to the movable protection unit 9. Thus, the camera 11 whose viewing angle etc. has been adjusted can be mounted in the cylinder 9B of the movable protection unit 9.

[0040]

In addition, an opaque film 16 as a cover piece with a flat T or L shape is inserted into the cylinder 9B. Due to the film 16, light reflected by the inner surface of the cylinder 9B can be prevented from entering an image picked up by the camera 11 while the camera mounting plate 13A and the cable 12 in the upper portion of the camera 11 can be hidden.

[0041]

The film 16 consists of a T-shaped or L-shaped shield portion 16A and an antireflection portion 16B. The shield portion 16A serves to hide the upper portion of the camera 11. The antireflection portion 16B is substantially half as wide as the inner circumference of the cylinder 9B. A long hole 16Aa is provided in the shield portion 16A. The long hole 16Aa corresponds to a hole 9Ba provided in the upper portion of the

cylinder 9B when the upper end of the cylinder 9B is put on the same plane as the upper end of the shield portion 16A.

[0042]

In addition, the camera 11 has an upper viewing angle point A and a lower viewing angle point B in the cylinder 9B. In order to prevent reflections of light, it will go well if light reflected from the opposite side to the viewing field of the camera 11 can be prevented in a range from the viewing angle point A to the viewing angle point B. Therefore, it will go well if the lower end of the antireflection portion 16B reaches a position corresponding to the lower viewing angle point B even when it is the longest. Define a projection point C on the viewing field side in a critical angle for total reflection of light reflected by acrylic resin, which light is radiated downward from the upper viewing angle point A and reflected by the inner surface of the cylinder 9B on the opposite side to the viewing field. Here, if light totally reflected by a lower portion of the cylinder 9B is reflected in a position higher than the projection point C, the light would enter the camera, causing reflections of the light in the image. Thus, it will go well if the lower end of the antireflection portion 16B is located between the lower viewing angle point B and the projection point C.

[0043]

Consider the horizontal viewing angle. The horizontal viewing angle of the camera is about 120 degrees. Thus, it will be sufficient if the antireflection portion 16B is located at an angle of 180 degrees on the opposite side to the viewing field in the cylinder 9B.

[0044]

In addition, a print area 16Ba may be provided outside the antireflection portion 16B in the film 16. The print area 16Ba can be made use of for warning (e.g. "camera in operation") or public relations for guidance of a store or the like.

[0045]

In this manner, the camera mounting plate 13A and the cable 12 provided in the upper portion as well as the camera 11 can be hidden by the shield portion 16A of the film 16. Thus, any passenger of the escalator 1 is not aware of the existence of the camera 11, and there is no fear that the passenger makes mischief on the camera 11 intentionally.

[0046]

In addition, the antireflection portion 16B of the film 16 surely suppresses reflected glare of light caused by reflection on the inside of the cylinder 9B. Thus, an explicit image can be recorded.

[0047]

Next, the trapezoidal plate 9A of the movable protection

unit 9 has a notch portion 9Ac. The notch portion 9Ac is formed by notching a portion which extends from the upper end angle portion of the cylinder-side side 9a which is a lower bottom of the trapezoidal shape of the plate 9A. The notch portion 9Ac has a width as large as the sum of the inner diameter of the cylinder 9B and the thickness of the cylinder 9B, and a length as large as the distance between the upper end of the cylinder 9B and the lower viewing angle point B of the camera 11 in the cylinder 9B. Reinforcing materials each having a predetermined width are pasted to the opposite surfaces of the upper end of the plate 9A. In addition, a hole 9Ab is provided on the cylinder 9B side in the portion where the reinforcing materials are pasted, and a hole 9Aa is provided on the opposite side to the cylinder 9B. The holes 9Aa and 9Ab are provided for mounting the movable protection unit 9.

[0048]

On the other hand, in the cylinder 9B of the movable protection unit 9, a groove portion 9Bb which is as thick as the plate 9A is provided to extend downward in the longitudinal direction from the lower viewing angle point B of the camera 11 in the cylinder 9B. In addition, a hole 9Ba with a predetermined diameter is provided in an upper portion of the cylinder 9B.

[0049]

The plate 9A and the cylinder 9B are produced as described above. A bonding agent is applied to an end portion of the cylinder-side side 9a of the plate 9A excluding the notch portion 9Ac. The end portion of the cylinder-side side 9a of the plate 9A is inserted into the groove portion 9Bb of the cylinder 9B while the upper end portion of the plate 9A is set on the same plane as the upper end portion of the cylinder 9B. The end portion of the cylinder-side side 9a coated with the bonding agent is pressed onto the inner surface of the cylinder 9B opposed to the groove portion 9Bb. The bonding agent adheres to the site where the cylinder 9B and the plate 9A touch each other. Thus, the cylinder 9B and the plate 9A are bonded.

[0050]

Here, the groove portion 9Bb provided in the cylinder 9B is provided to extend downward in the longitudinal direction from the lower viewing angle point B of the camera 11 in the cylinder 9B. However, the groove portion 9Bb may extend from the lower viewing angle point B of the camera 11 in the cylinder 9B so as to be as long as the length of the cylinder-side side 9a excluding the notch portion 9Ac, or may be provided all over the longitudinal direction of the cylinder 9B.

[0051]

In this manner, the camera 11 can be received in the upper portion of the cylinder 9B of the movable protection unit 9.

Thus, pictures can be taken in a position close to passengers.

[0052]

Next, the procedure of installing the escalator monitoring apparatus will be described with reference to Fig. 5.

[0053]

First, the mounting bracket 14 for suspending the camera 11 and the movable protection unit 9 is attached to the first floor ceiling 8 in the narrow-angle portion 8D so that the support portion 14c is directed to the first floor 2 (Step S1).

[0054]

Next, the rings 15A are attached to the support portions 14a and 14b of the mounting bracket 14, while the ring 15B attached to the support portion 14c is attached to the camera support portion 13Bc of the mounting jig 13 fastened to the camera 11. Thus, the camera 11 is attached.

[0055]

Next, the vertical viewing angle and the horizontal viewing angle of the attached camera 11 are adjusted through a not-shown monitor. Here, the horizontal viewing angle of the camera 11 is adjusted by removing the mounting jig 13, rotating the camera 11 at a predetermined angle and changing the position where the holes 13Aa of the camera mounting plate 13A are fastened to a plurality of not-shown threaded holes

provided in the top portion of the camera 11 (Step S2).

[0056]

Next, the antireflection portion 16B of the film 16 is adjusted to an optimum position corresponding to the horizontal viewing angle of the camera 11 adjusted in Step S2 as follows. By making the movable protection unit 9 closer to the camera 11 or inserting the camera 11 into the cylinder 9B, a position where the camera 11 should be directed in the cylinder 9B is determined (a position in the top portion of the cylinder 9B may be marked). The film 16 is rounded and inserted from the opening portion of the top portion of the cylinder 9B while being adjusted so that the central line of the antireflection portion 16B is aligned with the opposite direction to the camera 11. The insertion is stopped in a position where the long hole 16A provided in the shield portion 16A of the film 16 corresponds to the hole 9Ba of the upper portion of the cylinder 9B. The condition where the film 16 is in contact with the inner wall of the cylinder 9B is confirmed. When the contact condition is bad, the bending degree of the film 16 is changed and the work of insertion is performed again (Step S3).

[0057]

Next, the ring 15A attached to the support portion 14a of the mounting bracket 14 in Step S2 is mounted into the rear portion mounting hole 9Aa provided in the upper portion of the

plate 9A of the movable protection unit 9 so as to temporarily fix the movable protection unit 9 (Step S4).

[0058]

Next, the camera 11 is inserted into the cylinder 9B of the movable protection unit 9 (Step S5). The ring 15B attached to the support portion 14c of the mounting bracket 14 in Step S2 is mounted into the cylinder-side mounting hole 9A provided in the upper portion of the plate 9Ab of the movable protection unit 9 (Step S6). A wire ring 17 is attached to the support portion 14c of the mounting bracket 14, the hole 9Ba of the upper portion of the cylinder 9B, and the long hole 16Aa of the shield portion 16A of the film 16 attached to the cylinder 9B.

[0059]

Here, the reason why the hole 9Ba of the cylinder 9B and the long hole 16Aa of the film 16 are connected to the support portion 14c of the mounting bracket 14 by the wire ring 17 is to prevent the cylinder 9B from falling down even if the plate 9A of the movable protection unit 9 is cracked to separate the plate 9A from the cylinder 9B.

[0060]

In this manner, the work relating to the camera 11 and the work relating to the movable protection unit 9 can be performed independently of each other. It is therefore

possible to easily and accurately perform the work of adjusting the viewing field of the camera 11 or the work of preventing reflected glare of light.

[0061]

In addition, for escalators located crosswise and adjacently to each other, the structure of a protection unit slightly differs from that in the aforementioned embodiment due to a different angle of a narrow-angle portion between a moving handrail of one escalator and a bottom portion of the other escalator adjacent thereto. However, an escalator monitoring apparatus is substantially the same as that in the aforementioned embodiment, and description thereof will be omitted.

FIG. 1

SECOND FLOOR

FIRST FLOOR

CONTROL UNIT

FIG. 4

CAMERA IN OPERATION

FIG. 5

S1 PLACE MOUNTING BRACKET

S2 ATTACH CAMERA AND ADJUST VIEWING FIELD

S3 INSERT COVER PIECE CORRESPONDINGLY TO VIEWING FIELD OF
CAMERA

S4 ATTACH REAR PORTION OF PROTECTION UNIT

S5 MOUNT CAMERA IN CYLINDER OF PROTECTION UNIT

S6 ATTACH FRONT PORTION OF PROTECTION UNIT

What is claimed is:

1. An escalator monitoring apparatus provided in an escalator arrangement structure having a protection unit disposed in a narrow-angle portion, the protection unit having a cylinder in a front position thereof to prevent passengers from getting caught in the narrow-angle portion, the narrow-angle portion being a narrow-angle portion formed between a moving handrail of one escalator placed with an inclination and a ceiling of a building or a narrow-angle portion formed between a moving handrail of one escalator and a bottom portion of another escalator disposed crosswise and adjacently thereto, the escalator monitoring apparatus comprising:

a camera which is received inside the cylinder; and

a support member which supports the camera on a vertical line from a central portion of the cylinder.

2. An escalator monitoring apparatus according to Claim 1, further comprising:

a mounting jig for the camera, which includes:

a camera mounting plate which has a hole with a predetermined diameter in a central portion thereof and a plurality of mounting holes provided at predetermined angle intervals and on a circumference with a predetermined radius from a center thereof;

a U-shaped mounting member which is provided erectly with

predetermined-length foot portions opposed to each other around the predetermined-diameter hole; and

a camera support portion which is provided in a central portion of a horizontal plane with the camera mounting plate in the mounting member.

3. An escalator monitoring apparatus according to Claim 1 or 2, further comprising:

a cover piece which covers an inner circumferential surface of the cylinder from an upper surface of the cylinder at least to a lower end portion of the camera mounting plate, and which has at least a length extending to a lower end portion of the camera mounting plate from a projection point where light emitted downward from an upper end portion of a viewing field of the camera in the cylinder is projected on the viewing field side of the camera in the cylinder, the cover piece being flexible and covering almost half a circumference of the cylinder on an opposite side to the viewing field of the camera.

4. An escalator monitoring apparatus according to any one of Claims 1 through 3, wherein:

the cover piece is formed out of a T-shaped or L-shaped opaque film and provided with at least one hole in a position corresponding to a hole provided in an upper portion of the cylinder when an upper side of the cover piece is set on the same plane as an upper end surface of the cylinder.

5. A method for installing an escalator monitoring apparatus in an escalator arrangement structure having a protection unit disposed in a narrow-angle portion, the protection unit having a cylinder in a front position thereof to prevent passengers from getting caught in the narrow-angle portion, the narrow-angle portion being a narrow-angle portion formed between a moving handrail of one escalator placed with an inclination and a ceiling of a building or a narrow-angle portion formed between a moving handrail of one escalator and a bottom portion of another escalator disposed crosswise and adjacently thereto, a camera being mounted to be received inside the cylinder, the method comprising the steps of:

placing a support member, from which the camera should be suspended, between the moving handrail and the ceiling of the building forming the narrow-angle portion or in the bottom portion of the adjacent escalator;

suspending the camera from the support member and adjusting a viewing field of the camera;

aligning a cover piece with a horizontal viewing angle of the camera and inserting the cover piece into the cylinder to touch an inner circumferential surface of the cylinder;

supporting a rear portion support portion of the protection unit;

receiving the camera inside the cylinder; and

supporting a front portion support portion of the protection unit.

6. A device for installing an escalator monitoring apparatus, comprising:

a protection unit which is disposed in a narrow-angle portion and which is formed out of a cylinder disposed in a front position thereof and a trapezoidal plate behind the cylinder to prevent passengers from getting caught in the narrow-angle portion and to allow a camera to be received inside the cylinder, the narrow-angle portion being a narrow-angle portion formed between a moving handrail of one escalator placed with an inclination and a ceiling of a building or a narrow-angle portion formed between a moving handrail of one escalator and a bottom portion of another escalator disposed crosswise and adjacently thereto; wherein:

the protection unit includes:

a notch portion which is formed in the plate to extend with a predetermined width and a predetermined length from a terminal point surrounded by a side of the plate parallel to the ceiling of the building or the bottom portion of the escalator and a side corresponding to a lower bottom of the trapezoidal shape of the plate; and

a groove portion which is provided in a longitudinal direction of the cylinder to have a dimension as large as a

thickness of the plate; and

the cylinder and the plate are bonded with each other in a state where the side corresponding to the lower bottom of the plate has been inserted into the groove portion and the side corresponding to the lower bottom has been brought into contact with an inner surface of the cylinder opposed to the groove portion.

7. A device for installing an escalator monitoring apparatus according to Claim 6, wherein:

the width of the notch portion provided in the plate is made as large as the sum of an inner diameter of the cylinder and a thickness of the cylinder, and the length of the notch portion is set so that the notch portion is located at least at a lower end of a viewing field of the camera when the camera is disposed in a predetermined position and a vertical viewing angle of the camera is adjusted and optimized.

8. A device for installing an escalator monitoring apparatus according to Claim 6 or 7, wherein:

the groove portion is set to be at least as long as the side corresponding to the lower bottom excluding the notch portion in the plate.