

DESCRIPTION

SEALING DEVICE FOR ELEVATOR DOOR

5 Technical Field

The present invention relates to a sealing device for an elevator door, which seals a gap between an elevator door and a door adjacent member provided adjacent to the door.

10 Background Art

An elevator gate is provided in a wall surface of an elevator hall of a building and the gate is communicated to a shaft of an elevator in the building. The gate includes a gate-shaped three-sided frame (door adjacent member). A hall door (elevator door) that opens/closes the gate is provided on a rear surface side of the three-sided frame. The gate is closed by the hall door in a normal situation.

20 The hall door includes a hanger at its upper section. The hanger has a plurality of rotatable rollers. The gate has a header at an inner side of its upper section. The header includes a hanger rail that extends in a horizontal direction. The hall door is suspended from the hanger rail downwards while each
25 roller is engaged with the hanger rail. As the hall door moves right to left or vice versa along the hanger rail, the gate is opened or closed, respectively.

A doorsill is installed at a bottom section of the gate to be flushed with the floor surface of the elevator hall. A guide groove is formed in an upper surface of the doorsill. A guide shoe is provided on
5 a bottom portion of the hall door to fit with the guide groove with some play. When the hall door is opened/closed, the guide shoe slides along the guide groove.

Between the hall door and the three-sided frame or doorsill, a sufficient gap is left so that the hall
10 door can be smoothly operated. With this stricture, in case of a fire occurring in the building, the smoke due to the fire can enter the shaft through the gap between the hall door and the three-sided frame or the doorsill despite that the gate is closed by the hall door. As a
15 result, the shaft becomes to function as a chimney and may develop the fire. In addition, an elevator cage that moves through the shaft entails the following problem. That is, if there is a gap between a doorway of the elevator cage and a cage door, the smoke of
20 the fire can enter the cage through this gap. Thus, passengers in the cage are exposed to danger.

However, those measures conventionally proposed to shut the gaps, cause an increase in the size of the door device as a whole, and further complicate the
25 structure of the device. Accordingly, the adjusting operation carried out during the installation of these facilities becomes complicated.

Meanwhile, in order to shut the gap created between the bottom portion of the hall door and the doorsill, it has been proposed that the sealing member provided at the bottom portion of the hall door and the guide groove of the doorsill should be brought into tight contact with each other. However, with this proposed technique, the frictional force between the sealing member and the guide groove is increased, which makes it difficult to open or close the hall door. Further, the sealing member wears out in a short period of time. To avoid this, the contact force between the sealing member and the guide groove should be weakened; however, at the time, if the contact force is weakened, the air-tightness is decreased accordingly.

Disclosure of Invention

According to an aspect of the present invention, there is provided a sealing device for an elevator door, which can make an entire door device to have approximately a same size as that of a conventional device, requires no fine adjustment for a sealing member when it is installed, can make the open/close operation of the door device smooth and can prevent the sealing member from wearing out.

The sealing device for the elevator door, according to the present invention, comprises an elevator door, a door adjacent member, a sealing member and a sealing member moving mechanism. The elevator

door serves to shut down the passage between the elevator hall and the passenger cage. The door adjacent member is placed to surround the elevator door with some gap between the member and the elevator door.

5 The sealing member is provided on either one of the elevator door and door adjacent member, and this member is brought into contact with the other member by the elastic force of an elastic member. The sealing member serves to seal the gap between the elevator door and

10 the door adjacent portion. The sealing member moving mechanism serves to, during the open/close operation of the elevator door, keep the sealing member and the other member in a non-contact state against the elastic force of the elastic member. Further, the mechanism

15 serves to bring the sealing member into contact with the other member by the elastic force of the elastic member when the elevator door is closed.

The sealing member moving mechanism includes a roller and a roller rolled portion having a shape

20 elongated in one direction, on which the roller rotates. A recess step portion is formed in a zone of a part of the roller rolled portion. During the open/close operation of the elevator door, the roller rotates while it is urged by the roller rolled portion

25 with the elastic force of the elastic member. In this manner, the sealing member is kept in a non-contact state with respect to the other member. While the

elevator door is closed, the roller drops in the recess step portion. With this structure, the sealing member is brought into contact with the other member by the elastic force of the elastic member, thereby sealing the gap between these members.

According to another embodiment of the present invention, there is provided a sealing device for an elevator, in which the roller and sealing member are provided on the elevator door. The roller rolled portion is provided on the door adjacent portion. During the open/close operation of the elevator door, the roller is brought into contact with the roller rolled portion by elastic force of the elastic member, and the roller rotates thereon. Thus, the sealing member is kept in a non-contact state with respect to the door adjacent portion. When the elevator door is closed, the roller drops in the recess step portion of the roller rolled portion, and the sealing member is brought into contact with door adjacent portion by the elastic force of the elastic member, thereby sealing the gap.

Alternatively, according to another embodiment of the present invention, there is provided a sealing device for an elevator, in which the roller is provided on the elevator door. The roller rolled portion and sealing member are provided on the door adjacent portion. During the open/close operation of the

elevator door, the roller is brought into contact with the roller rolled portion by the elastic force of the elastic member, and the roller rotates thereon. Thus, the sealing member is kept in a non-contact state with respect to the elevator door. When the elevator door is closed, the roller drops in the recess step portion of the roller rolled portion, and the sealing member is brought into contact with the elevator door by the elastic force of the elastic member, thereby sealing the gap.

In the above-described case, for example, the elevator door is a hall door that opens/closes the gateway of the elevator hall, and the door adjacent member is the three-sided frame provided in the gateway. The sealing member seals the gap between the hall door and the upper side of the three-sided frame when the hall door is closed.

Further, according to still another embodiment of the present invention, there is provided a sealing device for an elevator, in which the elevator door is a hall door that opens/closes the gateway of the elevator hall, and the door adjacent member is a doorsill that supports the lower end portion of the hall door and guides the open/close operation of the door. The sealing member serves to seal the gap between the hall door and the doorsill when the hall door is closed.

Furthermore, according to still another embodiment

of the present invention, there is provided a sealing device for an elevator, in which the elevator door is a cage door that opens/closes the doorway of the passenger cage of the elevator, and the door adjacent member is a doorway frame provided at the doorway.
5 The sealing member serves to seal the gap between the cage door and the doorway when the cage door is closed.

Furthermore, according to still another embodiment of the present invention, there is provided a sealing device for an elevator, in which the elevator door is a cage door that opens/closes the doorway of the passenger cage of the elevator, and the door adjacent member is a doorsill that supports the lower end portion of the cage door and guides the open/close operation of the door. The sealing member serves to seal the gap between the cage door and the doorsill when the hall door is closed.
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Brief Description of Drawings

FIG. 1 is a diagram showing a front view of a hall door provided in a gateway of an elevator hall according to the first embodiment of the present invention, when viewed from a shaft side;
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FIG. 2 is a diagram showing an enlarged front view of the structure of a suspension portion of the hall door shown in FIG. 1;
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FIG. 3A is a cross section of a sealing mechanism provided at the suspension portion when the hall door

shown in FIG. 1 is in a closed state;

FIG. 3B is a cross section of the sealing mechanism provided at the suspension portion while the hall door shown in FIG. 1 is being opened or closed;

5 FIG. 4A is a cross section of the sealing mechanism provided on the doorsill portion when the hall door shown in FIG. 1 is in a closed state;

10 FIG. 4B is a cross section of the sealing mechanism provided on the doorsill portion while the hall door shown in FIG. 1 is being opened or closed;

FIG. 5 is a cross sectional view along the hall door moving direction between the roller and the recess step portion of the sealing mechanism at the doorsill shown in FIG. 4B;

15 FIG. 6 is a plan view from above schematically showing the arrangement between the roller and the recess step portion of the sealing mechanism provided at doorsill for hall door shown in FIG. 1;

20 FIG. 7 is a diagram showing a front view of the hall door provided in the gateway of the elevator hall, when viewed from the shaft side, in the second embodiment of the present invention;

25 FIG. 8 is a cross section of the sealing mechanism provided at the suspension portion of the hall door provided in the gateway of the elevator hall in the third embodiment of the present invention;

FIG. 9 is a plan view from above showing the

arrangement between the roller and the roller rail of the sealing mechanism provided in suspension of the hall door shown in FIG. 8; and

5 FIG. 10 is a diagram showing a front view of the hall door provided in the gateway of the elevator hall, when viewed from the shaft side, in the fourth embodiment of the present invention.

Best Mode for Carrying Out the Invention

10 Embodiments of the present invention will now be described with reference to accompanying drawings.

The first embodiment is shown in FIGS. 1 to 6. FIG. 1 is a front view of hall doors 2 as an elevator door provided on a gateway 1 of an elevator hall, when viewed from a shaft side. The gateway 1 comprises a
15 three-sided frame 3 and a doorsill 4. The three-sided frame 3 and doorsill 4 are arranged to surround the hall doors 2 and they serve as a door adjacent member provided adjacent to the hall doors 2.

20 The three-sided frame 3 has a gate shape formed along the periphery of the gateway 1 except for the lower portion thereof. The three-sided frame 3 includes a pair of vertical frames 7 arranged on both right and left sides, and an upper frame 8 bridged between the upper sections of the vertical frames 7,
25 which are formed into a gate shape. A header 9 is formed united with an upper portion of the upper frame 8. A hanger rail 10 is horizontally mounted to a side

surface of the header 9 via a bracket 11 shown in FIG. 3 to extend in the right and left direction.

Pair of hall doors 2 are placed to be in parallel to each other in the right and left direction on a rear surface side of the three-sided frame 3. Each of the
5 hall doors 2 has a hanger 13 at its upper section. A plurality of rollers 14 are rotatably provided on right and left sections adjacent to side surfaces of each hanger 13. Each hall door 2 is movably suspended
10 on the hanger rail 10 by these rollers 14. As the hall doors 2 move, the gateway 1 is opened or closed.

FIGS. 2 and 3 each show an enlarged view of the structure of the suspension portion of the hall doors 2. A sealing mechanism 17 designed to seal a gap G1
15 between the hall doors 2 and the upper frame 8 of the three-sided frame 3 is provided in the suspension portion.

The sealing mechanism 17 will now be described. That is, a plate spring 18 serving as an elastic member
20 is provided on a side surface of the hanger 13 of the hall door 2, which faces the three-sided frame 3. A lower half portion of the plate spring 18 has approximately the same width as that of the hall doors 2, and an upper portion thereof is fixed to the hanger
25 13. A free end side of the lower portion of the spring plate 18 is inclined towards the three-sided frame 3 with respect to the vertical surface. A sealing member

20 made of an elastic material such as rubber is mounted on the lower edge portion.

5 The sealing member 20 has a hollow main portion 20a and a tongue piece portion 20b extending downwards from the main portion 20a, which are formed as a unity body. The sealing member 20 is formed to have substantially the same length as the width of the hall doors 2.

10 The hall doors 2 each have an airtight plate 19 having substantially the same width as that of the hall doors 2 on an upper end surface of each. A standup wall 8a is formed unity with the upper frame 8 of the three-sided frame 3. The plate spring 18 presses the main portion 20a of the sealing member 20 against the
15 standup wall 8a of the three-sided frame 3, and the tongue piece portion 20b against the airtight place 19 of each hall door 2.

20 Pair of rollers 22a and 22b are mounted to approximately a vertical middle portion of the plate spring 18 to be separated on both left and right sides such that the rollers 22a and 22b face a roller rolled portion 10a of a side surface of the hanger rail 10. The rollers 22a and 22b are arranged in hi-and-low positions to be displaced from each other, and they are
25 supported rotatably in the rotating direction of the vertical shaft each via a support shaft 23.

Each of the rollers 22a and 22b is brought into

contact with the roller rolled portion 10a on the side surface of the hanger rail 10 by the elastic force of the plate spring 18. With this stricture, as the hall doors 2 move in the right and left direction, each of the rollers 22a and 22b rotates on the surface of the roller rolled portion 10a.

Recess step portions 24a and 24b are formed in the roller rolled portion 10a in the middle of rolled paths of the rollers 22a and 22b, respectively. When the hall doors 2 are closed, the rollers 22a and 22b drop in the recess step portions 24a and 24b, respectively, by the elastic force of the plate spring 18. It should be noted that in FIG. 3, the recess step portions 24a and 24b are illustrated to be on the same cross section for convenience of showing.

The doorsill 4 is provided horizontally in the bottom portion of the gateway 1 to be flushed with the floor surface of the elevator hall and extended in the right and left direction, as shown in FIG. 1 and FIGS. 4A and 4B. The guide groove 27 is formed in the upper surface of the doorsill 4 along its longitudinal direction. A plurality of guide shoes 28 are mounted to the lower end portion of each of the hall doors 2. Each of the guide shoes 28 is slidably fit in the guide groove 27. As the hall doors 2 move, each of the guide shoes 28 slides along the guide groove 27. A plurality of through holes 27a, which serve to discharge dusts

and trashes, are formed at respective positions in the middle of the bottom surface of the guide groove 27 along its longitudinal direction.

5 The sealing mechanism 29 that serves to seal the gap G2 between each hall door 2 and the doorsill 4 is provided between each hall door 2 and doorsill 4. The sealing mechanism 29 will now be described. A plate spring 30 serving as an elastic member is mounted on a lower portion of an inner wall surface of each hall door 2. The plate spring 30 has a bent portion 30a at substantially the vertical middle section thereof, and an upper section of the spring is fixed to the respective hall door 2. A sealing member 31 made of an elastic material such as rubber is mounted horizontally on a lower portion of the plate spring 30. The sealing member 31 displaces up and down as the bent portion 30a elastically deforms.

20 The sealing member 31 has substantially the same length as the width of each hall door 2, and it is slidably fit with the rear surface of the respective hall door 2. The sealing member 31 is supported by the plate spring 30 such that the lower edge thereof project from the respective hall door 2 downwards to face the upper surface of the doorsill 4. The sealing member 31 is placed at a position on a side of the elevator hall with respect to the guide groove 27 of the doorsill 4.

The rollers 34a and 34b are mounted on the respective end portions of the sealing member 31 via support shafts 33, respectively. The rollers 34a and 34b are arranged to be displaced from each other in a front and rear direction in an inner side of the sealing member 31, and they are supported rotatably around the respective support shafts 33 provided horizontally.

A part of the upper surface of the doorsill 4 is formed into a roller rolled portion 4a on which the rollers 34a and 34b rotate. As shown in FIGS. 5 and 6, recess step portions 35a and 35b that correspond to the rollers 34a and 34b are formed in a partial zone in the middle of the roller rolled portion 4a. When the hall doors 2 are in a closed state, the rollers 34a and 34b drop in the respective recess step portions 35a and 35b by the elastic force of the plate spring 30. It should be noted that in FIGS. 4A and 4B, the recess step portions 35a and 35b are illustrated to be on the same cross section for convenience of showing.

Next, the operation of the sealing device of the elevator doors according to the present invention will now be described.

When the gateway 1 is shut down as each hall door 2 is closed, the rollers 22a and 22b of the sealing mechanism 17 drop in the respective recess step portions 24a and 24b of the hanger rail 10 as shown in

FIG. 3A. The plate spring 18 makes the main portion 20a of the sealing member 20 provided at its lower edge portion fit to the standup wall 8a of the upper frame 8 of the three-sided frame 3, and also the tongue piece portion 20b fit to the airtight plate 19 of the
5 respective hall door 2. In this manner, the gap G1 between the respective hall door 2 and the upper frame 8 of the three-sided frame 3 is sealed.

Further, as shown in FIG. 4A, the rollers 34a and
10 34b of the sealing mechanism 29 drop in the respective recess step portions 35a and 35b formed in the roller rolled portion 4a. Thus, the sealing member 31 is fit to the upper surface of the doorsill 4 by the elastic force of the plate spring 18. In this manner, the gap
15 G2 between the respective hall door 2 and the doorsill 4 is sealed.

As described above, when the hall doors 2 are in a closed state, the gap G1 between the respective hall door 2 and the upper frame 8 of the three-sided frame
20 3, and the gap G2 between the respective hall door 2 and the doorsill 4 are sealed. With this structure, in case where a fire occurred in the building, it is possible to inhibit the smoke from entering the shaft from the elevator hall. Therefore, it becomes possible
25 to prevent the shaft from serving as a chimney. Consequently, the development of the fire can be avoided and the diffusion of the smoke to other floors

can be prevented.

5 The sealing member 31 is provided between the elevator hall and the guide groove 27 so as to shut down between them. Therefore, even if the through holes 27a are formed in the bottom surface of the guide groove 27 provided in the doorsill 4 to discharge dusts and trashes, it is possible to inhibit smoke in the elevator hall from entering the shaft.

10 On the other hand, in a normal situation, after the passenger cage arrives at an elevator hall, the hall doors 2 are slide to the right and left direction from the closed state, thus opening the gateway 1. During this operation, as the hall doors 2 start to move, the rollers 22a and 22b of the sealing mechanism
15 17 leave from the respective recess step portions 24a and 24b of the roller rolled portion 10a. As shown in FIG. 3B, the rollers 22a and 22b run on the surface of the roller rolled portion 10a, and they rotate along the rumbling portion 10a.

20 When each of the rollers 22a and 22b displaces to run up on the surface of the roller rolled portion 10a, the plate spring 18, due to the displacement, is pressed to the side where the hanger is located against the elastic force of itself. Therefore, the sealing
25 member 20 mounted to the lower end edge of the plate spring 18 is left from the standup wall 8a of the upper frame 8 of the three-sided frame 3 and the airtight

plate 19 of the respective hall door 2. While maintaining the above-described state, each of the hall doors 2 is moved in the direction that opens the gateway 1.

5 Thus, while each of the hall doors 2 is moving, the sealing member 20 and the standup wall 8a are maintained in a non-contact state. Therefore, the hall doors 2 can be opened smoothly, and further the wearing-out of the sealing member 20 can be prevented.
10 Further, while each of the hall doors 2 is moving in the direction that closes the gateway 1, the sealing member 20 and the standup wall 8a are continuously maintained in a non-contact state. Therefore, the hall doors 2 can be closed smoothly, and further the
15 wearing-out of the sealing member 20 can be prevented.

 When the hall doors 2 reach respective close positions to shut down the gateway 1, the rollers 22a and 22b drop in the recess step portions 24a and 24b, respectively, by the elastic force of the plate spring
20 18. Consequently, the main portion 20a of the sealing member 20 mounted on the lower end edge of the plate spring 18 is brought into tight contact with the standup wall 8a of the upper frame 8 of the three-sided frame 3, and the tongue piece portion 20b is brought
25 into tight contact with the airtight plate 19. In this manner, the gap G1 between the respective hall door 2 and the upper frame 8 of the three-sided frame 3 is

sealed.

5 The rollers 22a and 22b, which form a pair, are provided separately on the respective left and right ends of the plate spring 18. The rollers are arranged such that they are displaced from each other in the front and rear direction, which is the thickness direction of the hall doors 2. With this structure, the rollers 22a and 22b of the hall door 2 appropriately engage in or leave from the respective recess
10 step portions 24a and 24b corresponding to these rollers. Therefore, it is possible to prevent such an error that the rollers engage in or leave from the other recess step portions 24b and 24a while the doors are moving.

15 On the other hand, when the gateway 1 is opened as the hall doors 2 move in the left or right direction from the closed state, the sealing mechanism 29 provided between the hall doors 2 and the doorsill 4 operates in the following manner. That is, as the
20 hall doors 2 start to move, the rollers 34a and 34b of the sealing mechanism 29 leave from the respective recess step portions 35a and 35b of the doorsill 4. The rollers 34a and 34b run up on the surface of the roller rolled portion 4a against the elastic force of
25 the plate spring 30, and they rotate on the surface.

 As shown in FIG. 4B, when the rollers 34a and 34b are running on the surface of the roller rolled portion

4a, the sealing member 31 is moved upwards integrally with the rollers 34 and 34b, and therefore it is separated from the upper surface of the doorsill 4. While maintaining this state, each of the hall doors 2 moves in the direction that opens the gateway 1.

As described above, while the hall doors 2 are moving, the sealing member 31 and the doorsill 4 are maintained in a non-contact state. Therefore, the hall doors 2 can be moved smoothly, and further the wearing-out of the sealing member 31 can be prevented. Further, while the hall doors 2 are moving in the direction that closes the gateway 1, the sealing member 31 and the doorsill 4 are continuously maintained in a non-contact state. Therefore, the hall doors 2 can be closed smoothly, and further the wearing-out of the sealing member 31 can be prevented.

When the hall doors 2 reach respective predetermined close positions to shut down the gateway 1, the rollers 34a and 34b drop in the recess step portions 35a and 35b of the roller rolled portion 4a, respectively, by the elastic force of the plate spring 30. Consequently, the sealing member 31 is brought into tight contact with the upper surface of the doorsill 4. In this manner, the gap G2 between the respective hall door 2 and the doorsill 4 is sealed.

The rollers 34a and 34b, which form a pair, are provided separately on the respective left and right

ends of the sealing member 31. The rollers are arranged such that they are displaced from each other in the front and rear direction, which is the thickness direction of the hall doors 2. With this structure, the rollers 34a and 34b appropriately engage in or leave from the respective recess step portions 35a and 35b corresponding to these rollers. Therefore, it is possible to prevent such an error that the rollers 34a and 34b engage in or leave from the other recess step portions 35b and 35a while the hall doors 2 are moving.

The sealing mechanism 17 provided on the upper portion of the respective hall door 2 can be housed in an empty space inside the hanger 13. With this structure, the height of the door device is not increased as a whole, thereby making it possible to prevent an increase in the size of the door device.

In the meantime, the sealing members 20 and 31 of the sealing mechanisms 17 and 29, respectively, are brought into tight contact with the side surface of the hanger rail 10 and the upper surface of the doorsill 4 by means of the elastic forces of the plate springs 18 and 30, respectively. With this structure, the sealing mechanisms 17 and 29 can seal the gaps G1 and G2 accurately without having to finely adjusting the sealing members 20 and 31, respectively, during the installation of these members.

In the first embodiment, a pair of rollers 34a and

34b are provided separately on the left and right ends of the sealing member 31. Here, it is also preferable as the second embodiment that one roller 34 should be provided at a middle portion of the sealing member 31 as shown in FIG. 7. As can be seen in FIG. 7, it is possible that the sealing mechanism 29 takes such a structure that the sealing member 31 is brought into contact with or separated from the upper surface of the doorsill 4 as the roller 34 moves in the vertical direction.

The third embodiment is shown in FIG. 8. This embodiment provides a modified version of the sealing mechanism designed to seal the gap G1 created between the hall doors 2 and the upper frame 8 of the three-sided frame 3. The bracket 11 that supports the hanger rail 10 includes a movable plate 40 mounted to face the hanger 13 of the respective hall door 2.

An upper end of the movable plate 40 is supported swingingly in the direction away from the hanger 13 by means of a pin 41. The movable plate 40 is elastically urged in the direction that approaches the hanger 13 by a spring 42 serving as an elastic member.

A sealing member 45 made of an elastic material such as rubber is mounted on a lower end portion of the movable plate 40. The sealing member 45 is extended in the longitudinal direction of the hanger rail 10. The sealing member 45 has a hollow main portion 45a and

a tongue piece portion 45b extended downwards from the main portion 45a, which are formed as an unity unit. The main portion 45a is brought into contact with the airtight plate 19 provided on an upper end of the
5 respective hall door 2. The tongue piece portion 45b is brought into contact with an inner surface of the standup wall 8a of the upper frame 8 of the three-sided frame 3.

A roller rail 46 is mounted at approximately a
10 vertical middle section of the movable plate 40 to face the hanger 13. The roller rail 46 is extended in the longitudinal direction of the hanger rail 10. A side surface of the roller rail 46 serves as a roller rolled portion 46a. A longitudinal partial zone of the roller
15 rolled portion 46a is formed into a recess step portion 46b as shown in FIG. 9.

The roller 47 is mounted to a side surface of the hanger 13 to face the roller rolled portion 46a. The roller 47 is supported by a support shaft 48 to be
20 rotatable in the rotating direction around the vertical shaft. The roller rolled portion 46a is brought into contact with the roller 47 by the elastic force of the spring 42.

FIG. 8 shows a state where the hall doors 2 are
25 being opened or closed. FIG. 9 shows the positions of the roller rolled portion 46a and the roller 47 in relation to each other. In this figure, the solid line

indicates the opening or closing operation, and the chain double-dashed line indicates the closed state. As indicated by the solid line in FIG. 9, the roller 47 is in contact with the roller rolled portion 46a, and as the hall doors 2 moves to open or close, the roller 47 rotates on the surface of the roller rolled portion 46a.

While the hall doors 2 are moving, the sealing member 45 is maintained in a non-contact state with respect to the airtight plate 19 and standup wall 8a. With this structure, the hall doors 2 can be opened or closed smoothly, and further the wearing-out of the sealing member 45 can be prevented.

When the hall doors 2 move along the hanger rail 10 in the direction that closes the gateway and reach the predetermined close position to shut down the gateway of the elevator hall, the roller 47 drops in a recess step portion 46b formed in the roller rolled portion 46a by the elastic force of the spring 42 as indicated by the chain double-dashed line in FIG. 9.

Accordingly, the movable plate 40 is pivoted around the pin 41 towards the hanger 13. The spring 42, with its elastic force, brings the main portion 45a of the sealing member 45 into tight contact with the airtight plate 19, and the tongue piece portion 45b into tight contact with the standup wall 8a. In this manner, the gap G1 between the respective hall door 2

and the upper frame 8 of the three-sided frame 3 is sealed.

As described above, as the hall doors 2 are set in the closed state, the gap G1 provided between the
5 respective hall door 2 and the upper frame 8 is sealed. With this structure, in case where a fire occurred in the building, it is possible to inhibit the smoke from entering the shaft from the elevator hall. Therefore, it becomes possible to prevent the shaft from serving
10 as a chimney. Consequently, the development of the fire can be avoided and the diffusion of the smoke to other floors can be prevented.

In the case where the hall doors 2 move in the opening direction from the closed state, as soon as the
15 hall doors 2 start to move, the roller 47 relatively runs up the surface of the roller rolled portion 46a from the recess step portion 46b. The movable plate 40 is pressed to pivot in the direction away from the hanger 13 against the force of the spring 42. In this
20 manner, the sealing member 45 is separated from the airtight plate 19 and the standup wall 8a in a non-contact state. Thus, the hall doors 2 can move in the opening direction in the non-contact state, and therefore they can be opened smoothly. Further, the
25 wearing-out of the sealing member 45 can be prevented. Thus, a similar effect to that of the first embodiment can be obtained by the second and third embodiments.

Each of the above-described embodiments is directed to the hall doors 2, which is of a biparting type. Alternatively, it is possible to apply the present invention to hall doors 2 of one side sliding type as shown in FIG. 10 as the fourth embodiment.

It should be noted that the doorway of the passenger cage of an elevator has a cage door, a doorway frame and a doorsill. The cage door is an elevator door and it corresponds to a hall door provided in the passenger gateway of the elevator hall. The doorway frame is a door adjacent member to the cage door, and it corresponds to the three-sided frame provided in the passenger gateway of the elevator hall. The doorsill supports the bottom portion of the cage door and serves to guide the opening and closing operation of the door. Therefore, it is alternatively possible to provide, between the cage door and the doorway frame, a sealing mechanism having a similar structure to that of the mechanism employed in each of the embodiments.

As described above, according to the present invention, the sealing device does not increase the size of the door device, or it does not require fine adjustment in the installation of the sealing member. Further, with the sealing device, it is possible to open and close the door smoothly, and prevent the wearing-out of the sealing member.

Industrial Applicability

The present invention can be applied not only to the sealing device of the elevator door, but also to a slide-type door that requires air-tightness in a closed state.

C L A I M S

1. A sealing device for an elevator,
characterized by comprising:

5 an elevator door that moves between an opened
state and a closed state;

a door adjacent member provided around the
elevator door in such a way as to create a gap between
the elevator door and the door adjacent member;

10 a sealing member provided on one of the elevator
door and the door adjacent member, which can be brought
into contact with the other member by an elastic force
of an elastic member, to seal the gap by the contact;
and

15 a sealing member moving mechanism that maintains
the sealing member in a non-contact state with respect
to the other member against the elastic force of the
elastic member while the elevator door is being opened
or closed, and bring the sealing member into the other
member by the elastic force of the elastic member while
20 the elevator door is in a closed state.

2. The sealing device for an elevator, according
to claim 1, characterized in that:

25 the sealing member moving mechanism comprises
a roller and a roller rolled portion elongated in one
direction on which the roller rotates, the roller
rolled portion including a recess step portion formed
in a partial zone thereof;

the sealing member moving mechanism maintains the sealing member in a non-contact state by elastically bringing the roller into contact with the roller rolled portion by the elastic force of the elastic member to rotate thereon, while the elevator door is being opened or closed; and

the sealing member moving mechanism seals the gap by bringing the sealing member into contact with the other member by the elastic force of the elastic member as the roller drops in the recess step portion, while the elevator door is in a closed state.

3. The sealing device for an elevator, according to claim 2, characterized in that:

the roller and the sealing member are provided in the elevator door and the roller rolled portion is provided in the door adjacent member;

the roller is elastically brought into contact with the roller rolled portion by the elastic force of the elastic member to rotate thereon, thereby maintaining the sealing member in a non-contact state with respect to the door adjacent member while the elevator door is being opened or closed; and

the roller drops in the recess step portion to bring the sealing member into contact with the door adjacent member by the elastic force of the elastic member, thereby sealing the gap while the elevator door is in a closed state.

4. The sealing device for an elevator, according to claim 2, characterized in that:

the roller is provided in the elevator door and the roller rolled portion and the sealing member are provided in the door adjacent member;

the roller is elastically brought into contact with the roller rolled portion by the elastic force of the elastic member to rotate thereon, thereby maintaining the sealing member in a non-contact state with respect to the elevator door while the elevator door is being opened or closed; and

the roller drops in the recess step portion to bring the sealing member into contact with the elevator door by the elastic force of the elastic member, thereby sealing the gap while the elevator door is in a closed state.

5. The sealing device for an elevator, according to claim 1, characterized in that:

the elevator door is a hall door that opens or closes a gateway of an elevator hall and the door adjacent member is a three-sided frame provided in the gateway; and

the sealing member seals the gap provided between the hall door and an upper frame of the three-sided frame while the hall door is in a closed state.

6. The sealing device for an elevator, according to claim 1, characterized in that:

the elevator door is a hall door that opens or closes a gateway of an elevator hall and the door adjacent member is a doorsill that supports a lower end of the hall door and guides its open and close operation; and

the sealing member seals the gap provided between the hall door and the doorsill while the hall door is in a closed state.

7. The sealing device for an elevator, according to claim 1, characterized in that:

the elevator door is a cage door that opens or closes a doorway of the passenger cage of an elevator and the door adjacent member is a doorway frame provided at the doorway; and

the sealing member seals the gap provided between the cage door and the gateway while the cage door is in a closed state.

8. The sealing device for an elevator, according to claim 1, characterized in that:

the elevator door is a cage door that opens or closes a doorway of the passenger cage of an elevator and the door adjacent member is a doorsill that supports a lower end of the cage door and guides its open and close operation; and

the sealing member seals the gap provided between the cage door and the doorsill while the cage door is in a closed state.