

ELEVATOR HALL APPARATUS

FIELD

[0001]

5 Embodiments of the present invention relate to an elevator hall apparatus.

BACKGROUND

[0002]

10 An elevator hall door apparatus is required to have fire resistance to fire occurring on each floor. A hall door is caused to function as a fire protection zone to prevent spread of fire and smoke into other floors via a hoistway. Further, even in the event of fire, there is a standard that requires the surface
15 temperature of a member forming a hall door apparatus not to rise to a prescribed value or higher. This is intended to prevent the hall door forming member from being damaged and to secure safety at the time of evacuation and rescue. One known example of a countermeasure against fire is a hall door panel
20 including a heat insulator. In this case, it is possible to mitigate rise in the temperature of a surface of the hall door panel facing a hoistway.

[0003]

 In the meantime, a hall door panel performs opening and
25 closing operations, and thus a gap is provided between the hall door panel and a jamb defining a hall entrance. However, when fire occurs on a certain floor, the air pressure in the hall on the floor increases. A hot gas (or hot air) generated by the fire leaks from the hall to a hoistway through this gap. This results in rise
30 in the temperature of the hall door forming member. In the upper portion of the hall entrance, the pressure of the hot gas becomes relatively high, which can increase the leakage amount of the hot gas. Thus, the temperature of the hall door forming member positioned above the hall door panel is likely to rise.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0004]

FIG. 1 is a view illustrating a schematic overall configuration of an elevator apparatus according to a first
5 embodiment;

FIG. 2 is a front perspective view illustrating a hall in FIG. 1;

FIG. 3 is a view illustrating a hall apparatus as seen from a hoistway;

10 FIG. 4 is a sectional view illustrating an upper portion of the hall apparatus in FIG. 3;

FIG. 5 is a perspective view of the upper portion of the hall apparatus in FIG. 3 as seen from the hoistway;

15 FIG. 6 is a view of the upper portion of the hall apparatus in FIG. 5 as seen from the hoistway;

FIG. 7 is a view illustrating an airflow in a typical hall apparatus at the time of occurrence of fire;

20 FIG. 8A is a perspective view illustrating a temperature distribution in the typical hall apparatus at the time of occurrence of fire, and FIG. 8B is a perspective view illustrating the temperature distribution of FIG. 8A without a header cover;

FIG. 9 is a view illustrating an airflow in the hall apparatus in FIG. 4 at the time of occurrence of fire;

25 FIG. 10A is a perspective view illustrating a temperature distribution in the hall apparatus in FIG. 5 at the time of occurrence of fire, and FIG. 10B is a perspective view illustrating the temperature distribution of FIG. 10A without a header cover;

FIG. 11 is a perspective view illustrating a modification of FIG. 5;

30 FIG. 12 is a perspective view illustrating a different modification of FIG. 5;

FIG. 13 is a perspective view illustrating another different modification of FIG. 5;

35 FIG. 14 is a sectional view illustrating an upper portion of a hall apparatus according to a second embodiment;

FIG. 15 is a perspective view of the upper portion of the

hall apparatus in FIG. 14 as seen from a hoistway;

FIG. 16 is a sectional view illustrating an upper portion of a hall apparatus according to a third embodiment;

FIG. 17 is a perspective view of the upper portion of the
5 hall apparatus in FIG. 16 as seen from a hoistway;

FIG. 18 is a sectional view illustrating an upper portion of a hall apparatus according to a fourth embodiment; and

FIG. 19 is a perspective view of the upper portion of the hall apparatus in FIG. 18 as seen from a hoistway.

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DETAILED DESCRIPTION

[0005]

An elevator hall apparatus according to an embodiment includes: a jamb that defines a hall entrance and includes an
15 upper frame provided above the hall entrance; a hall door panel that opens and closes the hall entrance and forms a narrow portion between the hall door panel and the upper frame; a header case provided above the hall door panel, the header case forming a backside space that is open to a hoistway between the
20 header case and a hoistway wall, and forming a header space above the hall door panel; a door rail provided in the header case; a door hanger via which the hall door panel hangs from the door rail; and a first opening provided in the upper frame or the header case. The narrow portion communicates with the backside space
25 via the header space and the first opening.

[0006]

Further, an elevator hall apparatus according to another embodiment includes: a jamb that defines a hall entrance and includes an upper frame provided above the hall entrance; a hall
30 door panel that opens and closes the hall entrance and forms a narrow portion between the hall door panel and the upper frame; a header case provided above the hall door panel; a door rail provided in the header case; a door hanger via which the hall door panel hangs from the door rail; and a first opening provided
35 in the header case. The header case includes a top board positioned above the door hanger. The first opening is formed in

the top board. The narrow portion communicates with a space above the top board via the first opening.

[0007]

Below, an elevator hall apparatus according to an embodiment of the present invention will be described with reference to the drawings. First, an elevator apparatus to which the elevator hall apparatus according to the present embodiment is applied will be described.

[0008]

As illustrated in FIG. 1, an elevator apparatus 1 includes a car 3 and a counterweight 4 that are placed in a hoistway 2. The car 3 and the counterweight 4 are connected via a main rope 5. The main rope 5 is wound around a traction sheave 6a provided in a hoist 6 and is hoisted by the hoist 6. In this manner, the car 3 and the counterweight 4 are moved up and down by the hoist 6 via the main rope 5. The hoist 6 is placed in a machine room 7 provided above the hoistway 2. A control device 8 is placed in the machine room 7. The control device 8 is a device that controls the whole of the elevator apparatus 1 including the hoist 6. For example, the control device 8 controls the operation of the hoist 6 in response to a hall call and a car call, and causes the car 3 to arrive at the hall 9 on a floor to which the call has been made.

[0009]

The elevator apparatus 1 according to the present embodiment is not limited to the configuration illustrated in FIG. 1. For example, a so-called machine room-less elevator apparatus may be used. Specifically, the machine room 7 may be omitted and the hoist 6 and the control device 8 may be provided in the upper portion of the hoistway 2.

[0010]

The elevator apparatus 1 illustrated in FIG. 1 includes an elevator hall apparatus (hereinafter simply referred to as a hall apparatus 20). The hall apparatus 20 includes a jamb 21 and a hall door apparatus 30. The hall apparatus 20 is provided in the hall 9 on each floor of a building.

[0011]

As illustrated in FIG. 2, the jamb 21 defines a hall entrance 22. The jamb 21 includes a pair of vertical frames 23 provided on right and left sides of the hall entrance 22 and an upper frame 24 provided above the hall entrance 22. The upper frame 24 is connected to the upper ends of the pair of vertical frames 23, and the jamb 21 is formed in a gate shape. As illustrated in FIG. 4, the upper frame 24 includes an upper frame body 24a and a protrusion board 24b protruding upward from the upper end of the upper frame body 24a. The upper frame body 24a is a part formed in a frame shape in the section illustrated in FIG. 4. The protrusion board 24b is positioned in an end of the upper frame body 24a closer to the hoistway 2. The protrusion board 24b may overlap the lower end of a wall board 34a of a header case 34 (described later) while being in contact therewith.

[0012]

As illustrated in FIGS. 3 and 4, the hall door apparatus 30 includes a hall door panel 31, a hall sill 33, a header case 34, a door rail 36, a door hanger 37, a hanger roller 38, and a header cover 39.

[0013]

The hall door panel 31 is provided in the hall 9 on each floor of the building and opens and closes the hall entrance 22. The hall door panel 31 and a car door panel 10 provided in the car 3 are engaged with each other and are interlocked via an engagement board (not illustrated) when the car 3 arrives on a floor. The car 3 is provided with a drive device (not illustrated) that drives the car door panel 10, and the drive device causes the car door panel 10, in conjunction with the hall door panel 31, to open and close. The hall door panel 31 may include a heat insulator.

[0014]

As illustrated in FIG. 4, a narrow portion 32 is formed between the hall door panel 31 and the upper frame 24 of the jamb 21. The narrow portion 32 is a minute gap positioned between the hall door panel 31 and the upper frame 24. The

narrow portion 32 prevents the hall door panel 31 from interfering with the upper frame 24 at the time of opening and closing. A similar gap is also formed between the hall door panel 31 and the vertical frame 23.

5 [0015]

In the present embodiment, as illustrated in FIG. 3, the hall door apparatus 30 includes two hall door panels 31. The hall door apparatus 30 may have a double-door structure as illustrated in FIG. 2, or may have a single-door structure.

10 [0016]

The hall sill 33 is fixed to the floor of the hall entrance 22. The hall sill 33 is positioned below the hall door panel 31 and is formed so as to guide opening and closing of the hall door panel 31.

15 [0017]

As illustrated in FIG. 4, the header case 34 is provided above the hall door panel 31. The header case 34 is a case that covers a hall door forming member positioned above the hall door panel 31. More specifically, the header case 34 includes a wall board 34a facing the hoistway wall 2a, a top board 34b extending from the upper end of the wall board 34a toward the inner side of the hoistway 2, and a flange board 34c. The lower end of the wall board 34a is in contact with the protrusion board 24b of the upper frame 24 described above. The top board 34b is positioned above the door hanger 37 and covers the door hanger 37 from above. The flange board 34c extends upward from an end of the top board 34b on the inner side of the hoistway 2. The wall board 34a, the top board 34b, and the flange board 34c may be integrally formed. For example, the header case 34 may be integrally formed as a sheet metal component. The header case 34 may be fixed to the hoistway wall 2a.

[0018]

A backside space 35 is formed between the header case 34 and the hoistway wall 2a. More specifically, the wall board 34a is spaced away from the hoistway wall 2a, and the backside space 35 is formed between the wall board 34a and the hoistway

wall 2a. The backside space 35 is open to the hoistway 2. As illustrated in FIG. 4, the backside space 35 may be open to the hoistway 2 at the upper portion of the backside space 35. Alternatively, the backside space 35 may be open to the hoistway 2 not only at an upper portion of the backside space 35 but also at a side portion (at least one of right and left side portions) of the backside space 35, or may be open to the hoistway 2 only at a side portion (at least one of right and left side portions) of the backside space 35. Meanwhile, the header case 34 forms a header space 40 described later, above the hall door panel 31.
[0019]

The door rail 36 is provided on the wall board 34a of the header case 34. More specifically, the door rail 36 is fixed to a surface of the wall board 34a on the inner side of the hoistway 2. The door rail 36 extends horizontally along a lateral direction when viewed from the hoistway 2. The lateral direction referred to herein is used as a term meaning a horizontal direction when viewed from the hoistway 2 toward the hall entrance 22. The door rail 36 may be formed as a separate component from the header case 34 and attached to the wall board 34a. Alternatively, the door rail 36 may be formed integrally with the header case 34. The header case 34 and the door rail 36 may be integrally formed by using one board material that has been bent, for example.

[0020]

The door hanger 37 is formed such that the hall door panel 31 hangs from the door rail 36 via the door hanger 37. The door hanger 37 is provided on each hall door panel 31 (see FIG. 3). The door hanger 37 is fixed to the upper end of the hall door panel 31, and is positioned on the inner side of the hoist way 2 rather than the wall board 34a of the header case 34. When viewed from the hoistway 2, the lateral dimension of the door hanger 37 may be smaller than the lateral dimension of the hall door panel 31.

[0021]

The hanger roller 38 is provided on the door hanger 37.

The hanger roller 38 is rotatably fixed to the door hanger 37 and can roll on the door rail 36. In the present embodiment, as illustrated in FIG. 3, one door hanger 37 is fixed to one hall door panel 31, and two hanger rollers 38 are fixed to each door hanger 37. However, two door hangers 37 may be fixed to one hall door panel 31, and one hanger roller 38 may be fixed to each door hanger 37.

[0022]

As illustrated in FIG. 4, the header cover 39 is fixed to the header case 34. More specifically, the header cover 39 is positioned on the inner side of the hoistway 2 rather than the header case 34, and is fixed to the flange board 34c of the header case 34. The header cover 39 extends below the flange board 34c, and forms the header space 40 in which the hall door forming members such as the door hanger 37 and the hanger roller 38 are accommodated, between the header cover 39 and the wall board 34a of the header case 34. The header space 40 means a space defined by the hall door panel 31, the header case 34, and the header cover 39. The header cover 39 covers the door hanger 37 from the inner side of the hoistway 2. Additionally, in the present embodiment, the header cover 39 may be omitted. Also in this case, the header space 40 can be defined as a similar space defined by the hall door panel 31 and the header case 34.

[0023]

As illustrated in FIG. 4, a first opening 41 is provided in the wall board 34a of the header case 34. The first opening 41 allows the narrow portion 32 and the backside space 35 described above to communicate with each other. Thus, the narrow portion 32 communicates with the backside space 35 via the header space 40 and the first opening 41, thereby forming a path of an airflow passing from the narrow portion 32 toward the backside space 35 through the header space 40 and the first opening 41.

[0024]

The opening area of the first opening 41 may be larger than the flow-path area of the narrow portion 32. The flow-path area of the narrow portion 32 corresponds to an area of a flow

path to be used when a hot gas (described later) generated in the hall 9 at the time of occurrence of fire flows through the narrow portion 32. For example, the flow-path area of the narrow portion 32 may be determined by a product of a gap g (see FIG. 4) between the hall door panel 31 and the upper frame 24 and a lateral dimension w (see FIG. 6) of the hall entrance 22. The lateral dimension of the hall entrance 22 corresponds to a distance between the pair of vertical frames 23 of the jamb 21.

[0025]

As illustrated in FIGS. 4 to 6, the first opening 41 according to the present embodiment is formed in the wall board 34a of the header case 34. The first opening 41 is positioned in a position lower than the door rail 36. In the present embodiment, the first opening 41 is formed only in a position lower than the door rail 36, and is not formed in a position higher than the door rail 36.

[0026]

As illustrated in FIGS. 5 and 6, the first opening 41 extends continuously along the lateral direction. The first opening 41 may be formed in a closed shape in the wall board 34a. The closed shape means that a base material (material of the wall board 34a) remains along the entire circumference of the opening and edges of the opening are closed. The first opening 41 according to the present embodiment is formed in a rectangular shape elongated along the lateral direction. The first opening 41 is formed from a position above a left end 22a of the hall entrance 22 to a position above a right end 22b of the hall entrance 22 in the lateral direction. In the present embodiment, the first opening 41 extends from a position above the left end 22a to a position above the right end 22b. More specifically, when viewed from the hoistway 2, a left end 41a of the first opening 41 is positioned above the left end 22a of the hall entrance 22, and a right end 41b of the first opening 41 is positioned above the right end 22b of the hall entrance 22. In this case, the lateral dimension of the first opening 41 is equal to the lateral dimension of the hall entrance 22. Additionally, the first opening 41 may protrude leftward with respect to the left end 22a of the hall

entrance 22 or may protrude rightward with respect to the right end 22b of the hall entrance 22, in the lateral direction. In this case, the lateral dimension of the first opening 41 is larger than the lateral dimension of the door hanger 37.

5 [0027]

In the meantime, a second opening 42 is formed between the header cover 39 and the hall door panel 31. The second opening 42 allows the header space 40 and the hoistway 2 to communicate with each other. More specifically, the lower end
10 of the header cover 39 and the upper end of the hall door panel 31 are spaced away from each other in the vertical direction, and the second opening 42 is formed between the lower end of the header cover 39 and the upper end of the hall door panel 31.

[0028]

15 Next, the operations of the present embodiment having the above-described configuration will be described with reference to FIGS. 7 to 10B.

[0029]

When fire occurs on a certain floor of a building in which
20 the elevator apparatus 1 is placed, a hot gas containing air as its main component is generated at the scene of the fire. The generated hot gas reaches the elevator hall 9, to raise the atmospheric pressure in the hall 9. In the upper portion of the hall entrance 22, in particular, the pressure of the hot gas
25 becomes relatively high. Then, as illustrated in FIGS. 7 and 9, the hot gas in the hall 9 leaks into the header space 40 positioned above the hall door panel 31 through the narrow portion 32 between the hall door panel 31 and the upper frame 24.

[0030]

30 Now, a flow of a hot gas in a typical hall apparatus 20 at the time of occurrence of fire will be described with reference to FIG. 7. In the following description, the same reference signs as in the hall apparatus 20 according to the present embodiment will be used for the sake of convenience.

35 [0031]

In the hall apparatus 20 illustrated in FIG. 7, the first

opening 41 as illustrated in FIG. 4 and the like is not formed in the header case 34. In this case, a part of a hot gas having leaked into the header space 40 passes on the lateral side of the door hanger 37 and flows out to the hoistway 2 through the second opening 42 as indicated by solid-line arrows in FIG. 7. Another part of the hot gas having leaked into the header space 40 ascends along the door hanger 37 in the header space 40, and descends while detouring around the door hanger 37. Thereafter, the hot gas flows out to the hoistway 2 through the second opening 42.

[0032]

In the meantime, when the hot gas reaches the hall 9, the temperature of the hall door panel 31 rises. In this case, also the temperature of a hoistway-side surface 31a of the hall door panel 31 that faces the hoistway 2 rises. As a result, an upward airflow is generated in the vicinity of the hoistway-side surface 31a of the hall door panel 31. This upward airflow is an ascending flow of air in the hoistway 2 (hereinafter referred to as a hoistway gas). The hoistway gas ascends from the hall door panel 31 along the header cover 39 as indicated by broken-line arrows in FIG. 7, and thus is unlikely to flow into the header space 40.

[0033]

In this manner, in the typical hall apparatus 20, the hot gas flows in the header space 40. As a result, the temperature of the hall door forming member in the header space 40 can possibly rise. This is illustrated in FIGS. 8A and 8B. FIGS. 8A and 8B illustrate temperature distributions obtained from thermal-fluid numerical analysis in the typical hall apparatus 20 at the time of occurrence of fire. FIG. 8A mainly illustrates the surface temperature distribution of the header cover 39, and FIG. 8B mainly illustrates the surface temperature distribution of the door hanger 37 and the wall board 34a of the header case 34. Thus, it can be seen that the temperatures of the header cover 39, the door hanger 37, and the header case 34 rise. In this case, also the temperature of the door rail 36 and the

temperature of the hanger roller 38 can possibly rise.

[0034]

In contrast thereto, in the hall apparatus 20 according to the present embodiment, the first opening 41 is formed in the header case 34 as illustrated in FIG. 4 and the like. As illustrated in FIG. 9, the first opening 41 forms a path of an airflow passing from the narrow portion 32 toward the backside space 35 through the header space 40.

[0035]

More specifically, a part of a hot gas having leaked into the header space 40 flows out to the backside space 35 through the first opening 41 as indicated by solid-line arrows in FIG. 9.

[0036]

On the other hand, as the temperature of the hall door panel 31 rises, an upward airflow is generated in the vicinity of the hoistway-side surface 31a of the hall door panel 31. A part of the hoistway gas that has become an ascending airflow flows into the header space 40 from the second opening 42 formed between the header cover 39 and the hall door panel 31 as indicated by broken-line arrows in FIG. 9. The part of the hoistway gas having flowed into the header space 40 passes on the lateral side of the door hanger 37 toward the first opening 41. As a result, in the header space 40, the hot gas and the hoistway gas are mixed, so that the temperature of the hot gas decreases and the temperature of the header space 40 decreases. The mixed gas flows out to the backside space 35 through the first opening 41.

[0037]

Another part of the hoistway gas having flowed into the header space 40 ascends along the door hanger 37 in the header space 40, and descends while detouring around the door hanger 37. Thereafter, the hoistway gas is mixed with the hot gas in the first opening 41 and flows out to the backside space 35.

[0038]

In the backside space 35, the mixed gas of the hot gas and the hoistway gas ascends and flows out to the hoistway 2 from

the upper portion of the backside space 35.

[0039]

As described above, the hot gas and the hoistway gas are mixed in the header space 40, whereby rise in the temperature of the hall door forming member in the header space 40 can be mitigated. This is illustrated in FIGS. 10A and 10B. FIGS. 10A and 10B illustrate temperature distributions obtained from thermal-fluid numerical analysis in the hall apparatus 20 according to the present embodiment at the time of occurrence of fire. The temperature scale in FIGS. 10A and 10B is the same as the temperature scale in FIGS. 8A and 8B. FIG. 10A mainly illustrates the surface temperature distribution of the header cover 39, and FIG. 10B mainly illustrates the surface temperature distribution of the door hanger 37 and the wall board 34a of the header case 34. Thus, it can be seen that the temperatures of the header cover 39, the door hanger 37, and the header case 34 are lower than those illustrated in FIGS. 8A and 8B. In this case, also the temperature of the door rail 36 and the temperature of the hanger roller 38 are lower. Additionally, the temperature of the header cover 39 is lower than the temperature of the hall door forming member such as the door hanger 37 in the header space 40. Therefore, inclusion of the header cover 39 can prevent the forming member that is likely to have a high temperature from being exposed, thereby improving the safety.

[0040]

As described above, according to the present embodiment, the narrow portion 32 formed between the jamb 21 and the hall door panel 31 communicates with the backside space 35 formed between the hoistway wall 2a and the header case 34, via the header space 40 and the first opening 41. Because of this, the first opening 41 can form a path of an airflow passing from the narrow portion 32 toward the backside space 35 through the header space 40. Therefore, when fire occurs on a certain floor, a hot gas reaching the hall 9 can flow out to the backside space 35 through the narrow portion 32, the header space 40, and the first opening 41, and the hot gas can be prevented from

stagnating in the header case 34. This makes it possible to mitigate rise in the temperature of the hall door forming member at the time of occurrence of fire on the certain floor.

[0041]

5 Further, according to the present embodiment, the opening area of the first opening 41 is larger than the flow-path area of the narrow portion 32. This can reduce a pressure loss of an airflow in the first opening 41. Therefore, a hot gas can be caused to smoothly flow out to the backside space 35, so that the
10 hot gas can be further prevented from stagnating in the header case 34. Further, also a hoistway gas flowing from the hoistway 2 can be caused to smoothly flow out to the backside space 35 through the first opening 41.

[0042]

15 Moreover, according to the present embodiment, the first opening 41 is formed from a position above the left end 22a of the hall entrance 22 to a position above the right end 22b of the hall entrance 22 in the lateral direction. Thus, the first opening 41 can be formed across the entire hall entrance 22 in the lateral
20 direction. Therefore, a hot gas that leaks from the narrow portion 32 and ascends can be guided to the first opening 41 across the entire narrow portion 32 in the lateral direction. As a result, the hot gas can be further prevented from stagnating in the header case 34.

25 [0043]

Further, according to the present embodiment, the first opening 41 is formed in the header case 34. This allows the narrow portion 32 and the backside space 35 to easily communicate with each other, thereby easily forming a path of an
30 airflow from the narrow portion 32 to the backside space 35.

[0044]

Further, according to the present embodiment, the first opening 41 is positioned in a position lower than the door rail 36. This allows a hot gas leaking from the narrow portion 32 to
35 speedily flow out to the backside space 35. Thus, the hot gas can be further prevented from stagnating in the header case 34.

In this regard, in a case where the first opening 41 is formed only in a position lower than the door rail 36 as in the present embodiment, the first opening 41 is not formed in a position higher than the door rail 36. This can effectively prevent a hot gas leaking from the narrow portion 32 from stagnating in the header case 34.

[0045]

Further, according to the present embodiment, the second opening 42 is provided between the header cover 39 and the hall door panel 31, and the hoistway 2 communicates with the header space 40 formed between the header cover 39 and the header case 34 via the second opening 42. As a result, when fire occurs on a certain floor, a part of a hoistway gas that has become an upward airflow due to rise in the temperature of the hall door panel 31 can be caused to flow into the header space 40 through the second opening 42. Thus, the hoistway gas and the hot gas can be mixed in the header space 40, and the temperature of the hot gas can be lowered. In this case, rise in the temperature of the header space 40 can be mitigated. Further, another part of the hoistway gas having flowed into the header space 40 flows through the header space 40 while detouring around the door hanger 37 and flows out to the backside space 35 through the first opening 41. This allows a relatively-low temperature hoistway gas to flow in the header space 40, thereby mitigating rise in the temperature of the header space 40.

[0046]

Additionally, in the above-described embodiment, an example in which the first opening 41 extends continuously along the lateral direction has been described. However, the present embodiment is not limited to this example. For example, the first opening 41 may be intermittently formed as illustrated in FIG. 11. More specifically, the first opening 41 may include a plurality of split openings 41c, and the split openings 41c may be arranged at predetermined intervals in the lateral direction. This makes it possible to mitigate reduction of the strength of the wall board 34a. Each of the split openings 41c may be formed in a

closed shape or may be formed in a rectangular shape. The opening area of the first opening 41 in this case is a sum of the respective opening areas of the plurality of split openings 41c. The interval between the split openings 41c and the lateral dimension of each of the split openings 41c may be appropriately set in consideration of the opening area of the first opening 41 as a whole, the strength of the wall board 34a, ease of forming a path of an airflow toward the backside space 35, and the like. Also the first opening 41 illustrated in FIG. 11 is formed from a position above the left end 22a of the hall entrance 22 to a position above the right end 22b of the hall entrance 22 in the lateral direction. More specifically, the split opening 41c positioned on the leftmost side has the left end 41a (see FIG. 6) of the first opening 41, and the left end 41a is positioned above the left end 22a. The split opening 41c positioned on the rightmost side has the right end 41b (see FIG. 6) of the first opening 41, and the right end 41b is positioned above the right end 22b.

[0047]

Further, in the above-described embodiment, an example in which the first opening 41 is positioned in a position lower than the door rail 36 has been described. However, the present embodiment is not limited to this example.

[0048]

For example, as illustrated in FIG. 12, the first opening 41 may be positioned in a position higher than the door rail 36. In this case, the first opening 41 may be positioned in a position higher than the hanger roller 38. Also in this case, a hot gas leaking from the narrow portion 32 can be caused to smoothly flow out to the backside space 35.

[0049]

Alternatively, as illustrated in FIG. 13, two first openings 41 may be formed in the wall board 34a of the header case 34 with one first opening 41 positioned in a position lower than the door rail 36, and the other first opening 41 positioned in a position higher than the door rail 36. This can increase a flow-path area

of an airflow flowing out to the backside space 35 through the two first openings 41, thereby reducing a pressure loss of the airflow toward the backside space 35.

[0050]

5 Further, in the above-described present embodiment, an example in which the header cover 39 is fixed to the header case 34 has been described. However, the present embodiment is not limited to this example, and the header cover 39 may be omitted. Also in this case, a hot gas can be caused to flow out to the
10 backside space 35 from the narrow portion 32 through the header space 40 and the first opening 41.

[0051]

Further, in the above-described present embodiment, a flame shielding member as shown in Patent Literature 2, for
15 example, may be provided in the upper portion of the narrow portion 32. Also in this case, though a hot gas may possibly leak from the narrow portion 32 into the header space 40, the hot gas can be caused to flow out to the backside space 35 through the first opening 41.

20 [0052]

(Second embodiment)

Next, an elevator hall apparatus according to a second embodiment will be described with reference to FIGS. 14 and 15.

[0053]

25 A major difference of the second embodiment illustrated in FIGS. 14 and 15 from the first embodiment illustrated in FIGS. 1 to 13 lies in that a first opening is formed in a closed shape in the upper frame of the jamb, and the other components are substantially the same as those in the first embodiment
30 illustrated in FIGS. 1 to 13. Additionally, in FIGS. 14 and 15, the same parts as those in the first embodiment illustrated in FIGS. 1 to 13 are denoted by the same reference signs, and detailed description thereof is omitted.

[0054]

35 As illustrated in FIGS. 14 and 15, a first opening 50 is formed in the upper frame 24 of the jamb 21. More specifically,

the first opening 50 is formed in the protrusion board 24b. The first opening 50 is formed in a closed shape. The first opening 50 can be formed in the same manner as the first opening 41 illustrated in FIG. 4 and the like in the other respects than the above-described respect, and thus, detailed description thereof is omitted. Additionally, the first opening 50 may be formed continuously along the lateral direction or may be formed intermittently.

[0055]

As described above, according to the present embodiment, the first opening 50 is formed in the upper frame 24 of the jamb 21. This allows the narrow portion 32 to easily communicate with the backside space 35 via the header space 40 and the first opening 50, thereby easily forming a path of an airflow passing from the narrow portion 32 toward the backside space 35 through the header space 40 and the first opening 50. Further, because of formation of the first opening 50 in the upper frame 24, a hot gas leaking from the narrow portion 32 can be caused to speedily flow out to the backside space 35. Thus, the hot gas can be further prevented from stagnating in the header case 34.

[0056]

Additionally, in the above-described embodiment, an example in which the first opening 50 extends continuously along the lateral direction has been described. However, the first opening 50 may be intermittently formed as illustrated in FIG. 11.

[0057]

(Third embodiment)

Next, an elevator hall apparatus according to a third embodiment will be described with reference to FIGS. 16 and 17.

[0058]

A major difference of the third embodiment illustrated in FIGS. 16 and 17 from the first embodiment illustrated in FIGS. 1 to 13 lies in that a first opening is formed astride the header case and the jamb, and the other components are substantially the same as those in the first embodiment illustrated in FIGS. 1 to 13. Additionally, in FIGS. 16 and 17, the same parts as those in

the first embodiment illustrated FIGS. 1 to 13 are denoted by the same reference signs, and detailed description thereof is omitted.
[0059]

5 As illustrated in FIGS. 16 and 17, a first opening 60 according to the present embodiment is formed astride the header case 34 and the jamb 21. The first opening 60 includes a case-side opening 61 and a frame-side opening 62. The frame-side opening 62 is continuous with the case-side opening 61 to form an opening.

10 [0060]

The case-side opening 61 is formed in the lower end of the wall board 34a of the header case 34. The case-side opening 61 is formed in a recessed shape when viewed from the hoistway 2. In other words, the case-side opening 61 is a recessed opening
15 that is open downward.

[0061]

The frame-side opening 62 is formed in the upper end of upper frame 24 of the jamb 21. More specifically, the frame-side opening 62 is formed in the protrusion board 24b of the upper
20 frame 24. The frame-side opening 62 is formed in a recessed shape when viewed from the hoistway 2. In other words, the frame-side opening 62 is a recessed opening that is open upward.

[0062]

The case-side opening 61 and the frame-side opening 62
25 partially overlap each other. In this manner, the case-side opening 61 and the frame-side opening 62 are formed continuously to form the first opening 60.

[0063]

The first opening 60 can be formed in the same manner as
30 the first opening 41 illustrated in FIG. 4 and the like in the other respects than the above-described respect, and thus, detailed description thereof is omitted. Additionally, the first opening 60 may be formed continuously along the lateral direction or may be formed intermittently.

35 [0064]

As described above, according to the present embodiment,

the lower end of header case 34 is in contact with the upper end of the jamb 21, and the first opening 60 is formed astride the header case 34 and the jamb 21. This allows the narrow portion 32 to easily communicate with the backside space 35 via the header space 40 and the first opening 60, thereby easily forming a path of an airflow from the narrow portion 32 toward the backside space 35. Further, because of formation of the first opening 60 astride the header case 34 and the jamb 21, a hot gas leaking from the narrow portion 32 can be caused to speedily flow out to the backside space 35. Thus, the hot gas can be further prevented from stagnating in the header case 34.

[0065]

Additionally, in the above-described embodiment, an example in which the first opening 60 includes the case-side opening 61 and the frame-side opening 62 has been described. However, the present embodiment is not limited to this example. For example, the first opening 60 may be formed of the case-side opening 61, and the frame-side opening 62 may be omitted. Alternatively, the first opening 60 may be formed of the frame-side opening 62, and the case-side opening 61 may be omitted. Also in these cases, a hot gas can be caused to flow out to the backside space 35 from the narrow portion 32 through the header space 40 and the first opening 60. Furthermore, the lower end of the wall board 34a of the header case 34 and the upper end of the upper frame 24 of the jamb 21 may be spaced away from each other in the vertical direction. In this case, an opening formed between the lower end of wall board 34a and the upper end of upper frame 24 can be caused to function as the first opening 60.

[0066]

(Fourth embodiment)

Next, an elevator hall apparatus according to a fourth embodiment will be described with reference to FIGS. 18 and 19.

[0067]

A major difference of the fourth embodiment illustrated in FIGS. 18 and 19 from the first embodiment illustrated in FIGS. 1

to 13 lies in that a first opening is formed in the top board of the header case, and the other components are substantially the same as those in the first embodiment illustrated in FIGS. 1 to 13. Additionally, in FIGS. 18 and 19, the same parts as those in the first embodiment illustrated in FIGS. 1 to 13 are denoted by the same reference signs, and detailed description thereof is omitted.

[0068]

As illustrated in FIG. 18, according to the present embodiment, a first opening 70 is formed in the top board 34b of the header case 34. The first opening 70 allows the narrow portion 32 and an above-case space 71 positioned above the top board 34b to communicate with each other, to form a flow path of a hot gas from the narrow portion 32 toward the above-case space 71. The first opening 70 may be formed in a closed shape in the top board 34b.

[0069]

FIG. 19 illustrates an example in which the first opening 70 is intermittently formed. In this case, the first opening 70, like the first opening 41 illustrated in FIG. 11, includes a plurality of split openings 70c, thereby mitigating reduction of the strength of the top board 34b. The opening area of the first opening 70 may be larger than the flow-path area of the narrow portion 32. The opening area of the first opening 70 is a sum of the respective opening areas of the split openings 70c. The first opening 70 can be formed in the same manner as the first opening 41 illustrated in FIG. 4 and the like in the other respects than the above-described respect, and thus, detailed description thereof is omitted.

[0070]

As illustrated in FIGS. 18 and 19, the header case 34 according to the present embodiment may include a eave 72. The eave 72 covers the first opening 70 from above. The eave 72 may cover the whole of the first opening 70 from above. More specifically, the eave 72 may extend continuously along the lateral direction, and may extend from a position above a left end

of the first opening 70 to a position above a right end of the first opening 70 in the lateral direction. Alternatively, the eave 72 may protrude leftward with respect to the left end of the first opening 70 or may protrude rightward with respect to the right
5 end of the first opening 70, in the lateral direction. Further alternatively, the eave 72 may extend from the upper end of the flange board 34c toward the hoistway wall 2a beyond the first opening 70.

[0071]

10 When fire occurs on a certain floor of a building, a hot gas in the hall 9 leaks into the header space 40 through the narrow portion 32. The first opening 70 formed in the top board 34b of the header case 34 forms a path of an airflow passing from the narrow portion 32 to the above-case space 71 through the header
15 space 40. This allows the hot gas having leaked into the header space 40 to flow out the above-case space 71 through the first opening 70. Thereafter, the hot gas flows out to the hoistway 2.

[0072]

On the other hand, as the temperature of the hall door
20 panel 31 rises, an upward airflow is generated in the vicinity of the hoistway-side surface 31a of the hall door panel 31. A part of the hoistway gas that has become an ascending airflow flows into the header space 40 from the second opening 42 formed between the header cover 39 and the hall door panel 31. In the
25 header space 40, the hot gas and the hoistway gas are mixed. As a result, the temperature of the hot gas decreases, and the temperature of the header space 40 decreases. The mixed gas flows out to the above-case space 71 through the first opening 70, and then flows out to the hoistway 2.

30 [0073]

As described above, according to the present embodiment, the narrow portion 32 formed between the jamb 21 and the hall door panel 31 communicates with the above-case space 71 formed above the top board 34b of the header case 34 via the
35 first opening 70. Because of this, the first opening 70 can form a path of an airflow from the narrow portion 32 toward the above-

case space 71. Therefore, when fire occurs on a certain floor, a hot gas reaching the hall 9 can flow out to the above-case space 71 through the narrow portion 32, the header space 40, and the first opening 70, and the hot gas can be prevented from stagnating in the header case 34. This makes it possible to mitigate rise in the temperature of the hall door forming member at the time of occurrence of fire on the certain floor.

[0074]

Further, according to the present embodiment, the second opening 42 is provided between the header cover 39 and the hall door panel 31, and the hoistway 2 communicates with the header space 40 formed between the header cover 39 and the header case 34 via the second opening 42. As a result, when fire occurs on a certain floor, a part of a hoistway gas that has become an upward airflow due to rise in the temperature of the hall door panel 31 can be caused to flow into the header space 40 through the second opening 42. Thus, the hoistway gas and the hot gas can be mixed in the header space 40, and the temperature of the hot gas can be lowered. In this case, rise in the temperature of the header space 40 can be mitigated.

[0075]

Further, according to the present embodiment, the header case 34 includes the eave 72 that covers the first opening 70 from above. This can prevent an object falling from above from entering into the header space 40 through the first opening 70. Therefore, damages of the hall door forming member can be reduced, to prevent a trouble in the operation of the hall door apparatus 30.

[0076]

Additionally, in the example illustrated in FIG. 18, the backside space 35 is formed between the wall board 34a of the header case 34 and the hoistway wall 2a. However, the present embodiment is not limited to this example, and the backside space 35 is not necessarily required to be formed between the wall board 34a of the header case 34 and the hoistway wall 2a. In other words, the wall board 34a of the header case 34 and the

backside space 35 may be in contact with each other. Also in this case, a hot gas can be caused to flow out to the above-case space 71 through the narrow portion 32, the header space 40, and the first opening 70. In other words, even in a case where
5 the backside space 35 cannot be formed due to structural constraints or the like, forming the first opening 70 in the top board 34b allows a hot gas to flow out from the header space 40.
[0077]

According to the above-described embodiments, rise in the
10 temperature of the hall door forming member can be prevented at the time of occurrence of fire on a certain floor.
[0078]

While some embodiments of the present invention have been described, these embodiments have been presented as
15 examples, and are not intended to limit the scope of the invention. These novel embodiments can be implemented in various other forms, and various omissions, replacements, and alterations can be made without departing from the gist of the invention. These embodiments and modifications thereof are included in the scope
20 and gist of the invention, and are included in the invention described in the claims and the equivalent scope thereof.

CLAIMS

1. An elevator hall apparatus comprising:
 - a jamb that defines a hall entrance and includes an upper frame provided above the hall entrance;
 - a hall door panel that opens and closes the hall entrance and forms a narrow portion between the hall door panel and the upper frame;
 - a header case provided above the hall door panel, the header case forming a backside space that is open to a hoistway between the header case and a hoistway wall, and forming a header space above the hall door panel;
 - a door rail provided in the header case;
 - a door hanger via which the hall door panel hangs from the door rail; and
 - a first opening provided in the upper frame or the header case, wherein the narrow portion communicates with the backside space via the header space and the first opening,
 - the first opening is formed in a closed shape in the header case, and
 - the first opening is positioned in a position lower than the door rail.
2. The elevator hall apparatus according to claim 1, wherein the first opening is positioned only in the position lower than the door rail.
3. An elevator hall apparatus comprising:
 - a jamb that defines a hall entrance and includes an upper frame provided above the hall entrance;
 - a hall door panel that opens and closes the hall entrance and forms a narrow portion between the hall door panel and the upper frame;
 - a header case provided above the hall door panel, the header case forming a backside space that is open to a hoistway between the header case and a hoistway wall, and forming a header space above the hall door panel;
 - a door rail provided in the header case;
 - a door hanger via which the hall door panel hangs from the door rail; and
 - a first opening provided in the upper frame or the header case, wherein the narrow portion communicates with the backside space via the header space and the first opening,
 - the first opening is formed in a closed shape in the header case, and,
 - the first opening includes two first openings formed in the header case,
 - and

one of the first openings is positioned in a position lower than the door rail, and the other of the first openings is positioned in a position higher than the door rail.

4. An elevator hall apparatus comprising:

a jamb that defines a hall entrance and includes an upper frame provided above the hall entrance;

a hall door panel that opens and closes the hall entrance and forms a narrow portion between the hall door panel and the upper frame;

a header case provided above the hall door panel, the header case forming a backside space that is open to a hoistway between the header case and a hoistway wall, and forming a header space above the hall door panel;

a door rail provided in the header case;

a door hanger via which the hall door panel hangs from the door rail; and

a first opening provided in the upper frame or the header case, wherein the narrow portion communicates with the backside space via the header space and the first opening, the first opening is formed in a closed shape in the upper frame.

5. An elevator hall apparatus comprising:

a jamb that defines a hall entrance and includes an upper frame provided above the hall entrance;

a hall door panel that opens and closes the hall entrance and forms a narrow portion between the hall door panel and the upper frame;

a header case provided above the hall door panel, the header case forming a backside space that is open to a hoistway between the header case and a hoistway wall, and forming a header space above the hall door panel;

a door rail provided in the header case;

a door hanger via which the hall door panel hangs from the door rail; and

a first opening provided in the upper frame or the header case, wherein the narrow portion communicates with the backside space via the header space and the first opening,

a lower end of the header case is in contact with an upper end of the upper frame, and

the first opening is formed astride the header case and the upper frame.

6. The elevator hall apparatus according to any of claims 1 to 5, wherein an opening area of the first opening is larger than a flow-path area of the narrow

portion.

7. The elevator hall apparatus according to any of claims 1 to 6, wherein the first opening is formed from a position above a left end of the hall entrance to a position above a right end of the hall entrance in a lateral direction.

8. The elevator hall apparatus according to any of claims 1 to 7, further comprising

a header cover that is positioned on the inner side of the hoistway rather than the header case and forms the header space between the header cover and the header case, wherein

a second opening via which the hoistway and the header space communicate with each other is provided between the header cover and the hall door panel.