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(54) **RAILWAY VEHICLE WITH SLIDING DOORS**

SCHIENENFAHRZEUG MIT SCHIEBETÜREN

VÉHICULE FERROVIAIRE AVEC PORTES COULISSANTES

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Description

BACKGROUND OF THE INVENTION

Field of the invention

[0001] The present invention relates to railway vehicles having side sliding doors through which crews and passengers get on or off the railway vehicle, and especially, relates to railway vehicles having an externally suspended side sliding door device that opens and closes along an outer side of a side structure of the railway vehicle.

Description of the related art

[0002] Railway vehicles have side sliding door devices disposed on openings formed on side structures of the vehicle for through which passengers and crews get on or off the vehicle. There are two types of conventional side sliding doors, an internally suspended side sliding door device and an externally suspended side sliding door device.

[0003] The internally suspended system has side sliding doors disposed on the inner side of the side structure of the car body, and the externally suspended system has side sliding doors disposed on the outer side of the side structure of the car body. In both systems, the side sliding doors open and close along the longitudinal direction of the side structure. The internally suspended side sliding door device must have door pockets on the inner side of the side structure for housing the side sliding doors so as to prevent passengers' clothes and the like from being caught in the side sliding doors during opening and closing operation. In contrast, the externally suspended side sliding door device does not require door pockets disposed on the inner side of the side structure since the side sliding doors are opened and closed along the outer side of the car body.

[0004] FIG. 8 is a cross-sectional view showing an example of the prior art internally suspended side sliding door device, wherein the device is shown in a cross-section perpendicular to the height direction thereof. A side sliding door 100 of the internally suspended side sliding door device is opened and closed along an inner side surface of the side structure 20. A door pocket 26 for housing the side sliding door 100 is disposed on an inner side surface of the side structure 20. Interior equipments such as seats 15 and hand rails 28 are disposed on a side of the door pocket 26 facing the center of the car body 400. The distance L0 from the door pocket 26 to the center of the car body 400 in the width direction (300) of the railway vehicle is smaller than the distance from the side structure 20 to the center of the car body 400 in the width direction of the car body, corresponding to the thickness of the door pocket 26.

[0005] If the opening width of the side sliding door 100 (the dimension along the longitudinal direction of the rail-

way vehicle) is increased to minimize the getting on and off time, the rigidity of the opening (area where the side sliding door 100 is disposed) of the side structure 20 is decreased, and a high stress may occur by the deformation caused near the opening of the side structure 20. If the area near the opening of the side structure 20 is to be reinforced, reinforcement members disposed on the side structure 20 on the inner side of the car body may interfere with the door pocket 26, since the door pocket 26 of the internally suspended side sliding door device is disposed on the side structure 20 facing the inner side of the car body. The structure of the reinforcement area including the door pocket 26 will become complex in order to prevent such interference, and the number of design-
ing and manufacturing steps thereof is increased.

[0006] Further, in the case of the internally suspended side sliding door device, not only the number of components required for forming the door pocket 26 is increased, but also the interior design of the vehicle must be varied between the portion having the door pocket 26 and the portion without the door pocket 26. On the other hand, the internally suspended side sliding door device is advantageous since the upper door rail for guiding the side sliding door 100 during opening and closing operation and the door suspension device for suspending the side sliding door 100 and moving via rolling motion along the upper door rails is disposed on the inner side of the car body, according to which the water-resisting property and the dust-resisting property of the door suspension device can be ensured easily and the reliability thereof can be maintained.

[0007] On the other hand, according to the externally suspended sliding door device, the upper door rail for guiding the side sliding doors and the door suspension device moving via rolling motion on the upper door rail is disposed on the outer side of the car body on the side wall of the railway vehicle. Therefore, in the externally suspended side sliding door device, it is necessary to ensure the reliability of these rolling motion units and to ensure the water-resisting property and the dust-resisting property so as to prevent rain water and wind from entering the car body (prevent wind containing dust from entering the car body) through the gap formed between the side sliding doors and the car structure. Furthermore, it is desirable that the structure of the device allows the door suspension device subjected to periodic maintenance to be easily maintained.

[0008] Publication of Japanese patent No. 4173588 (patent document 1) discloses a structure in which the side sliding doors of an internally suspended side sliding door device is guided via an upper door rail disposed on an arm provided on the structure of the railway vehicle.

[0009] The problem to be solved in a railway vehicle having an externally suspended side sliding door device that opens and closes along an outer side of the car of the side structure of the railway vehicle is to ensure the water-resisting property and the dust-resisting property of the side sliding doors with respect to the roof structure,

the side structure and the underframe, to improve the reliability of the door suspension device suspending the side sliding doors and moving via rolling motion on the upper door rail for guiding the side sliding doors, and to facilitate the maintenance operation thereof.

[0010] US 4,150,509 suggests a sliding doors and seals system and a passenger vehicle having such system. US 5,927,015 suggests an automatic door system for mass transit vehicles utilizing a linear induction motor for powering door panels from open to closed.

SUMMARY OF THE INVENTION

[0011] The present invention aims at solving the problems of the prior art by providing a railway vehicle having an externally suspended side sliding door device opening and closing along a plane on an outer side of the railway vehicle, having an ensured water-resisting property and a dust-resisting property of the side sliding doors with respect to the roof structure, the side structure and the underframe, capable of improving the reliability of the door suspension device supporting the side sliding doors in suspended manner and moving along the upper door rail via rolling motion for guiding the side sliding doors, and capable of facilitating maintenance of the side sliding door device.

[0012] In order to solve the prior art problems, the present invention provides a railway vehicle according to claim 1.

[0013] The present invention provides a railway vehicle having an externally suspended side sliding door device opening and closing along the side surface on the outer side of the railway vehicle, having an ensured water-resisting property and dust-resisting property of the side sliding door with respect to the roof structure, the side structure and the underframe, an improved reliability of the door suspension device supporting the side sliding door in suspended manner and moving in rolling motion along the upper door rail for guiding the side sliding door, and facilitating the maintenance thereof.

[0014] Moreover, the externally suspended side sliding door device has a tongue portion extending downward in a continuous manner from a lower end portion of the side sliding door, wherein the tongue portion is guided along a lower door rail disposed on a step, and a slip-proof member is attached removably on an upper side of the step from both the inner side of the car and the outer side of the car towards and adjacent to the tongue portion, according to which the height of the side sliding doors (positioning of the doors) can be adjusted easily, and the efficiency of maintenance operations including cleaning can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a perspective view of a railway vehicle hav-

ing an externally suspended side sliding door device; FIG. 2 is a side view showing in enlarged view the portion of the railway vehicle having the externally suspended side sliding door device shown in FIG. 1; FIG. 3 is a cross-sectional view of the upper portion of the externally suspended side sliding door device taken at A-A of the railway vehicle shown in FIG. 2; FIG. 4 is a cross-sectional view of the upper portion of the externally suspended side sliding door device of the railway vehicle shown in FIG. 3, illustrating the state in which the side sliding doors are opened (cross-sectional view taken at D-D of FIG. 3); FIG. 5 is a cross-sectional view of the upper portion of the externally suspended side sliding door device of the railway vehicle shown in FIG. 3, illustrating the state in which the side sliding doors are closed (cross-sectional view taken at D-D of FIG. 3); FIG. 6 is a cross-sectional view of the width-direction end of the externally suspended side sliding door device taken along a direction perpendicular to the height of the door (cross-sectional view taken at B-B of FIG. 2); FIG. 7 is a cross-sectional view showing the state in which the lower end portion of the side sliding doors of the externally suspended side sliding door device is guided by the lower door rail disposed on the step (cross-sectional view taken at C-C of FIG. 2); and FIG. 8 is a cross-sectional view showing an example of a prior art internally suspended sliding door device taken at a cross-section perpendicular to the height direction of the door.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Now, we will describe a preferred embodiment of a railway vehicle having an externally suspended side sliding door device according to the present invention with reference to the drawings. A railway vehicle is a general term referring to vehicles guided via a guide way, such as railway cars, streetcars, monorails and vehicles of new transport systems. We will take the railway car as an example of the railway vehicle in the following description.

[0017] FIG. 1 is a perspective view showing an example of the railway vehicle having the externally suspended side sliding door device. A railway vehicle 1 comprises an underframe 10 constituting a floor surface of the car body, side structures 20 and 20 (only one side of which is illustrated) erected on both width-direction ends of the underframe 10, end structures 30 and 30 (only one side of which is illustrated) erected on both longitudinal ends of the underframe 10, and a roof structure 40 disposed on the upper ends of the side structures 20 and 20 and the end structures 30 and 30. Openings are provided on portions of the side structures 20 and 20 where doors through which passengers get on and off the vehicle and windows are to be formed, and on these openings are

provided externally suspended side sliding door devices described in detail later and window glasses. External covers 22 and 22 covering upper door rails of the side sliding doors and door suspension devices rolling along the upper door rails and supporting the side sliding doors in a suspended manner are disposed along the longitudinal direction of the railway vehicle at the outer side of the car at connecting portions (door roof portions) between the side structures 20 and 20 and the roof structure 40.

[0018] FIG. 2 is a side view showing an enlarged view of the portion of the railway vehicle illustrated in FIG. 1 where the externally suspended side sliding door device is disposed, and FIG. 3 is a cross-sectional view taken at A-A of the railway vehicle illustrated in FIG. 2 showing the upper portion of the externally suspended side sliding door device. The externally suspended side sliding door device is mainly composed of side sliding doors 100a and 100b, an upper door rail 130 for guiding the opening and closing operation of the side sliding doors 100a and 100b, a door suspension device 140 moving in rolling motion on the upper door rail 130 and supporting the side sliding doors 100a and 100b in a suspended manner, a door engine 110 for generating driving power for opening and closing the side sliding doors 100a and 100b, and a lower door rail 134 for guiding a lower end portion of the side sliding doors 100a and 100b (refer to FIG. 6).

[0019] The upper door rail 130 is disposed along the longitudinal direction of the railway vehicle 1 at the upper portion of the side wall on the outer side of the railway vehicle 1. As shown in FIG. 3, the cross-sectional shape of the upper door rail 130 perpendicular to the longitudinal direction of the rail is composed of portions (planes) extending horizontally from upper and lower ends of a vertically disposed plate. One end of a door suspension fitting 150 is fixed to the upper end of the side sliding doors 100a and 100b, and a door suspension device 140 is fixed to the other end of the door suspension fitting 150. The door suspension device 140 is a device for supporting the side sliding doors 100a and 100b and the door suspension fitting 150 in a suspended manner, and the device 140 is disposed in such a manner so as to move in rolling motion on the upper door rail 130. In FIG. 2, the external cover 22, which is normally disposed in the area shown by the two dotted dashed lines, is omitted from the drawing, so as to show how the upper door rail 130 and the door suspension fitting 150 are disposed. Further, the actual structure for enabling the door suspension device 140 to be moved in rolling motion on the upper door rail 130 can preferably adopt a rolling movement structure such as door rollers, balls, rollers and wheels.

[0020] As shown in FIG. 2, door head rubbers 105a and 105b are disposed on door close portions opposed to one another when the side sliding door 100a and the side sliding door 100b are closed. Although not shown, the cross-sectional shape of one of the door head rubbers 105a perpendicular to the longitudinal direction has at a

center of a base portion of the door head rubber a projecting portion formed to project from the base portion toward the door close direction, and a space is formed in the interior of the projecting portion. The cross-sectional shape of the other door head rubber 105b perpendicular to the longitudinal direction has a wall portion projected toward the door close direction on each end in the base portion of the door head rubber, and a projecting portion projected to a height smaller than the projecting portion formed on one door head rubber 105a is disposed at the center of the base portion. When the doors are closed, the projecting portion disposed on the door head rubber 105a is pressed by the projecting portion disposed on the door head rubber 105b, by which the projecting portion of the door head rubber 105a is deformed to come into contact with the wall portions of the door head rubber 105b, thereby forming a door seal portion (door close portion) for preventing rainwater and dust from entering the vehicle.

[0021] Door tail rubbers 106a and 106b are disposed along the height direction on opposite ends of the side sliding doors 100a and 100b from the door head rubbers 105a and 105b. Details will follow, but contact portions 107a and 107a formed integrally with the door tail rubbers 106a and 106b (refer to FIG. 6) contact receivers 25 disposed in the perpendicular direction on a plane on the outer side of the side structure when the doors are closed, thereby ensuring the water-resisting property and a dust-resisting property of the side sliding doors 100a and 100b with respect to the side structures 20.

[0022] A tongue portion 102 is formed to extend downward from the lower end portion of the side sliding doors 100a and 100b, wherein the tongue portion 102 is guided along the lower door rail 134 disposed on the step 24 (refer to FIG. 7). A step 24 is a member having a horizontal plane disposed along the longitudinal direction of the railway vehicle 1 at the width-direction end of the underframe 10 or at the lower end in the height direction of the side structure 20 at a height corresponding to the upper surface height of a platform (not shown), so as to connect the platform and the opening on the railway vehicle for the getting on and off. The water-resisting property and the dust-resisting property of the lower end portion of the side sliding doors 100a and 100b with respect to the step 24 will be described with reference to the embodiment illustrated in FIG. 7.

[0023] FIG. 3 is an A-A cross-sectional view showing the upper portion of the externally suspended side sliding door device disposed on the railway vehicle 1 illustrated in FIG. 2. An upper door rail support member 132 is fixed to a slanted surface (door roof portion) on both ends of the roof structure 40 in the width direction 300, and on the perpendicular surface of the upper door rail support member 132 is disposed the upper door rail 130. One end of the door suspension fitting 150 is fixed to the upper end of the side sliding doors 100a, and the door suspension device 140 is fixed to the other end of the door suspension fitting 150. The door suspension device 140 sup-

ports the side sliding doors 100a and 100b in suspended manner so as to move in rolling motion along the upper door rail 130. A door engine 110 for opening and closing the side sliding door 100a (100b) is disposed on the inner side of the car body at the width-direction ends of the roof structure 40, wherein the door engine 110 and the side sliding door 100a (100b) are connected via a connecting bracket 120. When the door engine 110 is operated, driving power is transmitted via the connecting bracket 120 to the side sliding door 100a (100b), by which the side sliding doors 100a and 100b are opened and closed. The design of the interior of the railway vehicle is improved by providing a ceiling 180 on the inner side of the car and a cover 190 which covers the area on the inner side of the car at the width-direction ends of the ceiling 180 and the side structures 20 so that the door engine 110 and the connecting bracket 120 are not visible to the passengers. Although not shown, the cover 190 is attached so that it can be opened and closed, and the cover 190 can be opened, for example, to strengthen the engagement of bolts or the like fixing the connecting bracket 120, or to perform inspection and maintenance operation of the door engine 110.

[0024] By fixing the upper door rail 130 on the side wall at the outer side of the car of the railway vehicle 1 via the upper door rail support member 132 having a perpendicular surface, the door suspension device 140 can be moved in rolling motion along the perpendicular plane or one of the horizontal planes of the upper door rail 130, according to which biased abrasion caused by partial contact of the rolling portion can be prevented and the reliability thereof can be improved, so that the interval of periodic maintenance can be extended.

[0025] An attachment section 42 for attaching the external cover 22 is disposed along the longitudinal direction of the roof structure 40 substantially on the width-direction ends of the horizontal plane of the roof structure 40. An engagement portion 23 is disposed on the height-direction end of the external cover 22, the engagement portion 23 being engaged with the attachment section 42 of the roof structure 40, and the external cover 22 is fixed if necessary via bolts or the like to the roof structure 40 or the side structure 20.

[0026] The external cover 22 is removed during maintenance and inspection of the upper door rail 130 and the door suspension device 140, for example. By disposing the engagement portion 23 on the external cover 22 and the attachment section 42 on the roof structure 40, the external cover 22 can easily be engaged to the roof structure 40 during attachment and detachment of the external cover 22, and the external cover 22 can be prevented from being dropped accidentally. Thus, the upper door rail 130 and the door suspension device 140 can be efficiently inspected and maintained.

[0027] Weather strip members 200a and 200b are provided at the lower end of the external cover 22 on the side facing the side sliding doors 100a and 100b. Weather strip members 200a (200b) and 210a (210b) are

formed for example of elastic rubber or foamed material (sponge). Weather strip members 210a (210b) are disposed at the upper ends of the side sliding doors 100a (100b) on the side facing the external cover 22 so as to oppose to the weather strip members 200a (200b). These weather strip members 200a (200b) and 210a (210b) are integrated when the side sliding doors 100a and 100b are closed, thereby sealing the gap formed between the lower end of the external cover 22 and the upper end of the side sliding doors 100a and 100b, so as to improve the water-resisting property and the dust-resisting property with respect to the upper door rail 130 and the door suspension device 140. As a result, the reliability of the upper door rail 130 and the door suspension device 140 can be enhanced, and the interval of periodic maintenance can be elongated.

[0028] FIG. 4 is a cross-sectional view showing the upper portion of the externally suspended side sliding door device of the railway vehicle illustrated in FIG. 3 in which the side sliding doors 100a and 100b are opened (cross-sectional view taken at D-D of FIG. 3), and FIG. 5 is a cross-sectional view of the externally suspended side sliding door device shown in FIG. 3 in which the side sliding doors are closed (cross-sectional view taken at D-D of FIG. 3). Weather strip members 200a and 200b disposed at the lower end of the external cover 22 on the side facing the side sliding door 100a are wedge shaped in which the thickness of the weather strip members 200a and 200b (width direction 300) is gradually increased toward a position P (door stop section) in which the door head rubbers are opposed to one another when the side sliding doors 100a and 100b are closed. Weather strip members 210a and 210b disposed at the upper end of the side sliding doors 100a and 100b on the side facing the external cover 22 are wedge shaped in which the thickness of the weather strip members 200a and 200b (width direction 300) is gradually reduced toward a position P in which the door head rubbers are opposed to one another when the side sliding doors 100a and 100b are closed. When the side sliding doors 100a and 100b are closed, the opposing slanted surfaces of the weather strip members 200a and 200b and the weather strip members 210a and 210b contact one another, by which the gap formed between the external cover 22 and the side sliding doors 100 is sealed. Thus, rainwater and dust entering through the gap formed between the external cover 22 and the side sliding doors 100 can be prevented from reaching the upper door rail 130 and the door suspension device 140 provided on the external side of the roof structure 40 disposed above the side sliding doors 100, according to which the reliability of these devices can be maintained and the maintenance cycle thereof can be elongated.

[0029] FIG. 6 is a cross-sectional view taken at a plane perpendicular to the height direction at the width-direction ends of the externally suspended side sliding door device (cross-sectional view taken at B-B of FIG. 2). Door tail rubbers 106a and 106b are disposed along the height

direction on both side ends in the width direction of the side sliding doors 100a and 100b (in the longitudinal direction 310 of the vehicle). Contact portions 107b and 107b are formed via integral molding on the door tail rubber 106b toward the width direction 300 of the vehicle. Contact portions 107b and 107b are formed of two substantially parallel flat panels extending toward the car width direction 300 from the door tail rubber 106b.

[0030] When the side sliding doors 100a and 100b are closed, the contact portions 107b and 107b come into contact with a receiver 25 disposed along the perpendicular edge of the opening formed on the side structure 20 for the getting on and off. Out of the two contact portions 107b and 107b, normally the contact portion 107b positioned close to the door head rubber 105b comes into contact with the contact portion receiver 25. The contact portions 107b and 107b are formed as two flat panels placed at a distance from one another and disposed substantially parallel to one another, according to which the contact portion 107b coming in contact with the receiver 25 is prevented from being collapsed excessively. The contact portion 107b on the door tail rubber 106a and 106b coming into contact with the receiver 25 will be deformed elastically, sealing the gap between the side sliding door 100b near the door tail rubber 106b and the side structure 20, ensuring the water-resisting property and the dust-resisting property thereof. Thus, wind containing rain water and dust can be prevented from entering the interior of the railway vehicle 1, so that a pleasant in-car environment can be maintained. The contact portion 107b attached to the door tail rubber 106b of the side sliding door 100b has been described up to now, but the contact portions 107a and 107a attached to the door tail rubber 106a disposed on the side sliding door 100a also function in the same manner. In the above-described example, there were two contact portions 107a and 107a (107b and 107b) attached to the door tail rubber 106a (106b), but the contact portion 107a (107b) may also be composed of a single panel.

[0031] FIG. 7 is a cross-sectional view (cross-sectional view taken at C-C of FIG. 2) showing the state in which the lower end of the side sliding doors 100a and 100b of the externally suspended side sliding door device is guided along the lower door rail 134 embedded in the step 24. A tongue portion 102 is disposed on the lower end of the side sliding doors 100a and 100b so as to be suspended continuously from the side sliding doors 100a and 100b. A sliding member 104 is disposed on the leading end portion of the tongue portion 102. On the other hand, a step 24 is disposed on the outer side of the vehicle at the portion of the underframe 10 where the side sliding doors 100a and 100b are disposed (refer to FIG. 1). The lower door rail 134 in the shape of a groove with an opening formed in the upper direction is formed on the step 24, and the tongue portion 102 is stored within the lower door rail 134 for guiding the tongue portion 102. The sliding member 104 functions to facilitate the rolling motion of the tongue portion 102 within the lower door rail 134.

Slip-proof members 14 and 14 are disposed on the upper surface of the step 24 toward both the inner side and the outer side of the vehicle from the tongue portion 102.

[0032] Since the tongue portions 102 disposed on the lower end of the side sliding doors 100a and 100b are disposed in a suspended manner, the position of the side sliding doors 100a and 100b in the vertical direction (the direction of arrow 320) can be adjusted without having to adjust the position of the slip-proof members 14 and 14 disposed on the lower door rail 134 in the width direction (in the direction of the arrow 300). Therefore, during maintenance of the side sliding doors 100a and 100b, such as replacement of the door suspension device 140 or the like, the replacement operation can be performed easily by adjusting only the vertical position of the side sliding doors 100a and 100b without having to adjust the width direction positions thereof. Furthermore, since the lower door rail 134 has a recessed shape (groove shape) and is not projected from the step 24, the passengers getting on and off the railway vehicle 1 will not trip on the rail 134. Further, the dust accumulating on the lower door rail 134 can be cleaned easily by removing the removable slip-proof members 14 and 14, so that the maintenance time can be shortened. An example has been illustrated in which the sliding member 104 is disposed on the leading end of the tongue portion 102 so as to reduce the friction between the tongue portion 102 disposed on the lower ends of the side sliding doors 100a and 100b and the lower door rail 134 formed on the step 24, but the sliding member 104 can also be disposed on the lower door rail 134.

[0033] According further to the above-described embodiment, two side sliding doors 100a and 100b opposed to one another are disposed, but the present invention can also be applied to an externally suspended side sliding door device composed only of a single side sliding door 100a.

Claims

1. A railway vehicle (1) having an externally suspended side sliding door device, wherein the externally suspended side sliding door device comprises:

- one side sliding door (100a) opening and closing along a plane on an outer side of the railway vehicle;
- an upper door rail (130) disposed along a longitudinal direction of the railway vehicle on an upper portion of a side surface of the railway vehicle;
- a door suspension device (140) capable of moving in rolling motion on the upper door rail and supporting the side sliding door in a suspended manner;
- a lower door rail (134) for guiding a lower portion of the side sliding door;

an external cover (22) for covering the upper door rail and the door suspension device is disposed along the longitudinal direction of the railway vehicle at a width-direction end portion of the roof structure of the railway vehicle;
 an engagement portion (23) for engaging the external cover to the width-direction end portion of the roof structure of the car body is disposed on an upper portion of the external cover; and
 an attachment section (42) for attaching an engagement portion of the external cover is disposed on the outer side of the car body at the width-direction end of the roof structure and along the longitudinal direction of the roof structure;

characterized in that:

one weather strip member (200a) is disposed on the side facing the side sliding door (100a) at the lower end portion of the external cover along the longitudinal direction of the railway vehicle, the one weather strip member being wedge shaped so that a thickness thereof in the width direction of the railway vehicle is increased toward a door stop portion of the side sliding door (100a);

another weather strip member (210a) is disposed on a surface of the upper portion of the side sliding door facing the external cover along the longitudinal direction of the railway vehicle, the other weather strip member (210a) being wedge shaped so that the thickness thereof in the width direction of the railway vehicle is reduced toward the door stop portion; and

when the side sliding door (100a) is closed, the one weather strip member and the other weather strip member are overlapped, and a slanted surface of the one weather strip member (200a) and a slanted surface of the other weather strip member (210a) are opposed to one another and substantially integrated so as to seal a gap formed between the lower end portion of the external cover and the upper portion of the side sliding door (100a).

2. The railway vehicle according to claim 1, wherein the upper door rail includes portions extending horizontally from upper and lower ends of a panel disposed vertically in a cross-section perpendicular to the longitudinal direction; and the door suspension device moves in rolling motion on the horizontal plane of the upper door rail so as to suppress biased abrasion of the upper door rail and the door suspension device.

3. The railway vehicle according to claim 2, wherein the upper door rail is fixed via an upper door rail support portion (132) to a roof structure (40) of the railway vehicle.

4. The railway vehicle according to claim 1, wherein a door tail rubber (106a, 106b) is disposed on a width-direction end of the side sliding door along a height direction of the side sliding door, the door tail rubber having a flat plate-like contact portion (107a, 107b) extending toward the railway vehicle; a receiver (25) is disposed on an opening formed for the getting on and off on the side surface of the railway vehicle along a perpendicular edge on the outer side of the railway vehicle; and the contact portion comes into contact with the receiver when the side sliding door is closed.

5. The railway vehicle according to claim 4, wherein the contact portion is formed integrally with the door tail rubber and composed of multiple flat plate-like portions extending toward the side of the railway vehicle and arranged substantially in parallel with and placed apart from one another, and wherein the contact portion positioned closest to the leading end side of the door out of the multiple contact portions comes into contact with the receiver.

6. The railway vehicle according to claim 1, wherein a tongue portion (102) is disposed on a lower end of the side sliding door in a suspended manner; a step (24) is disposed along a horizontal edge on an outer side of the railway vehicle at a lower portion of an opening formed on the side surface of the railway vehicle for the getting on and off; a lower door rail is disposed on the step along a longitudinal direction of the railway vehicle; and the lower portion of the side sliding door is guided via the lower door rail.

7. The railway vehicle according to claim 6, wherein the lower door rail is in a shape of a groove formed on an upper side of the step; and a roller member for facilitating sliding motion of the tongue portion with respect to the lower door rail is disposed on a leading end portion of the tongue portion.

Patentansprüche

1. Schienenfahrzeug mit einer außen aufgehängten seitlichen Schiebetürvorrichtung, wobei die außen aufgehängte seitliche Schiebetürvorrichtung aufweist:

eine seitliche Schiebetür (100a), die sich in einer Ebene auf einer Außenseite des Schienenfahr-

zeugs öffnet und schließt;
 eine obere Türschiene (130), die in einer Längsrichtung des Schienenfahrzeugs in einem oberen Bereich einer Seitenfläche des Schienenfahrzeugs angeordnet ist;
 eine Türaufhängungsvorrichtung (140), die sich rollend auf der oberen Türschiene bewegen und die seitliche Schiebetür hängend tragen kann;
 eine untere Türschiene (134) zum Führen eines unteren Teils der seitlichen Schiebetür;
 eine äußere Abdeckung (22) zur Abdeckung der oberen Türschiene und der Türaufhängungsvorrichtung, die in der Längsrichtung des Schienenfahrzeugs in einem Endbereich der Dachstruktur des Schienenfahrzeugs in deren Querrichtung angeordnet ist;
 einen Eingriffsabschnitt (23) zum Herstellen eines Eingriffs zwischen äußeren Abdeckung und der Außenseite der Fahrzeugkarosserie, der in einem oberen Bereich der äußeren Abdeckung angeordnet ist; und
 einen Befestigungsabschnitt (42) zum Befestigen eines Eingriffsabschnitts der äußeren Abdeckung, der an der Außenseite der Fahrzeugkarosserie in einem Endbereich der Dachstruktur des Schienenfahrzeugs in deren Querrichtung und in der Längsrichtung der Dachstruktur angeordnet ist;

dadurch gekennzeichnet, dass

an dem unteren Endabschnitt der Außenabdeckung in der Längsrichtung des Schienenfahrzeugs auf einer der seitlichen Schiebetür (100a) zugewandten Seite ein Wetterleistenelement (200a) angeordnet ist, wobei das eine Wetterleistenelement keilförmig ist, so dass seine Dicke in der Querrichtung des Schienenfahrzeugs in der Richtung eines Türstopperbereichs der seitlichen Schiebetür (100a) zunimmt;
 auf einer Oberfläche des oberen Abschnitts der seitlichen Schiebetür an derjenigen Seite der Schiebetür, die der äußeren Abdeckung zugewandt ist, in der Längsrichtung des Schienenfahrzeugs ein anderes Wetterstreifenelement (210a) angeordnet ist, wobei das andere Wetterstreifenelement keilförmig ist, so dass seine Dicke in der Querrichtung des Schienenfahrzeugs in der Richtung eines Türstopperbereichs der seitlichen Schiebetür (100a) abnimmt,
 und, wenn die seitliche Schiebetür (100a) geschlossen ist, das eine Wetterstreifenelement und das andere Wetterstreifenelement miteinander überlappen und eine schräge Fläche des einen Wetterstreifenelements (200a) und eine schräge Fläche des anderen Wetterstreifenelements (210a) einander gegenüberliegen und einander ergänzen, um so einen Spalt abzudichten, der zwischen dem unteren Endabschnitt der äußeren Abdeckung und dem

oberen Abschnitt der seitlichen Schiebetür (100a) gebildet ist.

2. Schienenfahrzeug nach Anspruch 1, wobei die obere Türschiene Abschnitte aufweist, die horizontal von oberen und unteren Enden einer Platte vorspringen, die in einem Querschnitt senkrecht zur Längsrichtung vertikal angeordnet ist; und die Türaufhängungsvorrichtung sich rollend auf der horizontalen Ebene der oberen Türschiene bewegt, um einen ungleichseitigen Verschleiß der oberen Türschiene und der Türaufhängungsvorrichtung zu verhindern.
3. Schienenfahrzeug nach Anspruch 2, wobei die obere Türschiene über einen oberen Türschienenträgerabschnitt (132) an einer Dachkonstruktion (40) des Schienenfahrzeugs befestigt ist.
4. Schienenfahrzeug nach Anspruch 1, wobei ein Tür-Endgummi (106a, 106b) an einem Ende der seitlichen Schiebetür in deren Breitenrichtung entlang einer Höhenrichtung der seitlichen Schiebetür vorgesehen ist, wobei der Tür-Endgummi einen flachen, plattenartigen Kontaktabschnitt (107a, 107b) aufweist, der in die Richtung des Schienenfahrzeugs ragt;
 entlang einer senkrechten Kante auf der Außenseite des Schienenfahrzeugs an einer Öffnung, die zum Ein- und Aussteigen auf der Seitenfläche des Schienenfahrzeugs ausgebildet ist, eine Aufnahme (25) ausgebildet ist; und der Kontaktabschnitt in Kontakt mit der Aufnahme tritt, wenn die seitliche Schiebetür geschlossen wird.
5. Schienenfahrzeug nach Anspruch 4, wobei der Kontaktabschnitt einstückig mit dem Tür-Endgummi ausgebildet ist und aus mehreren flachen, plattenartigen Abschnitten besteht, die sich zur Seite des Schienenfahrzeugs vorspringen und im Wesentlichen parallel zueinander angeordnet und voneinander beabstandet sind, und wobei derjenige Kontaktabschnitt unter den mehreren Kontaktabschnitten, der der vorderen Endkante der Tür am nächsten liegt, in Kontakt mit der Aufnahme tritt.
6. Schienenfahrzeug nach Anspruch 1, wobei ein Zungenabschnitt (102) hängend an einem unteren Ende der seitlichen Schiebetür angeordnet ist;
 entlang einer horizontalen Kante auf einer Außenseite des Schienenfahrzeugs an einem unteren Abschnitt einer Öffnung, die auf der Seitenfläche des Schienenfahrzeugs ausgebildet ist, um das Ein- und Aussteigen zu ermöglichen, eine Stufe (24) ausgebildet ist;
 auf der Stufe in einer Längsrichtung des Schienenfahrzeugs eine untere Türschiene angeordnet ist;

und
der untere Teil der seitlichen Schiebetür durch die
untere Türschiene geführt wird.

7. Schienenfahrzeug nach Anspruch 6, 5
wobei die untere Türschiene in Form einer Nut aus-
gestaltet ist,
die auf einer Oberseite der Stufe ausgebildet ist; und
an einem vorderen Endabschnitt des Zungenab- 10
schnitts ein Rollenelement zum Erleichtern der Gleit-
bewegung des Zungenabschnitts in Bezug auf die
untere Türschiene angeordnet ist.

Revendications

1. Véhicule ferroviaire (1) ayant un dispositif de porte 15
coulissante latérale extérieurement suspendu, dans
lequel le dispositif de porte coulissante latérale ex-
térieurement suspendue comporte :

une porte coulissante latérale (100a) s'ouvrant
et se fermant le long d'un plan sur un côté ex-
térieur du véhicule ferroviaire,
un rail de porte supérieur (130) disposé le long 25
d'une direction longitudinale du véhicule ferro-
viaire sur une partie supérieure d'une surface
latérale du véhicule ferroviaire,
un dispositif de suspension de porte (140) pou-
vant se déplacer avec un mouvement de rouле- 30
ment sur le rail de porte supérieur et supportant
la porte coulissante latérale d'une manière sus-
pendue,
un rail de porte inférieur (134) pour guider une
partie inférieure de la porte coulissante latérale, 35
un couvercle externe (22) pour recouvrir le rail
de porte supérieur et le dispositif de suspension
de porte est disposé le long de la direction lon-
gitudinale du véhicule ferroviaire sur une partie
d'extrémité de direction de largeur de la struc- 40
ture de toit du véhicule ferroviaire,
une partie de prise (23) pour mettre en prise le
couvercle externe avec la partie d'extrémité de
direction de largeur de la structure de toit de la
caisse de voiture est disposée sur une partie 45
supérieure du couvercle externe, et
une portion de fixation (42) pour fixer une partie
de prise du couvercle externe est disposée sur
le côté extérieur de la caisse de voiture sur l'ex-
trémité de direction de largeur de la structure de 50
toit et le long de la direction longitudinale de la
structure de toit,
caractérisé en ce que :

un élément de bourrelet d'étanchéité (200a) 55
est disposé sur le côté dirigé vers la porte
coulissante latérale (100a) sur la partie
d'extrémité inférieure du couvercle externe

le long de la direction longitudinale du vé-
hicule ferroviaire, l'élément de bourrelet
d'étanchéité étant en forme de coin de sorte
qu'une épaisseur de celui-ci dans la direc-
tion de largeur du véhicule ferroviaire est
augmentée vers une partie de butée de por-
te de la porte coulissante latérale (100a),
un autre élément de bourrelet d'étanchéité
(210a) est disposé sur une surface de la
partie supérieure de la porte coulissante la-
térale dirigée vers le couvercle externe le
long de la direction longitudinale du véhicu-
le ferroviaire, l'autre élément de bourrelet
d'étanchéité (210a) étant en forme de coin
de sorte que l'épaisseur de celui-ci dans la
direction de largeur du véhicule ferroviaire
est réduite vers la partie de butée de porte,
et
lorsque la porte coulissante latérale (100a)
est fermée, l'élément de bourrelet d'étan-
chéité et l'autre élément de bourrelet d'étan-
chéité sont recouverts, et une surface in-
clinée de l'élément de bourrelet d'étanchéi-
té (200a) et une surface inclinée de l'autre
élément de bourrelet d'étanchéité (210a)
sont opposées l'une à l'autre et sensible-
ment intégrées de manière à sceller un es-
pace formé entre la partie d'extrémité infé-
rieure du couvercle externe et la partie su-
périeure de la porte coulissante latérale
(100a).

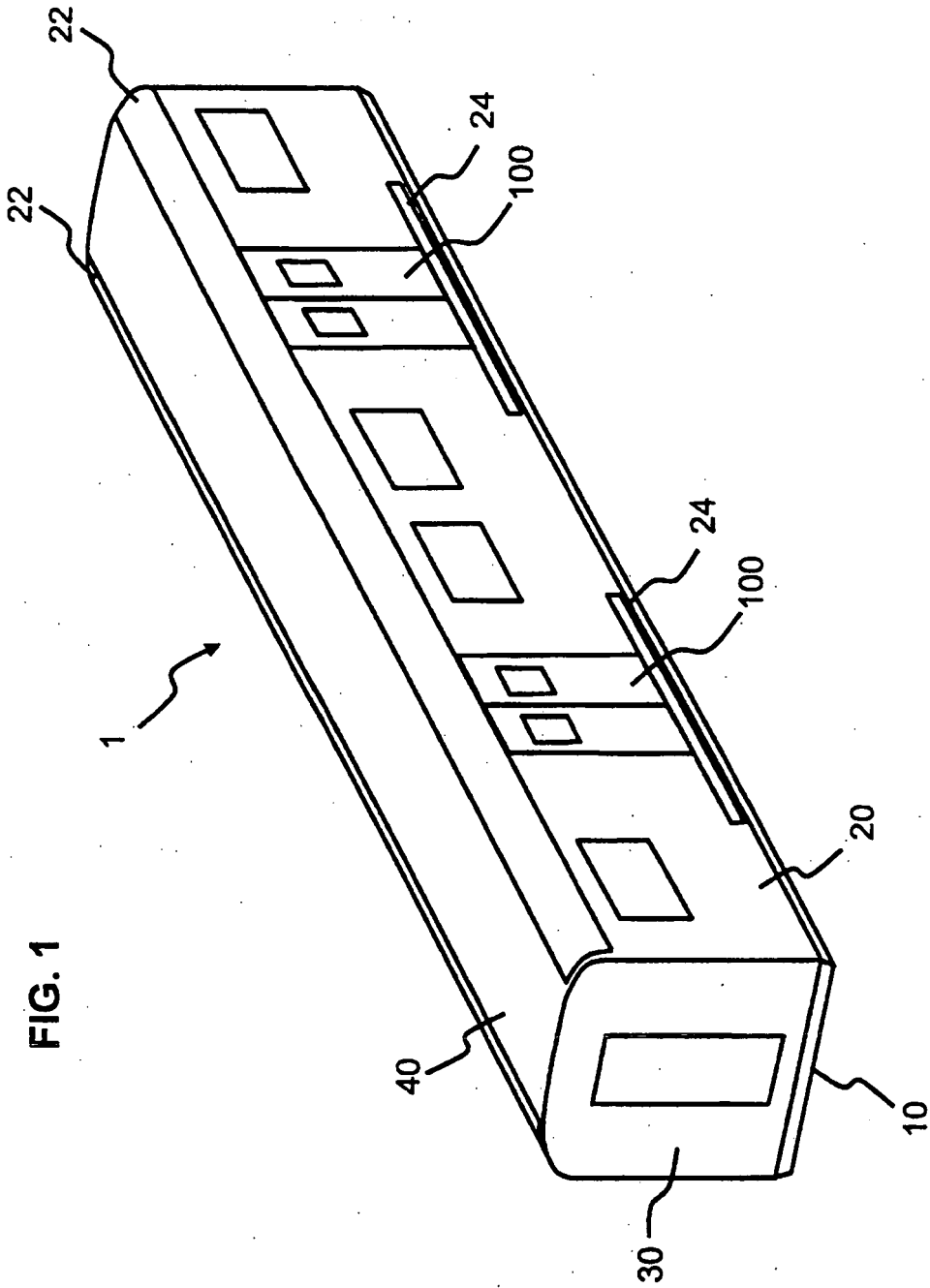
2. Véhicule ferroviaire selon la revendication 1, dans
lequel
le rail de porte supérieur inclut des parties s'étendant
horizontalement depuis des extrémités supérieure
et inférieure d'un panneau disposé verticalement
dans une section transversale perpendiculaire à la
direction longitudinale, et
le dispositif de suspension de porte se déplace dans
un mouvement de roulement sur le plan horizontal
du rail de porte supérieur de manière à enrayer une
abrasion biaisée du rail de porte supérieur et du dis-
positif de suspension de porte.
3. Véhicule ferroviaire selon la revendication 2,
dans lequel le rail de porte supérieur est fixé via une
partie de support de rail de porte supérieur (132) à
une structure de toit (40) du véhicule ferroviaire.
4. Véhicule ferroviaire selon la revendication 1,
dans lequel un caoutchouc arrière de porte (106a,
106b) est disposé sur une extrémité de direction de
largeur de la porte coulissante latérale le long d'une
direction de hauteur de la porte coulissante latérale,
le caoutchouc arrière de porte ayant une partie de
contact analogue à une plaque plate (107a, 107b)
s'étendant vers le véhicule ferroviaire,

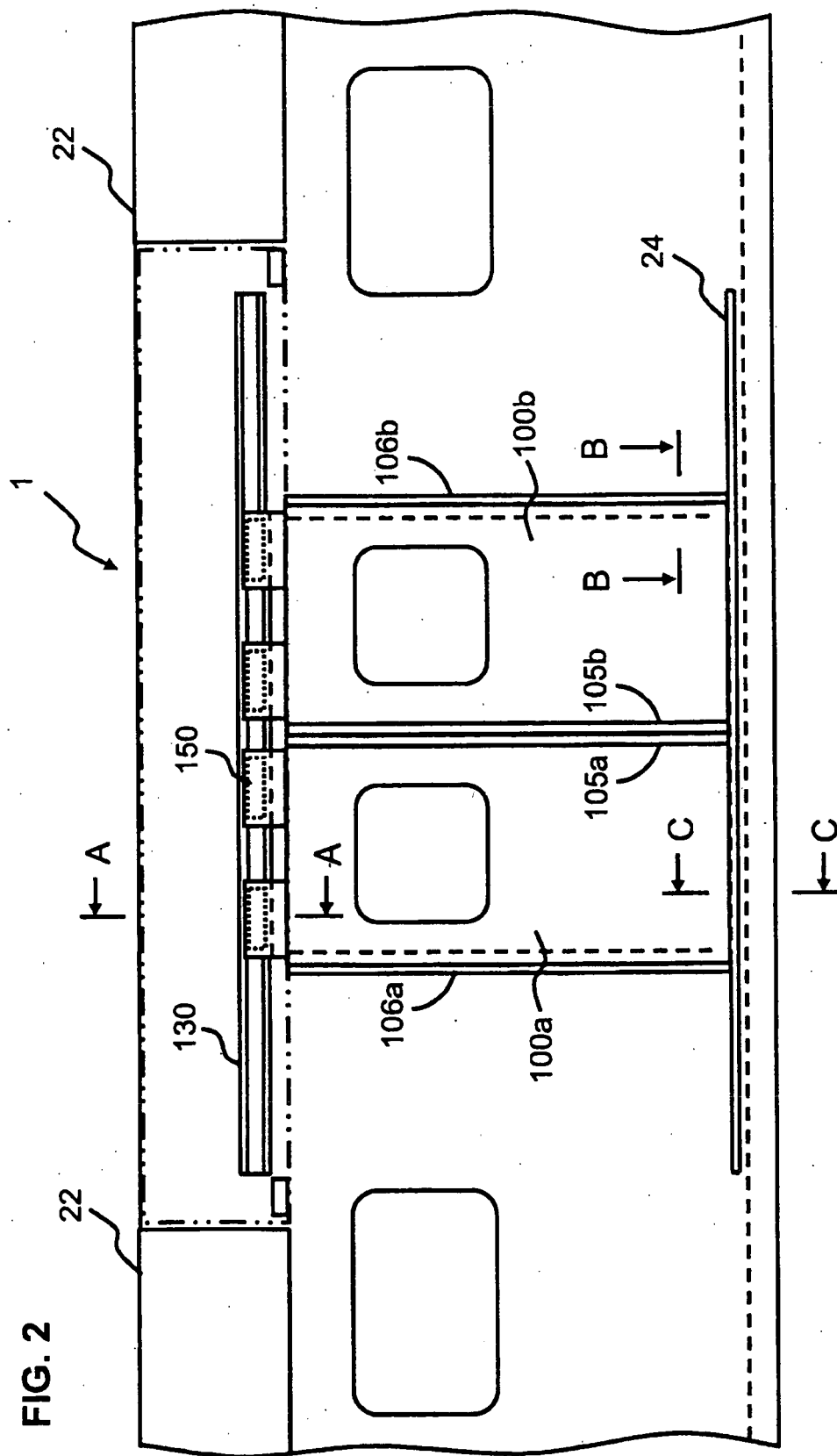
un récepteur (25) est disposé sur une ouverture formée pour monter sur la surface latérale du véhicule ferroviaire et descendre de celle-ci le long d'un bord perpendiculaire sur le côté extérieur du véhicule ferroviaire, et

5

la partie de contact vient en contact avec le récepteur lorsque la porte coulissante latérale est fermée.

5. Véhicule ferroviaire selon la revendication 4, dans lequel la partie de contact est formée d'un seul tenant avec le caoutchouc arrière de porte et composée de multiples parties analogues à des plaques plates s'étendant vers le côté du véhicule ferroviaire et agencées sensiblement parallèlement les unes aux autres et espacées les unes des autres, et dans lequel la partie de contact positionnée la plus près du côté d'extrémité avant de la porte en dehors des multiples parties de contact vient en contact avec le récepteur.
- 10
- 15
- 20
6. Véhicule ferroviaire selon la revendication 1, dans lequel une partie de languette (102) est disposée sur une extrémité inférieure de la porte coulissante latérale d'une manière suspendue, une marche (24) est disposée le long d'un bord horizontal sur un côté extérieur du véhicule ferroviaire au niveau d'une partie inférieure d'une ouverture formée sur la surface latérale du véhicule ferroviaire pour la montée et la descente,
- 25
- 30
- 35
7. Véhicule ferroviaire selon la revendication 6, dans lequel le rail de porte inférieur a une forme de rainure formée sur un côté supérieur de la marche, et un élément de rouleau pour faciliter un mouvement coulissant de la partie de languette par rapport au rail de porte inférieur est disposé sur une partie d'extrémité avant de la partie de languette.
- 40
- 45
- 50
- 55





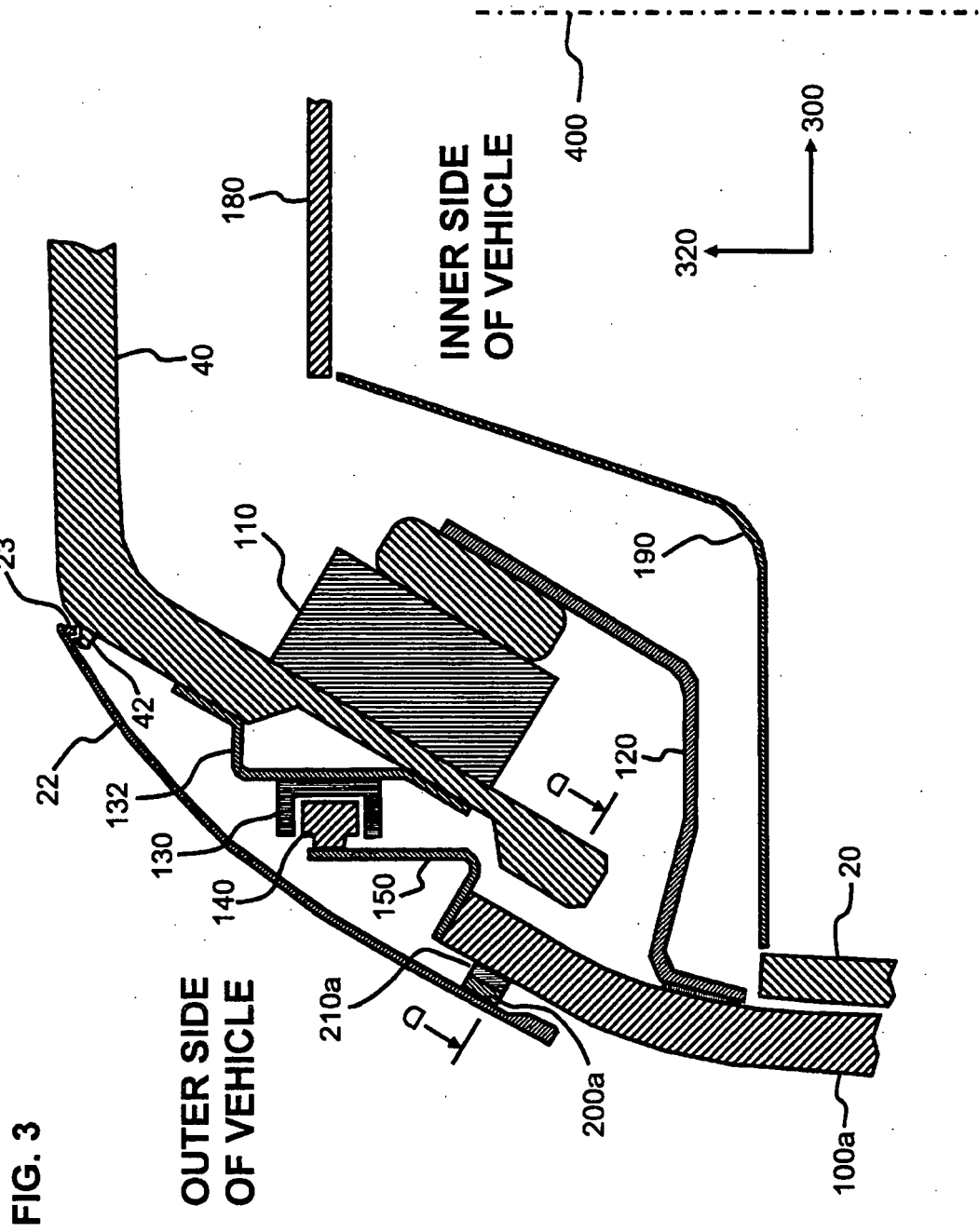


FIG. 4

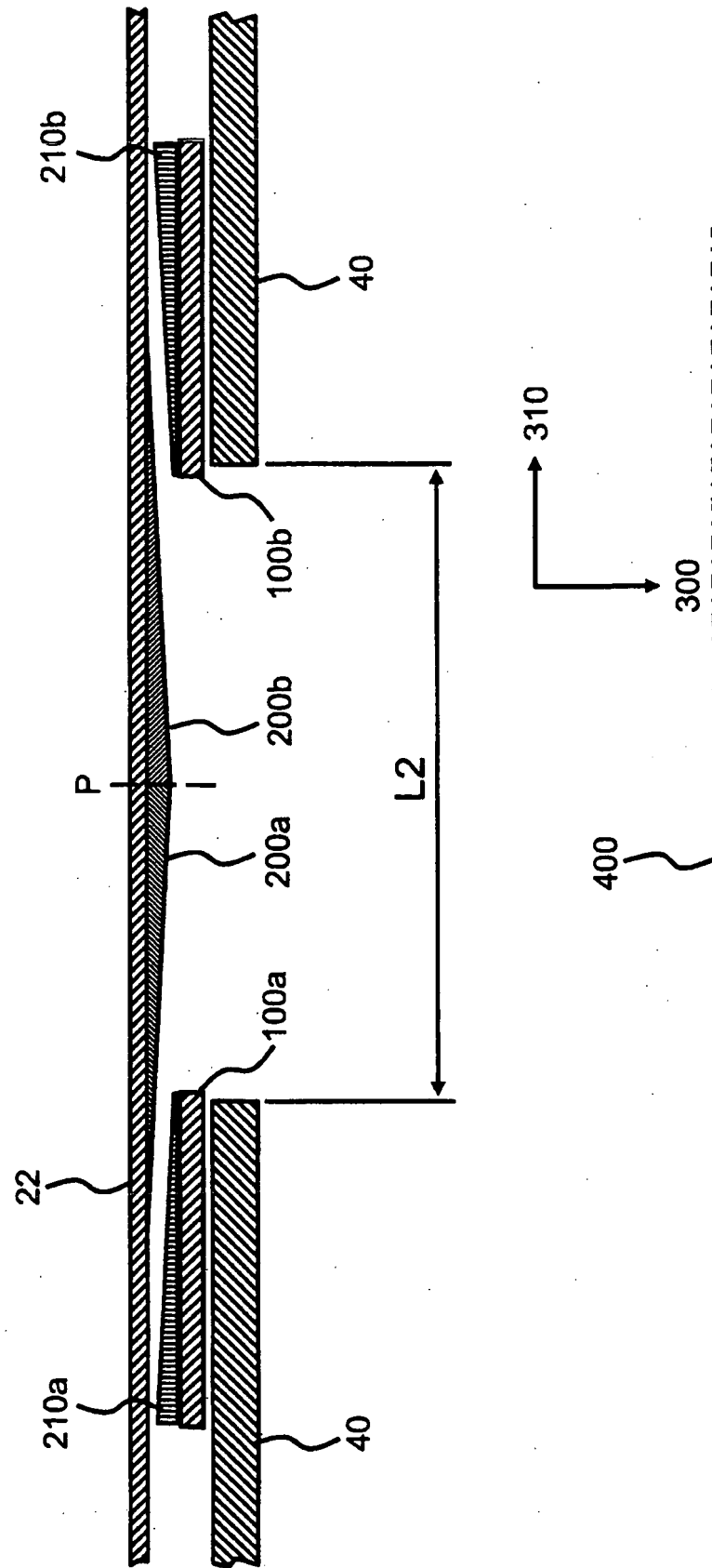


FIG. 5

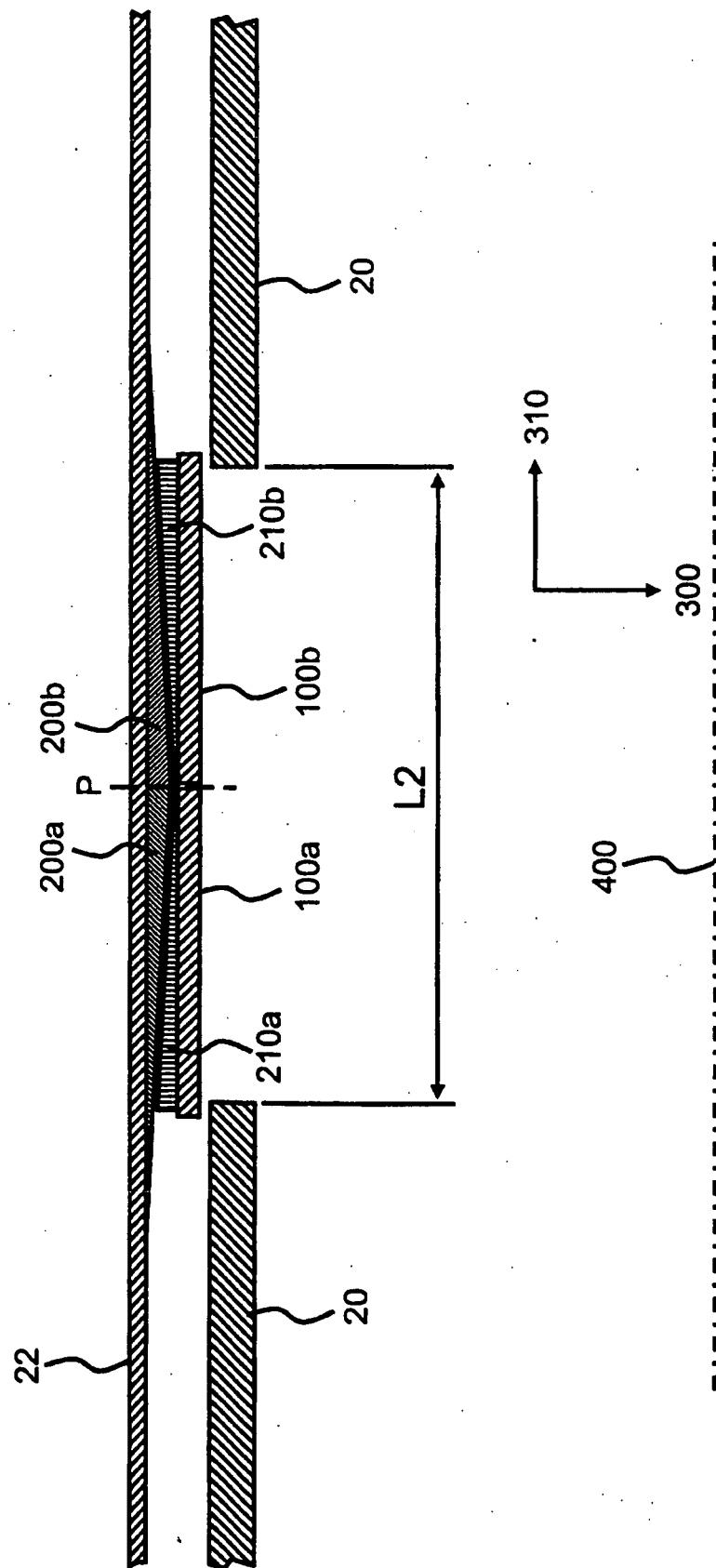


FIG. 6

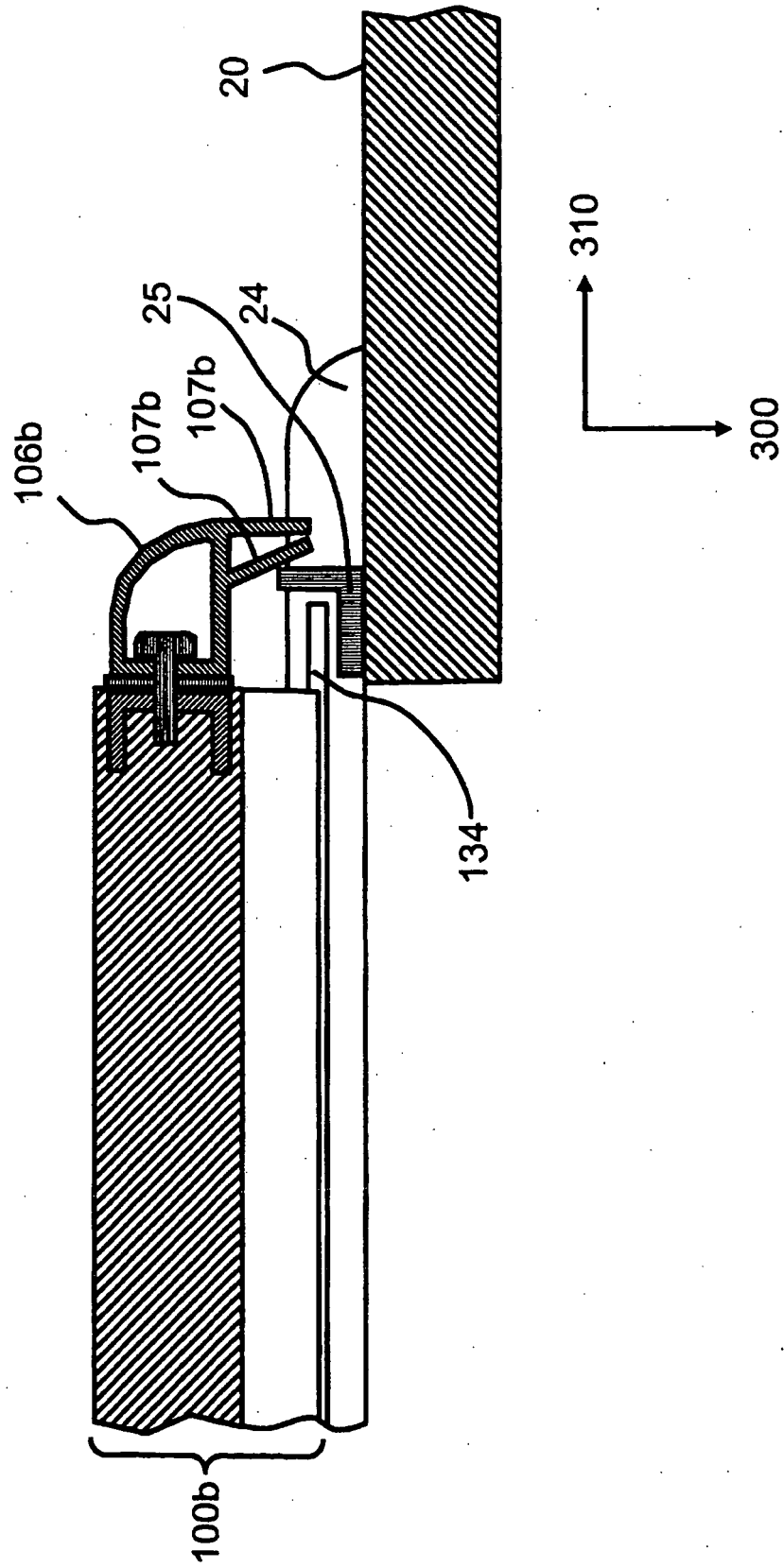
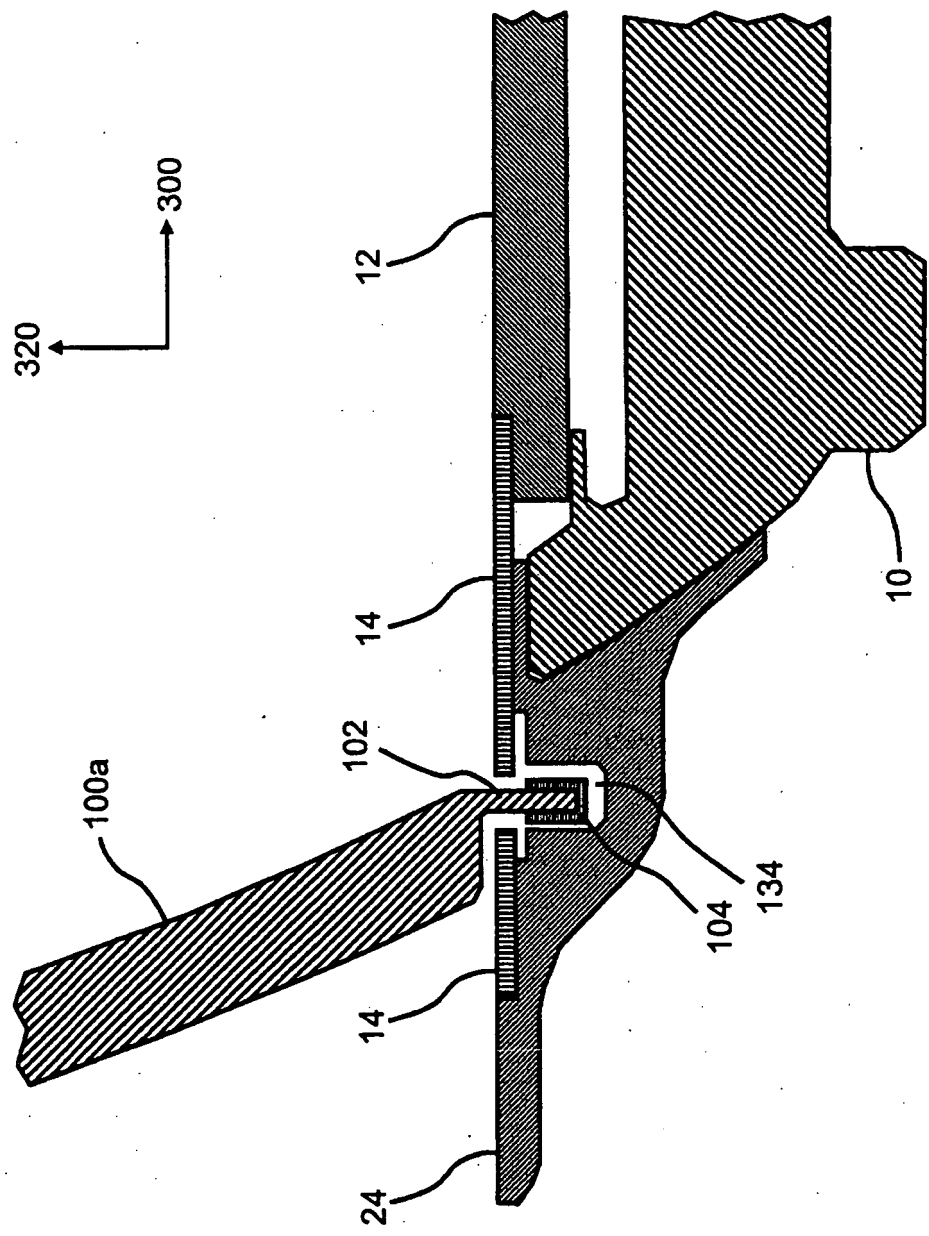
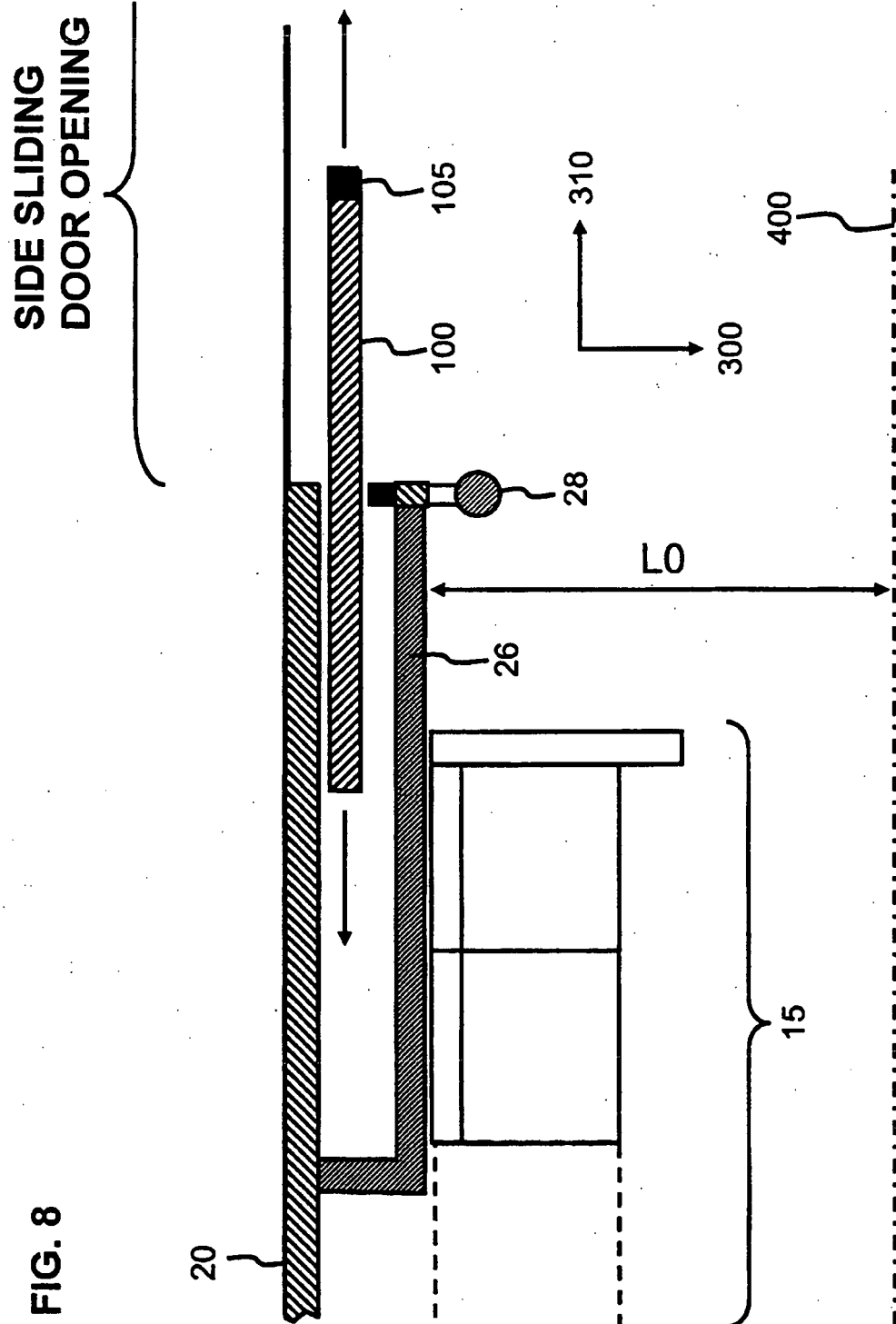


FIG. 7





REFERENCES CITED IN THE DESCRIPTION

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