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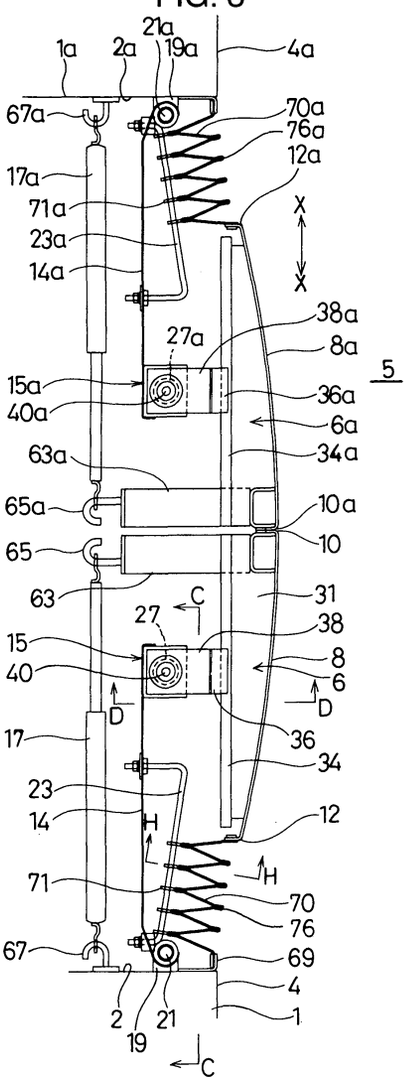
(54) Panel device for railway rolling stock

(57) In a panel constituting an interconnection passage in railway rolling stock, in order that a passenger can not open the panel by his or her hand by a constitution in which the structure is simple and the maintenance operation management is easy, there are provided, on a side portion of an interconnection passage (5), a supporting panel (14, 14a) provided on each of coupled cars (1, 1a), so as to be horizontally rotatable with a center of rotation (21, 21a) being on a car end face (2, 2a) side; a vertical bearing (27, 27a) provided on an end portion of the supporting panel (14, 14a); a side panel (8, 8a) provided on an interconnection passage (5) side of the supporting panel; a rail (34, 34a) provided horizontally on the side panel; a slider (36, 36a) provided slideably on the rail; a guide shaft (40, 40a) provided vertically on the slider and inserted slideably in the bearing; an extensible sheet (70, 70a) stretched between the side panel and a car end face; and a balancer (17, 17a) extended between the side panel and the car end face to hang the side panel in the middle in a passage direction.

FIG. 3



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a panel device for railway rolling stock.

Description of the Related Art

[0002] Conventionally, for a side face of an interconnection passage as a gangway of an interconnecting portion in railway rolling stock, various side walls have been proposed from the viewpoint of safety of passers and design of the passage.

[0003] In the above side walls, conventionally, one side wall has been proposed in which a movable panel is horizontally rotatably attached to an end face of a car to protrude beyond the end face and the panel is closed by a spring in its normal state and kept in that state (see JP-Y2-3-26048).

[0004] This prior art has a problem that a passenger can open the panel by his or her hand against the closing force of the spring and put his or her hand inside the panel.

[0005] As a method for solving such a problem, a technique is also known in which a rope is provided on the movable panel as described above, for stopping opening the panel (see JP-Y2-3-8530).

[0006] In this technique, however, the movable panel can not be fixed in a closed state and the above-described problem remains.

[0007] As a method of preventing such a panel as described above from opening, a technique is also known in which an inner pole is provided on each side of an interconnection passage to position at the center in a passage direction, a central panel is provided on the inner pole, a movable panel rotatably provided on the car end face side is brought into contact with the inner side face of the central panel, and further a stopper plate to be in contact with the outer side face of the central panel is provided on the movable panel, thereby preventing the movable panel from opening (see JP-A-2002-347614).

[0008] In this technique, however, there are many sliding portions between members to complicate the structure, and, as a result, there is a problem on maintenance operation management.

SUMMARY OF THE INVENTION

[0009] An object of the present invention is to provide a panel device for railway rolling stock wherein such a panel as described above can be prevented from opening, the number of sliding portions between members is small, the structure is simple, and the maintenance operation management is easy.

[0010] To achieve the above object, a panel device for railway rolling stock according to the present invention, comprises, on a side portion of an interconnection passage, a supporting panel provided on each of coupled cars so as to be horizontally rotatable while a center of the rotation is replaced on a car end face side; a vertical bearing provided on an end portion of the supporting panel; a side panel provided on an interconnection passage side of the supporting panel; a rail provided horizontally on the side panel; a slider provided slideably on the rail; a guide shaft provided vertically on the slider and inserted slideably in the bearing; an extensible sheet stretched between the side panel and a car end face; and a balancer extended between the side panel and the car end face to hang the side panel in the middle in a passage direction.

[0011] In the present invention, when end faces of the coupled cars deviate from each other, the supporting panel rotates horizontally around the car end face side. On the other hand, when the interval between the end faces of the coupled two cars is extended/contracted, the slider and the rail relatively slide in a passage direction and the extensible sheet is extended/contracted. The side panel is hung and held by the balancer at a middle position in a passage direction in the interconnection passage. Therefore, even in case that the supporting panel and the side panel are made of rigid materials, the supporting panel and the side panel follow complicated movements of the cars.

[0012] In addition, the interval between the end faces of the coupled cars are closed by the side panel and the extensible sheet and not opened.

[0013] Further, the side panel may be divided at a center in the passage direction and a side panel coupling device may be provided to separably couple the divided side panels with each other.

[0014] By this constitution, the above-described functions are exhibited and the side panels can be separated from each other by separating the side panel coupling device.

[0015] Besides, bearings on the supporting panel side and guide shafts on the side panel side may be provided at upper and lower positions, an aligning bearing may be used for the upper bearing, and a hole diameter of the lower bearing may be set to be larger than a hole diameter of the upper bearing.

[0016] With this constitution, even when the coupled cars run on vertically curved rails and a swing is formed between the axial line of the bearing and the axial line of the guide shaft, because the upper bearing is the aligning bearing and the axial hole of the lower bearing is large, the swing angle can be permitted and the side panel can be supported.

[0017] Further, in the present invention, the extensible sheet may be made of a folded sheet.

[0018] With this constitution, because folds of the folded sheet are deformed to extend/contract, even in case that the extensible sheet itself is made of a non-exten-

sible material, the above-described functions can be exhibited.

[0019] Besides, in the present invention, a guide bar may be provided on the supporting panel along the passage direction and the folded sheet may be slideably held on the guide bar.

[0020] With this constitution, because the folded sheet is extended/contracted along the guide bar, the fold peaks are aligned on a plane along the passage direction and extend/contract.

[0021] According to the present invention, because the side panel device provided on both side portions of the interconnection passage can be constructed by exquisitely assembling the supporting panel made of a rigid material and the side panel made of a rigid material and most part of the side face of the interconnection passage can be formed by the rigid panels, the beauty of the interconnection passage can be improved.

[0022] Further, even in case of forming by the panels made of such rigid materials, by cooperation with the extensible sheet, there is no compulsion in mechanical operation to complicated movements of the coupled cars, there are few slide portions, and smooth operation can be realized.

[0023] Besides, the structure is simple, assembling and disassembling are easy, and the maintenance operation management is easy.

[0024] Further, because the side panel can be formed in a single plane and constructed to have no portion that is opened/closed in running, the safety of the passengers passing through the interconnection passage can be increased and a superior structure can be also obtained in the viewpoint of design of the side panel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

FIG. 1 is a view of an embodiment of a panel device according to the present invention when viewing a car end face from a car coupling portion;

FIG. 2 is a sectional view taken along line A-A in FIG. 1;

FIG. 3 is an enlarged sectional view taken along line B-B in FIG. 2;

FIG. 4 is a view from line C-C in FIG. 3;

FIG. 5 is an enlarged sectional view taken along line D-D in FIG. 3;

FIG. 6 is a view showing a state of the panel device of FIG. 2 before coupling;

FIG. 7 is a sectional view taken along line E-E in FIG. 6;

FIG. 8 is a view showing a coupled state of an upper side panel coupling device in FIG. 6;

FIG. 9 is a view showing a coupled state of a lower side panel coupling device in FIG. 6;

FIG. 10 is a sectional view taken along line F-F in FIG. 7 in a state wherein a side panel coupling device is coupled, corresponding to the state of FIG. 7;

FIG. 11 is an enlarged sectional view taken along line G-G in FIG. 6;

FIG. 12 is an enlarged sectional view taken along line H-H in FIG. 3;

FIG. 13 is a sectional plan view of a coupling portion upon passing on an R curve;

FIG. 14 is a sectional plan view of the coupling portion upon passing on an S curve;

FIG. 15 is a view showing a state wherein a difference in level between coupled cars has been generated, corresponding to the state of FIG. 2;

FIG. 16 is a view showing a relation between a guide shaft and a bearing device between the coupled cars upon passing on a vertically curved railway; and

FIG. 17 is a view showing a relation of the guide shaft and the bearing device between the coupled cars upon car rolling.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] The best mode for carrying out the present invention will be described on the basis of an embodiment shown in drawings.

[0027] FIG. 1 is a view of an end face of a car viewed from the middle of a car coupling portion. FIG. 2 is a sectional view taken along line A-A in FIG. 1. FIG. 3 is an enlarged sectional view taken along line B-B in FIG. 2.

[0028] In these drawings, because the same members are provided in two coupled cars, respectively, a suffix a is added to the reference numeral of each member on one car side for each member on the other car side that is the same member as the member on the one car side to omit the description thereof, thereby omitting complication of the description.

[0029] In FIGS. 1 and 2, side panel devices 6 and 7 for protecting passing of a man or woman are provided on both side portions in the left and right directions in an interconnection passage 5 between end faces 2 and 2a of two coupled cars 1 and 1a. In FIGS. 1 and 2, reference numerals 3 and 3a denote gateways opened on the car end faces.

[0030] The side panel devices 6 and 7 will be described with reference to FIGS. 2 to 5. Because the left and right side panel devices 6 and 7 have the same structure, only one side panel 6 will be described.

[0031] Supporting panels 14 and 14a constituting the side panel devices 6 and 7 are disposed along a passage direction X-X of the interconnection passage 5. As shown in FIG. 4, panel side hinges 21 and 22 are provided at upper and lower portions of the base ends of the supporting panels 14 and 14a. Car side hinges 19 and 20 are fixedly provided on the end face 2 of the car 1. The panel side hinges 21 and 22 are loosely fitted on the car side hinges 19 and 20 so that the supporting pan-

el 14 is provided on the end faces 2 and 2a so as to be horizontally rotatable around the hinges 21 and 22. The other side panel 14a is rotatably provided on the other car 1a in the same manner.

[0032] Bearing devices 15, 16, 15a, and 16a for hanging side panels 8 and 8a are provided at upper and lower portions of the other end portions of the supporting panels 14 and 14a in the passage direction X-X. The bearing devices 15 and 16 will be described with reference to FIGS. 3 and 5. FIG. 5 is an enlarged sectional view taken along line D-D in FIG. 3.

[0033] The side panels 8 and 8a are disposed on the interconnection passage 5 sides of the supporting panels 14 and 14a along the passage direction X-X. Rails 34, 35, 34a, 35a are horizontally fixedly provided along the passage direction X-X through reinforcing frames 31, 33, 31a, 33a, at upper and lower portions of outer side faces of the side panels 8 and 8a to correspond to the bearing devices 15, 16, 15a, 16a. As shown in FIG. 5, sliders 36 and 37 are horizontally slideably fitted on both rails 34 and 35. Guide shaft attachment fittings 38 and 39 are fixedly provided on the sliders 36 and 37. Guide shafts 40 and 41 are vertically provided on the guide shaft attachment fittings 38 and 39. The guide shafts 40 and 41 are inserted from above into the bearing devices 15 and 16 provided on the supporting panel 14 and the guide shaft attachment fittings 38 and 39 are stopped on the bearing devices 15 and 16 to hang the side panel 8.

[0034] The bearing devices 15 and 16 are constructed in the manner that bearing housings 26 and 29 are fixedly provided on the supporting panel 14 through attachment fittings 25 and 28 and bearings 27 and 30 are provided in the bearing housings 26 and 29. The guide shafts 40 and 41 are passing through the bearings 27 and 30. An aligning bearing is used for the upper bearing 27, and the diameter difference between the hole diameter of the lower bearing 30 and the shaft diameter of the guide shaft 41 is set to be larger than the diameter difference between the hole diameter of the upper aligning bearing 27 and the shaft diameter of the guide shaft 40. That is, as shown in FIG. 16, the hole 11 of the bearing 30 is formed into a size in which the guide shaft 41 can be inclined.

[0035] The other rail 34a, guide shaft attachment fitting 38a, bearing device 15a, and so on, as shown in FIG. 3, have the same structures as those described above.

[0036] An attachment seat 63 is provided near the car coupling center of the side panel 8 to protrude outward. An attachment fitting 65 is provided at the front end of the attachment seat 63. A balancer 17 as a means for holding the side panels 8 and 8a so as to be balanced at the central portion in a passage direction, is bridged between the attachment fitting 67 and the attachment fitting 65. As the balancer 17, for example, a gas spring is used. As shown in FIG. 2, as the balancer, an upper balancer 17 and a lower balancer 18 in a pair are provided. The distance between the attachment levels of the upper balancer 17 and the lower balancer 18 is wide on the panel end 10 side near the center of the interconnection passage 5 and narrow on the end face 2 side so that the side panel 8 always stands vertically.

[0037] As shown in FIG. 2, between the other car 1a and the side panel 8a, a pair of balancers 17a and 18a are bridged like the above.

[0038] A side panel coupling device 42 is provided on the panel end 10 of the one side panel 8 and the panel end 10a of the other side panel 8a. The side panel coupling device 42 will be described with reference to FIGS. 6 to 10.

[0039] As shown in FIGS. 6, 9, and 10, two coupling receiving fittings 54 and 55 are fixedly provided outside of a lower portion of the panel end 10 of one side panel 8 to be vertically distant from each other. Coupling holes 56 and 57 are vertically formed concentrically in both coupling receiving fittings 54 and 55.

[0040] A coupling fitting 60 is provided outside a lower portion of the panel end 10a of the other side panel 8a at a position where the coupling fitting 60 is fitted in the gap between the coupling receiving fittings 54 and 55, as shown in FIGS. 6 and 10, to protrude in an extension direction of the side panel 8a beyond the panel end 10a of the other side panel 8a, as shown in FIG. 7. Further, a coupling hole 62 is vertically formed through the coupling fitting 60. When the panel ends 10 and 10a of both side panels 8 and 8a are brought into contact with each other, the coupling fitting 60 enters the gap between the coupling receiving fittings 54 and 55 to be fitted, and the coupling holes 56 and 57 and the coupling hole 62 become vertically concentric. A coupling pin 49 as will be described later is inserted into the coupling holes 56, 57, and 62 to couple both side panels 8 and 8a with keeping a face-to-face contact state between their panel ends 10 and 10a.

[0041] As shown in FIG. 8, the same coupling receiving fittings 50 and 51 as the above-described coupling receiving fittings 54 and 55 are provided also outside an upper portion of the panel end 10 of one side panel 8. Further, the same coupling fitting 59 as the above-described coupling fitting 60 and the same coupling pin 48 as the above-described coupling pin 49 are provided also outside an upper portion of the panel end 10a of the other side panel 8a.

[0042] Both coupling pins 48 and 49 are disposed with their axes being vertical, and supported on one side panel 8 so as to be vertically movable.

[0043] A coupling bar 44 is vertically disposed on one side panel 8, and passes through the reinforcing frames 31, 32, and 33 to be vertically movable. The upper coupling pin 48 is fixedly provided on the upper end of the coupling bar 44 by coupling them through a shaft 46. The lower coupling pin 49 is fixedly provided on the lower end of the coupling bar 44 by coupling them through a shaft 47. The length of the coupling bar 44 can be adjusted with a turnbuckle 45 as shown in FIG. 6.

[0044] As shown in FIG. 7, a handle 43 is fixedly provided integrally with the coupling bar 44, and is horizontally disposed outside one side panel 8 substantially along the side panel 8. As shown in FIG. 11, a pair of opposed holders 58A and 58B are fixedly provided on one side panel 8 at upper and lower positions with respect to the handle 43. In the upper holder 58A is formed a holding groove being open downward by a pair of opposed leaf springs. In the lower holder 58B is formed a holding groove being open upward by a pair of opposed leaf springs. The handle 43 can be fitted and held in the holding groove of the upper holder 58A when the handle 43 is moved upward, or the handle 43 can be fitted and held in the holding groove of the lower holder 58B when the handle 43 is moved downward.

[0045] As shown in FIGS. 2, 3, and 6, an extensible sheet 70 is stretched between the panel end 12 of the one side panel 8 near a car and an attachment frame 69 provided on the end face of one car 1. In case of the embodiment shown in the drawings, the extensible sheet 70 is made of a folded sheet folded so as to be extensible in the passage direction X-X, and is made of a soft material. As shown in FIGS. 3 and 12, guide pieces 71 are protrusively provided at proper positions on the external fold peaks of the extensible sheet 70, at two of upper and lower portions of the extensible sheet 70 in case of the embodiment of FIG. 2. An oblong guide hole 72 is horizontally formed through each guide piece 71.

[0046] A guide bar 23 passing through all the guide holes 72 of the guide pieces 71 is horizontally provided on the one supporting panel 14, and each guide piece 71 can move in the passage direction X-X with being guided by the guide bar 23.

[0047] The same extensible sheet 70a as the above-described extensible sheet 70 is provided also between the other side panel 8a and the other car 2a in the same manner as described above. The extensible sheet 70a is movably held by the same guide bar 23a as described above, provided on the other supporting panel 14a.

[0048] As shown in FIGS. 1, 2, and 6, plug rubbers 74 and 75 are attached to the upper and lower ends of the side panel 8.

[0049] The above-described side panel devices 6 and 7 are provided symmetrically on both sides of the end faces 2 and 2a in the coupled cars 1 and 1a to sandwich the interconnection passage 5. Because the side panel devices on one car 1 side and the other car 1a side from the center of the interconnection passage 5 have the same construction except the coupling device 42, a suffix a is added to the same reference numeral as described above for the same member as described above and the description of its structure is omitted.

[0050] In FIG. 2, reference numerals 80 and 80a denote hoods. The hoods 80 and 80a are divided in a passage direction into two parts, which can be coupled to and separated from each other.

[0051] Next, a coupling operation will be described.

[0052] First, in advance before the separated cars 1 and 1a are coupled, as shown in FIG. 6, in order that a proper interval Lc can be ensured between the panel end 10 of one side panel 8 and the coupling fittings 59 and 60 of the other side panel 8a when the cars 1 and 1a are coupled, the side panels 8 and 8a are gotten near to the end faces 2 and 2a sides so that the protruding lengths of the side panels 8 and 8a beyond the end faces 2 and 2a are La and Lb. Further, as shown in FIG. 6, the handle 43 is moved upward to be sandwiched and held by the upper holder 58A and the upper and lower coupling pins 48 and 49 are drawn out from the coupling holes 76, 77, 56, and 57 of the coupling receiving fittings 50, 51, 54, and 55.

[0053] In this state, after the cars 1 and 1a are coupled, the interval Lc between the side panels 8 and 8a is manually narrowed, the coupling fittings 59 and 60 protruding from the other side panel 8a are fitted between the coupling receiving fittings 50, 51, 54, and 55 of one side panel 8, and the panel end 10 of one side panel 8 is brought into face-to-face contact with the panel end 10a of the other side panel 8a. Upon the face-to-face contact, the coupling holes 62 formed in the coupling fittings 59 and 60 coincide with the coupling holes 76, 77, 56, and 57 formed in the coupling receiving fittings 50, 51, 54, and 55.

[0054] Afterward, the handle 43 is manually pushed downward to be disconnected from the upper holder 58A, and fitted in the lower holder 58B to be sandwiched and held. By the downward movement of the handle 43, the coupling bar 44 also moves downward. The upper and lower coupling pins 48 and 49 provided integrally with the coupling bar 44 also move downward. The upper coupling pin 48 is inserted to pass through the coupling holes 56 and 57 of the upper coupling receiving fittings 50 and 51 and the coupling hole 62 of the coupling fitting 59, and the lower coupling pin 49 is inserted to pass through the coupling holes 56 and 57 of the lower coupling receiving fittings 54 and 55 and the coupling hole 62 of the coupling fitting 60. Thereby, the side panels 8 and 8a are coupled into one body, as shown in FIGS. 2 and 3.

[0055] In case of separating the side panels 8 and 8a, the operation in the inverse order is performed.

[0056] Next, actions of each member to movements of the cars will be described.

[0057] When the two coupled cars 1 and 1a pass on a railway of an R simple circular curve, as shown in FIG. 13, the distance between the car end faces on one side increases and the distance between the car end faces on the other side decreases.

[0058] On the side L1 where the distance between the car end faces has increased, although the distance between the front ends of the supporting panels 14 and 14a increases, by extensions of the balancers 17, 18, 17a, and 18a, the sliders 36 and 36a of the bearing devices 15, 16, 15a, and 16a slide on the rails 34 and 34a and move in the direction to the middle of the intercon-

nection passage 5, and the side panels 8 and 8a are hung in a state that their panel ends 10 and 10a are positioned in the middle of the interconnection passage 5 and in face-to-face contact. In addition, although the attachment interval between the car side ends of the side panels 8 and 8a and the car end faces increases, the extensible sheets 70 and 70a adapt themselves and extend to close the attachment interval.

[0059] On the other hand, on the side L2 where the distance between the car end faces has decreased, the balancers 17, 18, 17a, and 18a contract, the sliders 36 and 36a of the bearing devices 15, 16, 15a, and 16a slide on the rails 34 and 34a and move in the reverse direction to that described above, and the side panels 8 and 8a are hung in a state that their panel ends 10 and 10a are positioned in the middle of the interconnection passage 5 and in face-to-face contact. In addition, the extensible sheets 70 and 70a adapt themselves and contract to close the attachment interval between ends of the side panels 8 and 8a and the car end faces.

[0060] Next, in case that the two coupled cars 1 and 1a deviate as shown in FIG. 14 when passing on the railway of an S curve, the supporting panels 14 and 14a rotate around the upper and lower hinges 20, 21, 20a, and 21a and are kept parallel to the side panels 8 and 8a by actions of the balancers 17, 18, 17a, and 18a, and hang the side panels 8 and 8a at middle positions in the passage direction X-X of the interconnection passage 5. In addition, the extensible sheets 70 and 70a extend to adapt themselves.

[0061] In the above-described states, because the balancers 17, 18, 17a, and 18a are disposed at upper and lower positions as shown in FIG. 2, the side panels 8 and 8a can always be vertically held and hung substantially in the middle in the passage direction X-X, and the attachment interval of the extensible sheet 70 and the attachment interval of the extensible sheet 70a can be substantially the same interval.

[0062] In addition, the above-described extensible sheets 70 and 70a move with being held by the guide bars 23 and 23a of the supporting panels 14 and 14a. The fold peaks 76 and 76a of the extensible sheets 70 and 70a are held in substantially the same plane as the side panels 8 and 8a. Thereby, the extensible sheets 70 and 70a are prevented from protruding inward and being curved in an outward concave state.

[0063] Next, a case wherein a difference in level between the two coupled cars 1 and 1a is generated will be described.

[0064] The coupled cars are normally at the same level, as shown in FIG. 2. However, when vertical movement is generated upon running and the other car 1a becomes higher by a dimension H1 than one car 1 as shown in FIG. 15, the supporting panel 14a attached to the car 1a through the hinges 19a and 20a also becomes higher by the dimension H1 than the supporting panel 14. At the same time, the bearing devices 15a and 16a of the supporting panel 14a push up the guide shaft attachment fittings 38a and 39a as shown on the right side in FIG. 15, and the slider 36a and the rails 34a and 35a are also pushed up. Thus, the other side panel 8a integral with the rails 34a and 35a becomes higher by the dimension H1 at the same time.

[0065] When the other side panel 8a has moved upward by the dimension H1, because the coupling fittings 59 and 60 of the other panel 8a are being coupled to the coupling receiving seats 50, 51, 54, and 55 of one side panel 8, one side panel 8 is also pushed up together with the other panel 8a by the same dimension. Therefore, the guide shaft attachment fittings 38 and 39 of one side panel 8 move upward by the dimension H1 in comparison with the bearing devices 15 and 16 of one supporting panel 14.

[0066] In addition, by the upward movement of one side panel 8, in the upper and lower end faces of the extensible sheet 70, a difference between the high level of the sheet on the one side panel 8 side and the low level on the end face 2 side is generated, as shown in FIG. 15.

[0067] In addition, the lengths of the guide shaft 40 and 41 have been set to be longer than the expected maximum difference in level between two cars, so that the guide shafts 40 and 41 are not disconnected from the bearing devices 15, 16, 15a, and 16a even upon vertical movement between two cars.

[0068] Conversely, in case that one car 1 has become higher than the other car 1a, the state arises wherein the left and right are inversed to the state of FIG. 15.

[0069] Because of the construction as described above, even when the panel end 12 of one side panel 8 and the panel end 12a of the other side panel 8a move vertically upon vertical movement of the running cars 1 and 1a, both side panels 8 and 8a can always be vertically hung substantially in the middle in the passage direction X-X of the interconnection passage 5 by the balancers 17, 18, 17a, and 18a disposed at upper and lower positions, as described above. Thereby, the attachment distances of the extensible sheet 70 on one car 1 side and the extensible sheet 70a on the other car 1a side can be kept to substantially the same interval.

[0070] Next, a case wherein two cars 1 and 1a runs on vertically curved rails will be described.

[0071] When running on vertically curved rails, the end face 2 of one car 1 is inclined relatively to the end face 2a of the other car 1a, as shown by a chain line V in an upper portion of FIG. 2, and a difference in distance between the end faces 2 and 2a is generated between the upper and lower portions of the cars 1 and 1a.

[0072] As a result, as shown in FIG. 16, a relative angle θ is formed between the axial line of the bearing devices 15 and 16 attached to the supporting panel 14 and the axial line of the guide shaft 40 and 41 attached to the side panel 8 side.

[0073] When such an angle θ is formed and the upper guide shaft 40 on the side panel 8 side is inclined, the aligning bearing 27 provided on the supporting panel 14

side rotates. And, because the diameter of the hole 11 is larger than the diameter of the lower guide shaft 41, inclinations of both guide shafts 40 and 41 are permitted.

[0074] Next, upon curve running or car rolling, as shown by a chain line W in FIG. 1, rotational deviation is generated between two cars and a swing angle α is formed between permeating passage walls 4 and 4a (see FIG. 3), as shown in FIG. 17.

[0075] Also in this case, like the above, swing can be coped with by the aligning bearing 15 and the diameter of the hole 11 of the bearing 30.

[0076] In the movements of the side panels 8 and 8a as described above, even when an increase/decrease in interval between the panel ends 12 and 12a and the end faces 2 and 2a, a difference between the right car interval and the left car interval, or a difference of the above dimension H1 in level is generated, the extensible sheets 70 and 70a can follow it by the fold shape and characteristics of the soft material. Further, because the guide plates 71 and 71a are protrusively provided on the extensible sheets 70 and 70a made of folded sheets and the guide bars 23 and 23a are inserted in the oblong guide holes 72 and 72a formed in the guide plate 71 and 71a to hold the folded sheets 70 and 70a, fold peaks 76 and 76a of the folded sheets 70 and 70a (see FIG. 3) are aligned on a plane along the passage direction X-X even in the movements as described above. Thus, the external appearance can be kept good.

[0077] For the balancers 17, 18, 17a, and 18a in the above embodiment, springs can be used or actuators using air or oil can be used.

[0078] Besides, the extensible sheets 70 and 70a may be made of an extensible material into non-folded extensible sheets. In case of using such non-folded extensible sheets, the above-described guide plate 71 and guide bar 23 are not used.

[0079] Further, in the above embodiment, the side panel is divided in the passage direction, and the side panel coupling device 42 is provided for the divided side panels 8 and 8a so that one side panel 8 can be coupled with or separated from the other side panel 8a. However, the side panel may not be divided as one side panel in which one side panel 8 and the other side panel 8a as described above are united. In this case, the side panel coupling device 42 constituted by the above-described coupling receiving fittings 50, 51, 54, and 55, coupling pins 48 and 49, and coupling fittings 59 and 60 is needless.

Claims

1. A panel device for railway rolling stock comprising, on a side portion of an interconnection passage:

   a supporting panel provided on each of coupled cars so as to be horizontally rotatable while a center of the rotation is on a car end face side;
   a vertical bearing provided on an end portion of the supporting panel;
   a side panel provided on an interconnection passage side of the supporting panel;
   a rail provided horizontally on the side panel;
   a slider provided slideably on the rail;
   a guide shaft provided vertically on the slider and inserted slideably in the bearing;
   an extensible sheet stretched between the side panel and a car end face; and
   a balancer extended between the side panel and the car end face to hang the side panel in the middle in a passage direction.

2. The panel device according to claim 1, wherein the side panel is divided at a center in the passage direction and a side panel coupling device is provided to separably couple the divided side panels with each other.

3. The panel device according to claim 1 or 2, wherein bearings on the supporting panel side and guide shafts on the side panel side are provided at upper and lower positions, an aligning bearing is used for the upper bearing, and a hole diameter of the lower bearing is set to be larger than a hole diameter of the upper bearing.

4. The panel device according to any one of claims 1 to 3, wherein the extensible sheet is made of a folded sheet.

5. The panel device according to claim 4, wherein a guide bar is provided on the supporting panel along the passage direction and the folded sheet is slideably held on the guide bar.

FIG. 1

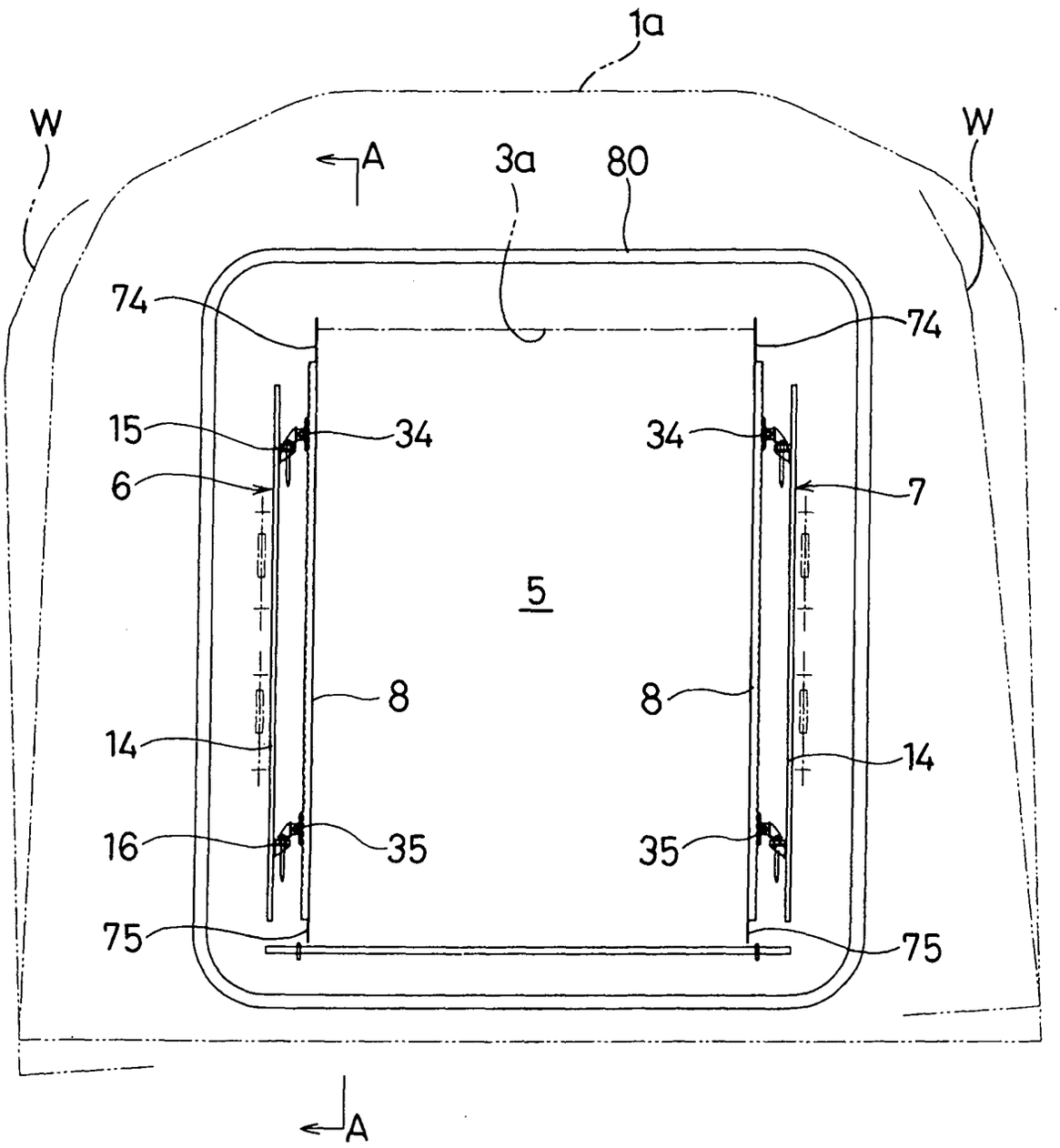

FIG. 2

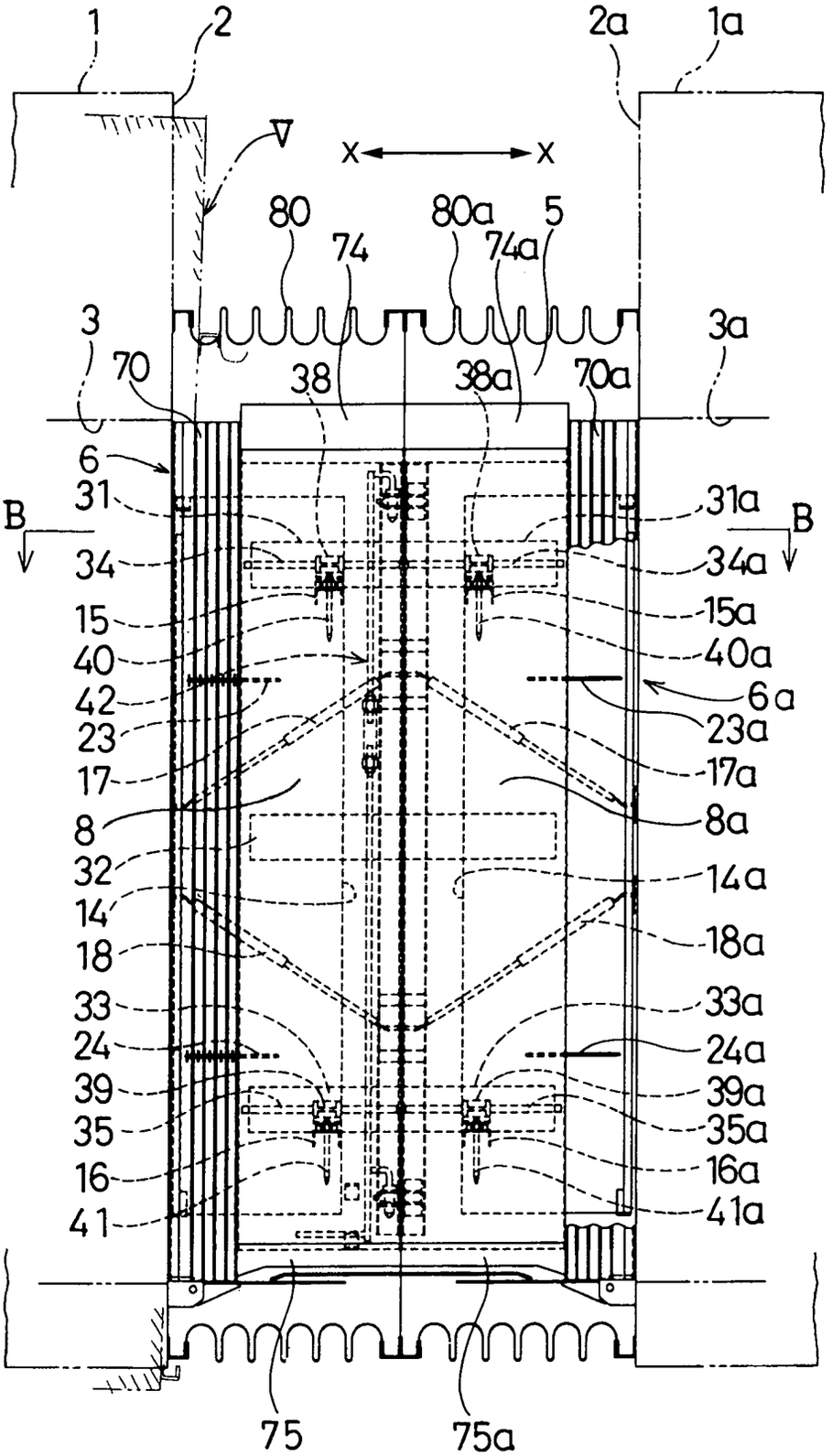
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FIG. 3

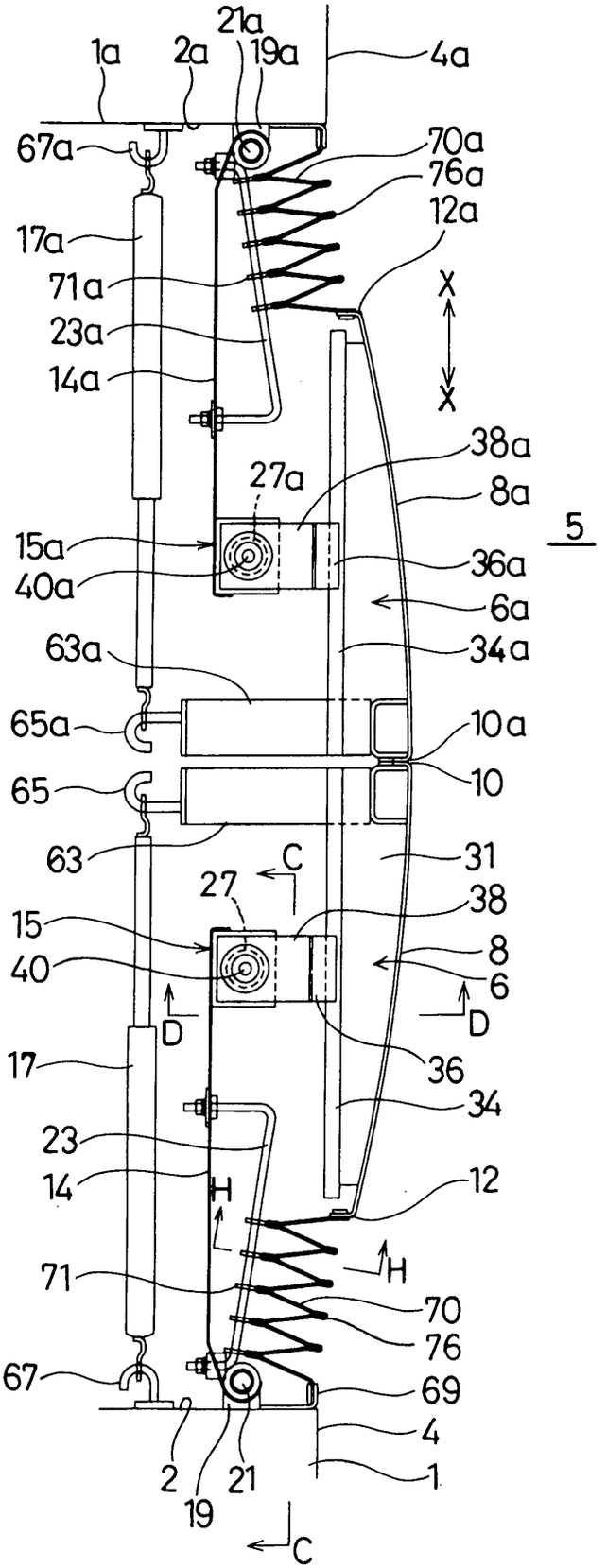
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FIG. 4

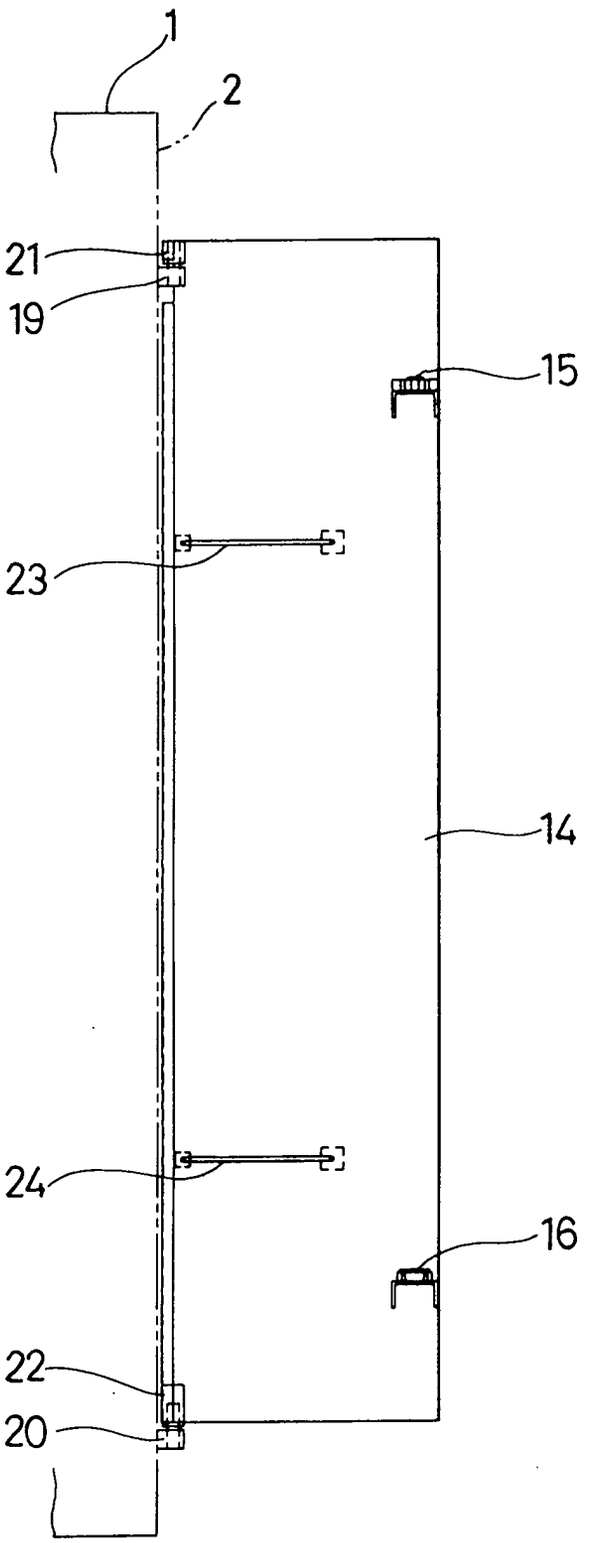


FIG. 5

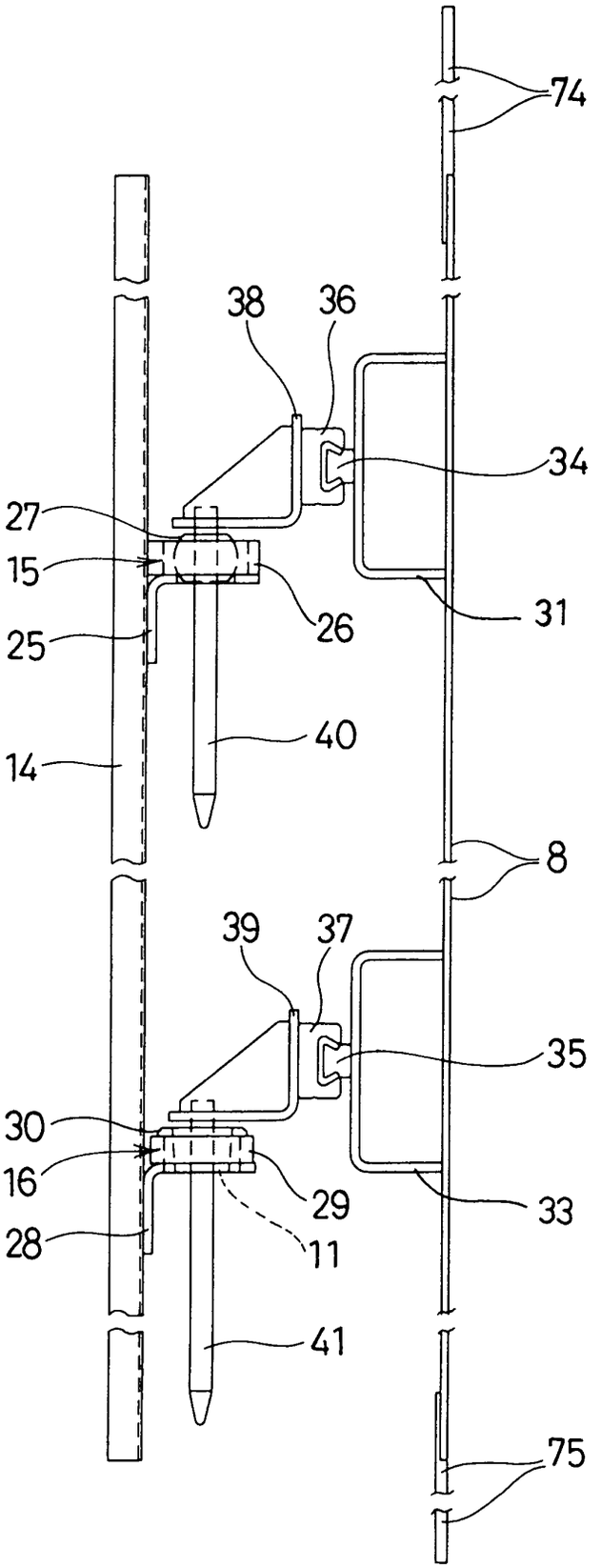
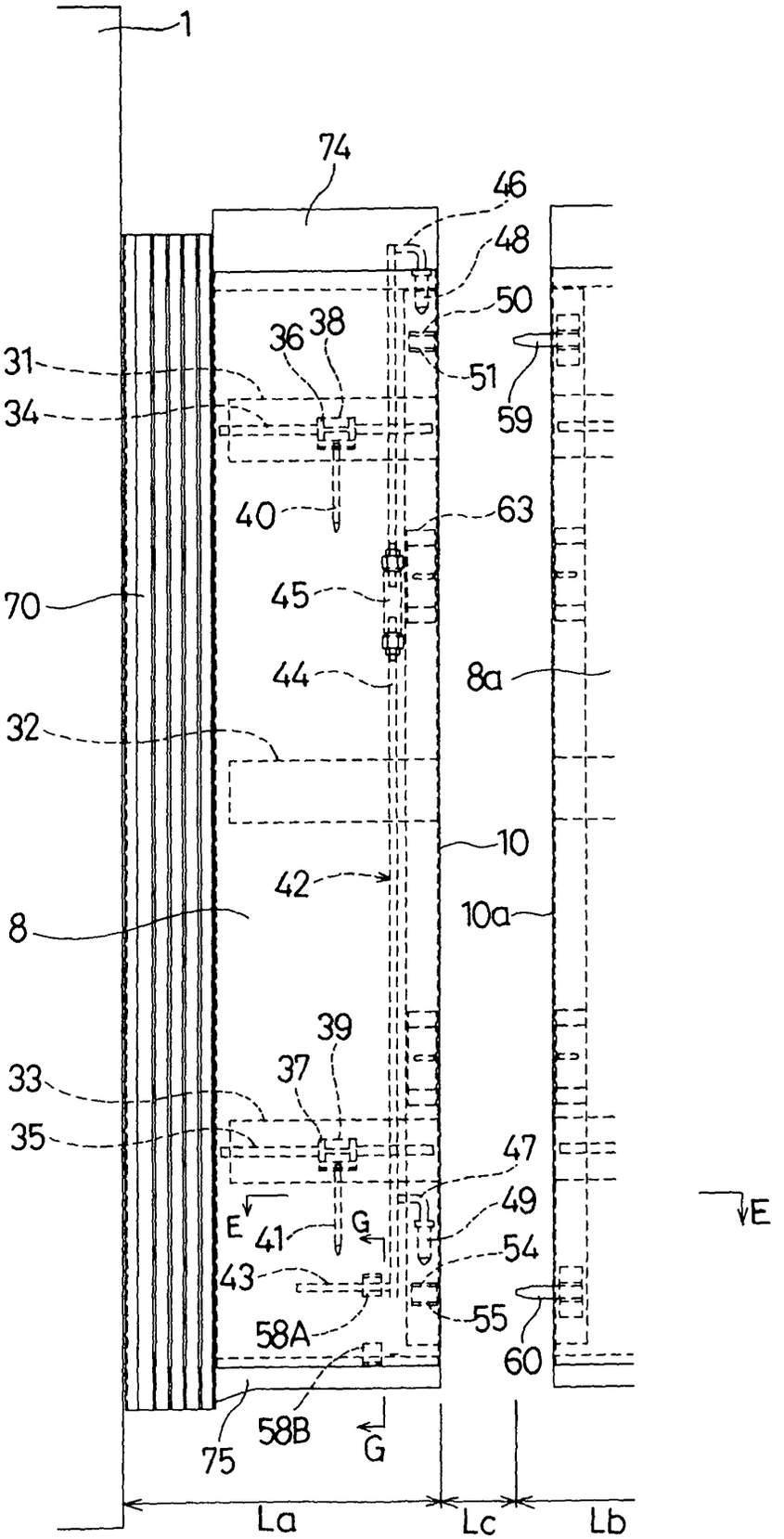


FIG. 6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E
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Lc
Lb

FIG. 7

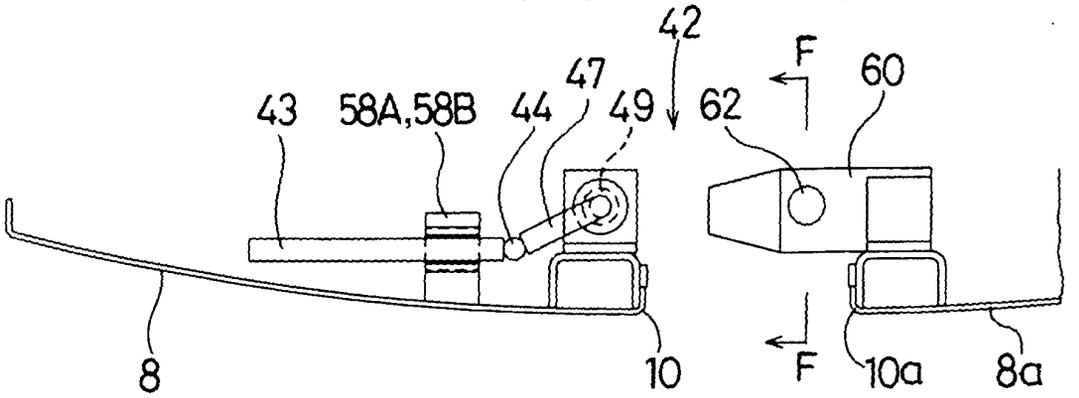


FIG. 8

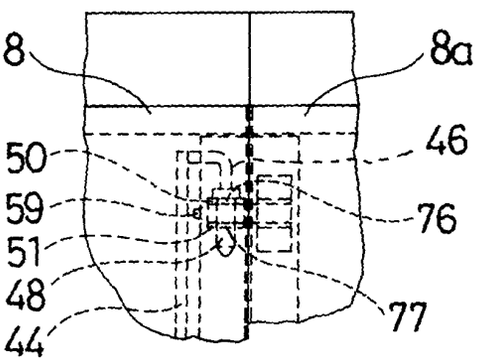


FIG. 9

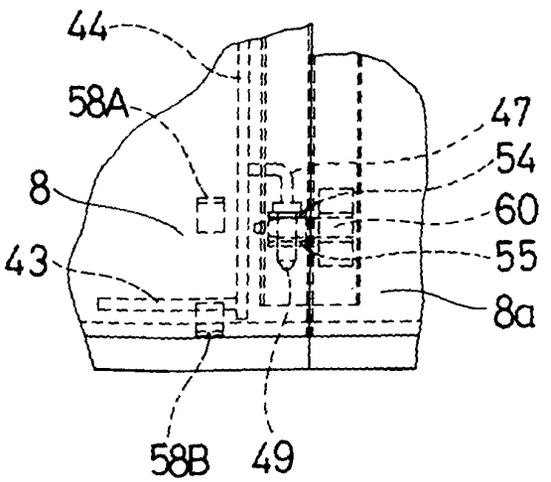


FIG. 10

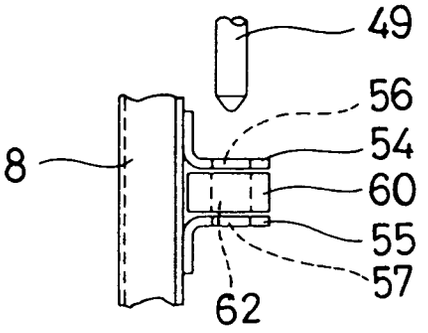


FIG. 11

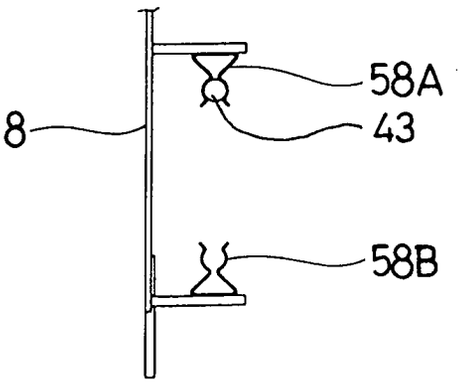


FIG. 12

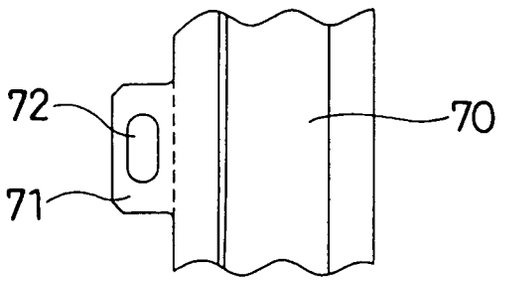
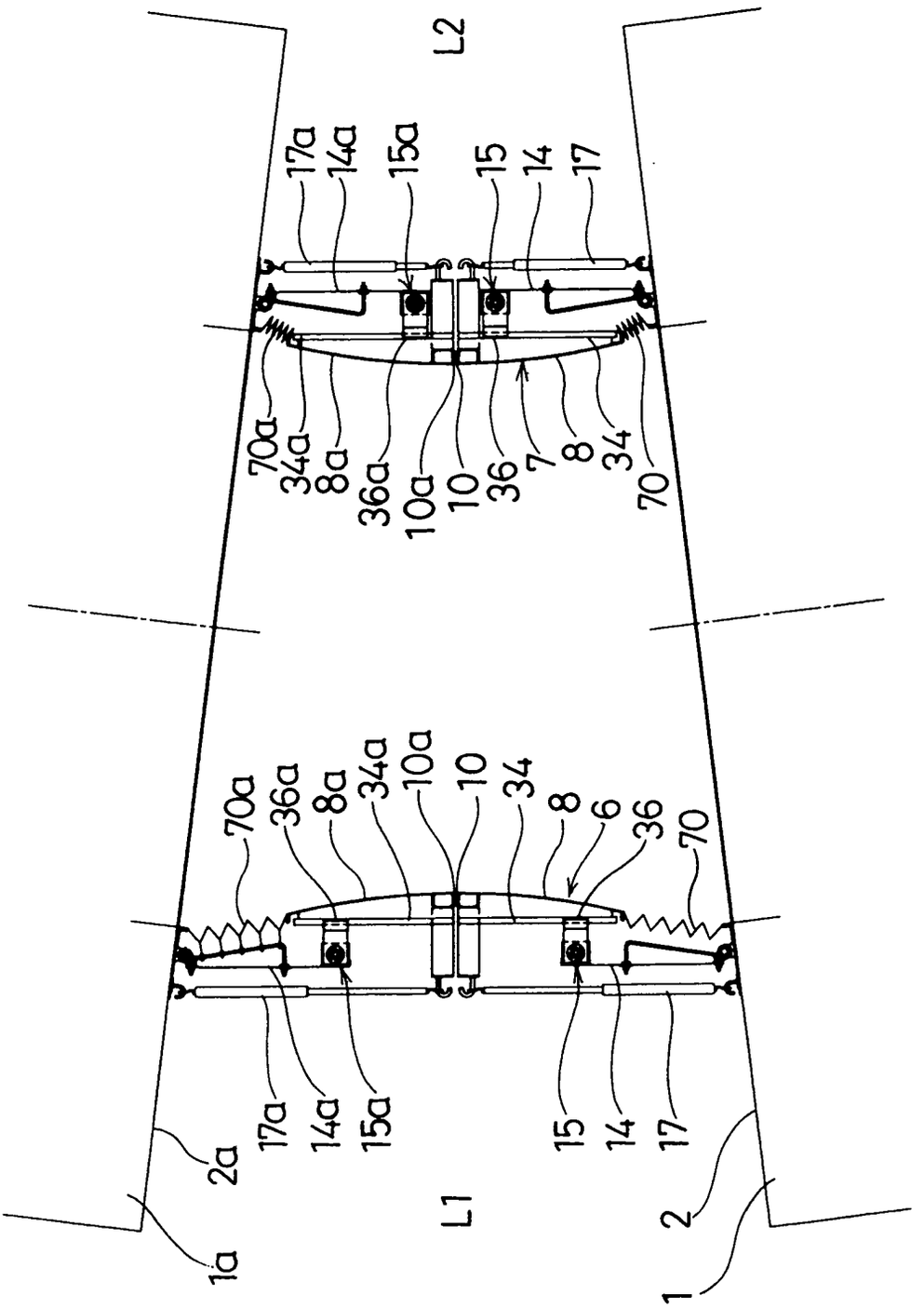


FIG. 13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L1

FIG. 14

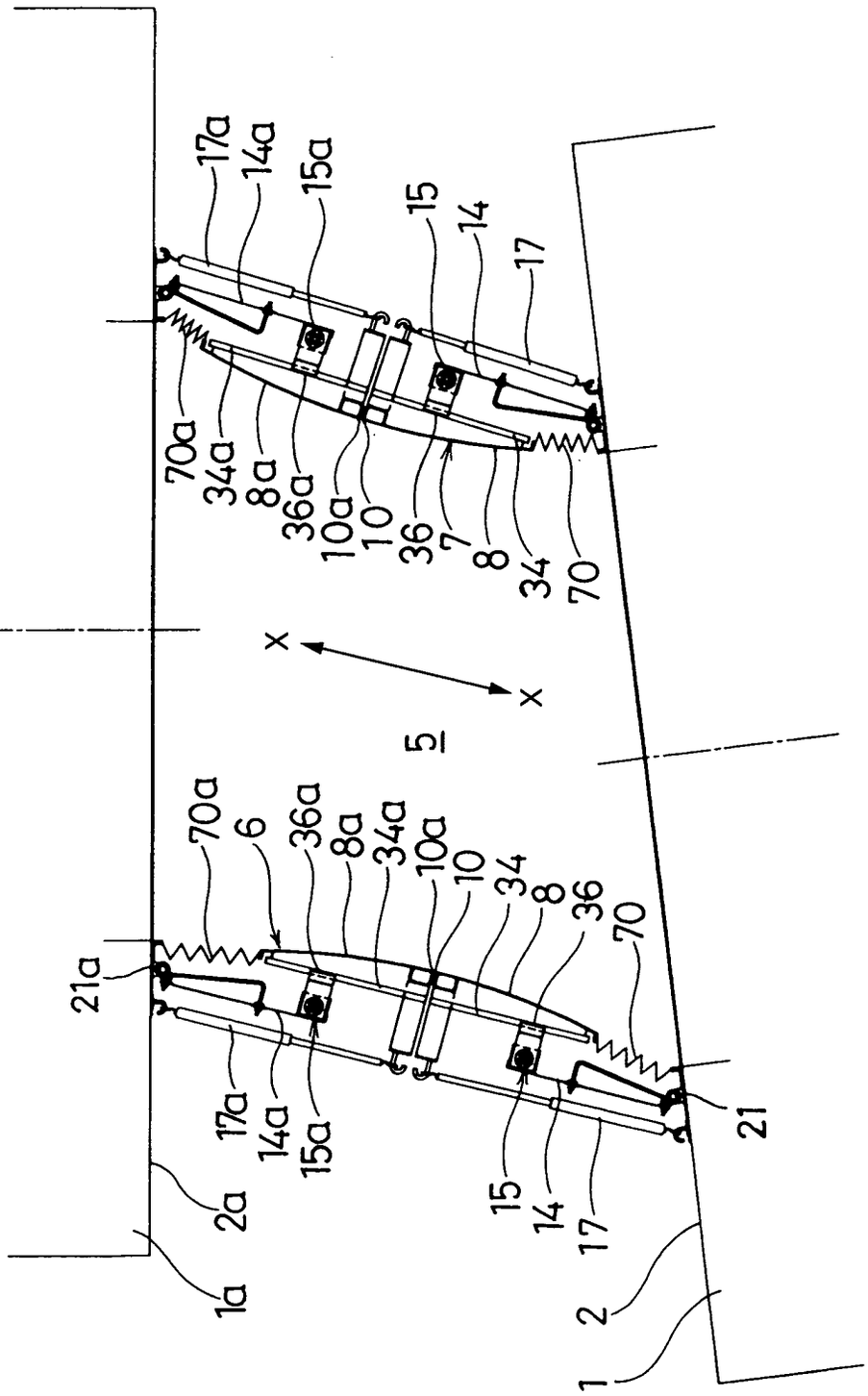
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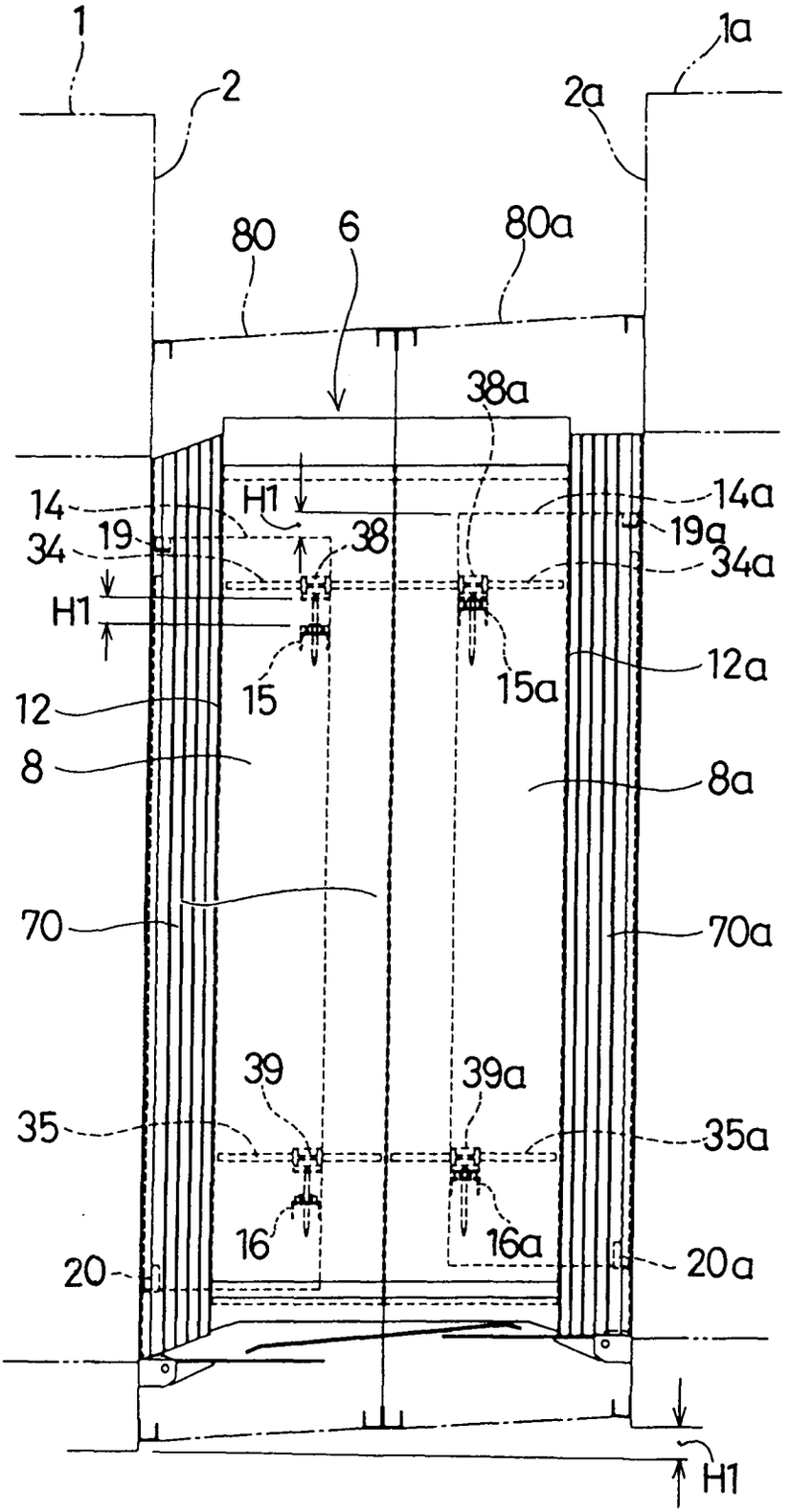
FIG. 15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H1

FIG. 16

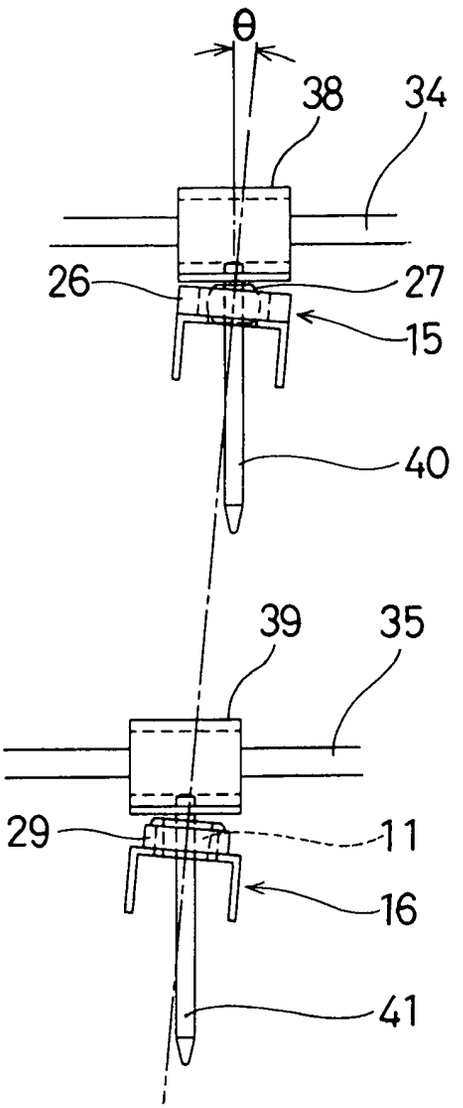
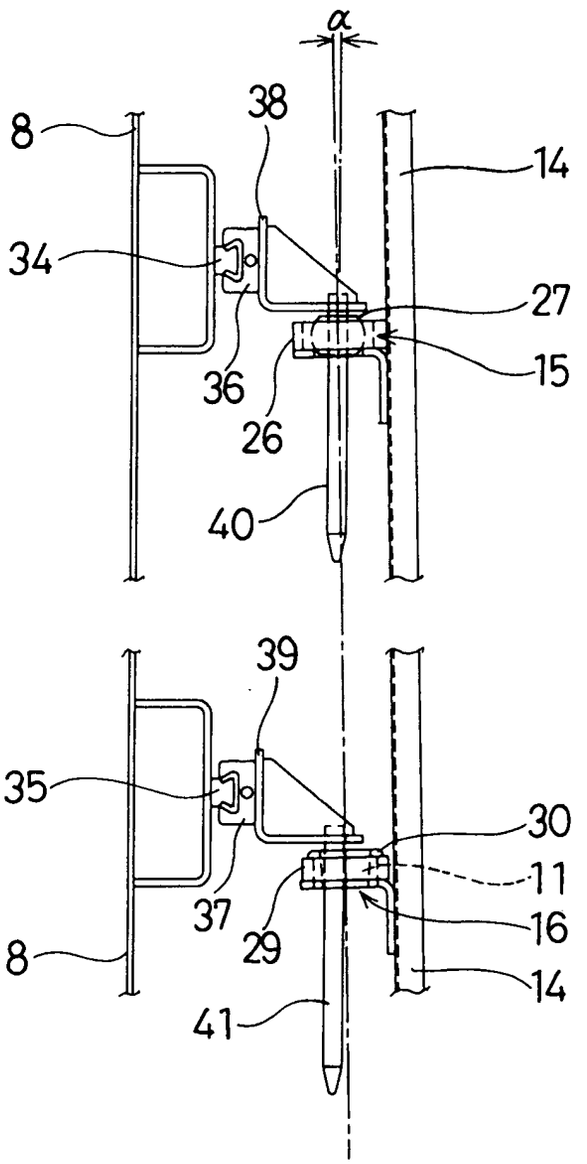


FIG. 17



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 00 1719

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A	US 4 736 688 A (ANDO ET AL) 12 April 1988 (1988-04-12) * column 2, line 57 - column 4, line 11; figures 1-4 *	1-4	B61D17/20
A	US 4 252 065 A (BICKEL ET AL) 24 February 1981 (1981-02-24) * column 3, line 28 - column 4, line 50; figures 1,2 *	1,2,4	
A	DE 36 39 898 A1 (DUEWAG AG; DUEWAG AG, 47829 KREFELD, DE) 1 June 1988 (1988-06-01) * column 10, line 12 - line 68; figures 8,9 *	1,2	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B61D
B60D
B62D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 May 2005	Chlosta, P

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