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(54) **HINGE DEVICE**

SCHARNIERVORRICHTUNG

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(56) References cited:
EP-A2- 0 392 570
EP-A2- 0 982 455
WO-A1-2012/057250
AT-B- 382 673
JP-A- H10 238 200
JP-A- H10 306 643
JP-A- S62 500 601
JP-A- 2006 118 189

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Description

Field of the Invention

[0001] The present invention relates to a hinge device that connects a door to a frame in a rotatable fashion.

Background of the Invention

[0002] To attach a door to a frame, it is a general practice to provide hinge devices at least at two points in upper and lower end portions of the frame and the door to rotatably connect the door to the frame via the hinge devices.

[0003] A hinge device of this type is disclosed in Patent Document 1 given below. The hinge device includes a pedestal to be attached to a frame, a cupped member (mounting member) to be attached to a door and a body. The cupped member is rotatably attached to a distal end portion of the body. The body is removably attached to the pedestal via a connecting member. Via the hinge device having these features, the door is rotatably connected to the frame.

[0004] The connecting member includes first and second engagement recesses disposed in the pedestal, first and second engagement portions disposed in the body and a biasing member such as a torsion coil spring. The first and second engagement recesses are respectively disposed in end portions of the pedestal in a front and a rear of the pedestal. The first engagement recess is open to the front and the second engagement recess is open to the rear. The first engagement portion is disposed in a front end portion of the body so as to be fixed in position. The second engagement portion is disposed in a rear end portion of the body so as to be movable in a front-rear direction. The biasing member biases the second engagement portion forward.

[0005] To attach the body to the pedestal, firstly, the body is moved rearward and the first engagement portion is engaged with the first engagement recess. Secondly, the rear end portion of the body is moved closer to the pedestal. Then, the second engagement portion is abutted against an inclined surface disposed in the pedestal. The second engagement portion is moved rearward by the inclined surface against a biasing force of the biasing member. When the rear end portion of the body is moved closer to a predetermined position, the second engagement portion is moved beyond the inclined surface and is opposed to an open portion of the second engagement recess. Then, the second engagement portion is moved forward by the biasing member and is engaged with the second engagement recess. By the respective engagement of the first and second engagement portions with the first and second engagement recesses, the body is removably attached to the pedestal.

Prior Art Documents

Patent Documents

[0006]

Patent Document 1: Japanese Unexamined Patent Application (Translation of PCT Application) Publication No. S62-500501

Patent Document 2: PCT Publication No. WO 2012/057250. WO 2012/057250 describes a hinge device in which a body section is immobilized in a forward/rear direction in relation to a mobile member of a base by means of an engaging structure.

[0007] Document EP0982455A2 discloses a furniture hinge with a hinged arm mounted on a base plate which is connected by means of articulated levers to a hinge cup. A guide is provided which guides the hinge arm in its longitudinal direction and another guide is provided by the hinge arm guiding a rotation of the joint adjustment screw, both parallel to the mounting surface of the base plate as well as pivoted perpendicular to the mounting surface.

Summary of the Invention

Problem to be Solved by the Invention

[0008] There is a problem in the conventional hinge device described above, which is that it is difficult to attach the body to the pedestal. Specifically, in order to attach the door to the frame, firstly, the first engagement portion is inserted in the first engagement recess to be engaged with the first engagement recess. After that, the body is rotated about a first engagement shaft to move the rear end portion of the body closer to the pedestal. Then. the second engagement portion enters the second engagement recess and is engaged with the second engagement recess. Since the cupped member is attached to the door beforehand, it is required to move the door in the front-rear direction to insert the first engagement portion in the first engagement recess. Thus, it is difficult to insert the first engagement portion in the first engagement recess, and therefore, it is difficult to attach the body to the pedestal.

Means for Solving the Problems

[0009] To solve the problems mentioned above, a first aspect of the present invention provides a hinge device according to claim 1.

Advantageous Effects of the Invention

[0010] According to the present invention having the features mentioned above, the body can be attached to the pedestal simply by moving the body closer to the

pedestal with the first and second engagement portions respectively pressed against the first and second inclined surfaces. Thus, the body can be easily attached to the pedestal.

Brief Description of the Drawings

[0011]

FIG. 1 is a cross-sectional view of a first embodiment of the present invention.
FIG. 2 is a perspective view of a pedestal adopted in the first embodiment.
FIG. 3 is an exploded perspective view of the pedestal.
FIG. 4 is an exploded perspective view of a mounting member, a body rotatably disposed at the mounting member and components disposed in the body adopted in the first embodiment.
FIG. 5 is a perspective view of the mounting member and the body with the components disposed in the body assembled.
FIG. 6 is a cross-sectional view, showing a first step to attach the body to the pedestal according to the first embodiment.
FIG. 7 is a cross-sectional view, showing a second step to attach the body to the pedestal according to the first embodiment.
FIG. 8 is a cross-sectional view, showing a third step to attach the body to the pedestal according to the first embodiment.
FIG. 9 is a cross-sectional view, showing a fourth step to attach the body to the pedestal according to the first embodiment.
FIG. 10 is a partially-cutaway side view of a second embodiment, which is not part of the present invention.
FIG. 11 is a partially-cutaway side view, showing a first step to attach the body to the pedestal according to the second embodiment.
FIG. 12 is a partially-cutaway side view, showing a second step to attach the body to the pedestal according to the second embodiment.
FIG. 13 is a partially-cutaway side view, showing a third step to attach the body to the pedestal according to the second embodiment.
FIG. 14 is a partially-cutaway side view, showing a fourth step to attach the body to the pedestal according to the second embodiment.
FIG. 15 is a partially-cutaway side view, showing a fifth step to attach the body to the pedestal according to the second embodiment.

Mode for Carrying out the Invention

[0012] A best mode for carrying out the invention will be described hereinafter with reference to the drawings.
[0013] FIGS. 1 to 9 show a first embodiment of the present invention. A hinge device A according to the first embodiment will be generally described first. As shown in FIG. 1, the hinge device A includes a pedestal 1, a mounting member 2, a body 3 and a connecting member 4.
[0014] The pedestal 1 is fixed to a portion of an inner side surface of a frame (not shown) that is close to an open portion of the frame. In this embodiment, the pedestal 1 is fixed to a front end portion of a left inner side surface of the frame whose front surface portion is open. To facilitate understanding of features of the hinge device A, front-rear, left-right and up-down directions of the frame (front-rear, left-right and up-down directions shown in FIG. 2) are used in explanations of the features. It is to be understood that the hinge device A is not limited to such directions.
[0015] The mounting member 2 is fixed to a back surface of a door (not shown). In this embodiment, corresponding to the disposition of the pedestal 1 in the left inner side surface of the frame, the mounting member 2 is disposed in a left end portion of the back surface of the door in a closed position.
[0016] The mounting member 2 is rotatably connected to a front end portion of the body 3 via a pair of links 5A, 5B. Specifically, as shown in FIG. 4, one end portions of the links 5A, 5B are respectively rotatably connected to the mounting member 2 via shaft portions 6a, 6b of a connecting shaft 6 having a generally U-shaped configuration. The other end portions of the links 5A, 5B are respectively rotatably connected to the front end portion of the body 3 via shafts 7A, 7B. The mounting member 2 and the body 3 may be rotatably connected directly to each other. Alternatively, the mounting member 2 and the body 3 may be rotatably connected to each other via three or more links. The body 3 is removably attached to the pedestal 1 by the connecting member 4. As a result, the door is attached to the frame via the hinge device A such that the door is rotatable in a horizontal direction.
[0017] Of the links 5A, 5B, one link 5A is rotatably biased by a one end portion 8a of a coiled spring (biasing member) 8 disposed around a shaft 7C via a spring receiver 9A. The other link 5B is rotatably biased by the other end portion 8b of the coiled spring 8 via a spring receiver 9B. When the door is located between the closed position and an intermediate position between the closed position and an open position, the door is rotationally biased toward the closed position by a rotationally biasing force of the coiled spring 8 via the links 5A, 5B. When the door is located between the intermediate position and the open position, the door is rotationally biased toward the open position via the links 5A, 5B. The door may be rotationally biased by other rotationally biasing mechanisms that are known in the art. It is not necessarily required to provide a rotationally biasing mechanism.
[0018] A rotary damper mechanism 10 is disposed at the shaft 7B. The rotary damper mechanism 10 is provided for restraining a rotation speed of the door at least when the door is rotated from the intermediate position

toward the closed position. The rotary damper mechanism 10 is not relevant to the present invention. Therefore, description about the rotary damper mechanism 10 is omitted.

[0019] Features of the hinge device A will be described more in detail. As shown in FIGS. 2 and 3, the pedestal 1 includes a base plate 11, a first movable member 12 and a second movable member 13.

[0020] The base plate 11 is fixed to a portion of the inner side surface of the frame near the open portion. In this embodiment, the base plate 11 is fixed to the front end portion of the left side surface of the frame whose front surface portion is open with a securing means such as a screw (not shown). To facilitate understanding of the features of the hinge device A, the front-rear, left-right and up-down directions of the frame (front-rear, left-right and up-down directions shown in FIG. 2) are used in the explanations of the features. It is to be understood that the hinge device A is not limited to such directions.

[0021] A projected portion 11a having a generally U-shaped cross-section is disposed in a front surface of the base plate 11 facing rightward such that a longitudinal direction of the projected portion 11a is oriented in the front-rear direction. A restriction hole 11b extending in the front-rear direction is formed in a middle portion of a distal end surface of the projected portion 11a facing rightward. A restriction groove 11c extending in the up-down direction is formed in a rear end portion of the distal end surface of the projected portion 11a. A catch recess 11d is formed in a front end surface of the projected portion 11a facing forward. A catch hole 11e extending through the projected portion 11a in the up-down direction is formed in a rear end portion of the projected portion 11a. The catch hole 11e is located in the rear of the restriction groove 11c.

[0022] The first movable member 12 having a generally U-shaped cross-section is disposed with a longitudinal direction thereof oriented in the front-rear direction. The projected portion 11a of the base plate 11 is disposed inside the first movable member 12. A distance between inner side surfaces of the first movable member 12 in the up-down direction is greater than a distance between outer side surfaces of the projected portion 11a in the up-down direction. Accordingly, the first movable member 12 is movable in the up-down direction with respect to the base plate 11 through a distance corresponding to a difference between the distance between the inner side surfaces of the first movable member 12 and the distance between the outer side surfaces of the projected portion 11a.

[0023] Shafts 14, 15 having a longitudinal direction thereof oriented in the up-down direction are respectively disposed through a front end portion and a rear end portion of the first movable member 12. The shaft 14 is caught by the catch recess 11d and the shaft 15 extends through the catch hole 11e. Thereby, the first movable member 12 is attached to the base plate 11 so as to be immovable in the front-rear direction and the left-right direction. Accordingly, the first movable member 12 is movable with respect to the base plate 11 only in the up-down direction.

[0024] A position of the first movable member 12 with respect to the base plate 11 in the up-down direction is adjusted by a first position adjustment mechanism. Specifically, a guide hole 12a having an elongated configuration extending in the front-rear direction is formed in a surface of the first movable member 12 facing rightward. A position adjustment member 16 having a configuration of a flat plate is disposed in the guide hole 12a such that the position adjustment member 16 is movable in a longitudinal direction (front-rear direction) of the guide hole 12a but immovable in the up-down direction.

[0025] A first cylindrical portion 16a and a second cylindrical portion 16b are formed in a surface of the position adjustment member 16 facing rightward. The first cylindrical portion 16a and the second cylindrical portion 16b are disposed so as to be spaced from each other in the front-rear direction and so as to have axes thereof oriented in the left-right direction. Each of circumferential wall portions of the first cylindrical portion 16a and the second cylindrical portion 16b are cut off at two points in a circumferential direction. This enables diameters of the first cylindrical portion 16a and the second cylindrical portion 16b to be increased and reduced. Hollow portions of the first cylindrical portion 16a and the second cylindrical portion 16b extend through the position adjustment member 16. Convex portions and concave portions, both extending in the left-right direction, are formed alternately in the circumferential direction in respective inner circumferential surfaces of the first cylindrical portion 16a and the second cylindrical portion 16b.

[0026] A head 17a of a first adjustment shaft 17 is disposed in the first cylindrical portion 16a. Convex portions and concave portions, both extending in the left-right direction, are formed alternately in an outer circumferential surface of the head 17a. Rotation of the first adjustment shaft 17 with respect to the position adjustment member 16 is prohibited by respective fitting of the convex portions and the concave portions of the head 17a with the concave portions and the convex portions of the first cylindrical portion 16a. However, since the diameter of the first cylindrical portion 16a can be increased and reduced, the first adjustment shaft 17 can be rotated if a rotating force of a predetermined magnitude or greater is applied, with the diameter of the first cylindrical portion 16a increased and reduced.

[0027] A left end surface of the head 17a of a first adjustment shaft 17 is opposed to the distal end surface (surface facing rightward) of the projected portion 11a of the base plate 11. A first eccentric shaft (not shown) is formed in the left end surface of the head 17a. The first eccentric shaft is disposed such that an axis of the first eccentric shaft is spaced from and parallel to an axis of the head 17a. That is, the first eccentric shaft is eccentrically disposed with respect to the head 17a. The first eccentric shaft is disposed in the restriction hole 11b such

that the first eccentric shaft is movable in a longitudinal direction of the restriction hole 11b (front-rear direction) and immovable in a short direction of the restriction hole 11b (up-down direction). Accordingly, when the first adjustment shaft 17 is rotated, the first eccentric shaft is moved in the restriction hole 11b in the front-rear direction and the head 17a is moved in the up-down direction. As a result, the position adjustment member 16 is moved in the up-down direction, and thereby, the first movable member 12 is moved in the up-down direction with respect to the base plate 11. Thus, a position of the first movable member 12 is adjusted in the up-down direction. It is to be understood that an amount of position adjustment of the first movable member 12 corresponds to an amount of rotation of the first adjustment shaft 17.

[0028] The first movable member 12 is provided with the second movable member 13. The second movable member 13 has a generally U-shaped cross sectional configuration and the first movable member 12 is disposed inside the second movable member 13. A distance between inner side surfaces of the second movable member 13 in the up-down direction is the same as a distance between outer side surfaces of the first movable member 12 in the up-down direction. Accordingly, the second movable member 13 is immovable with respect to the first movable member 12 in the up-down direction. Therefore, when the position of the first movable member 12 is adjusted in the up-down direction by rotating the first adjustment shaft 17, the position of the second movable member 13 is adjusted in the up-down direction together with the first movable member 12.

[0029] The second movable member 13 is movable with respect to the first movable member 12 in the front-rear direction and in the left-right direction. A position of the second movable member 13 with respect to the first movable member 12 in the front-rear direction is adjusted by a second position adjustment mechanism. Specifically, a through hole 13a extending through the second movable member 13 in the left-right direction is formed in the second movable member 13. The second cylindrical portion 16b of the position adjustment member 16 is fitted in the through hole 13a so as to be immovable in a radial direction of the through hole 13a. Accordingly, when the position adjustment member 16 is moved in the front-rear direction, the second movable member 13 is also moved in the front-rear direction.

[0030] A head 18a of a second adjustment shaft 18 is disposed in the second cylindrical portion 16b. The diameter of the second cylindrical portion 16b can be increased and reduced because of cut-off portions at two points in the circumferential direction. Moreover, the convex portions and the concave portions, both extending in the left-right direction, are formed alternately in the circumferential direction in the inner circumferential surface of the second cylindrical portion 16b and an outer circumferential surface of the head 18a. Accordingly, the head 18a can be rotated in the second cylindrical portion 16b if a rotating force of a predetermined magnitude or greater is applied. In other words, the head 18a cannot be rotated and is maintained at a certain rotational position unless a rotating force of a predetermined magnitude or greater is applied.

[0031] A left end surface of the head 18a is opposed to the distal end surface of the projected portion 11a of the base plate 11 and a second eccentric shaft (not shown) is formed in the left end surface of the head 18a. The second eccentric shaft is disposed such that an axis of the second eccentric shaft is spaced from and parallel to an axis of the head 18a. That is, the second eccentric shaft is eccentrically disposed with respect to the head 18a. The second eccentric shaft is disposed in the restriction groove 11c such that the second eccentric shaft is movable in a longitudinal direction of the restriction groove 11c (up-down direction) and immovable in a short direction of the restriction groove 11c (front-rear direction). Accordingly, when the second adjustment shaft 18 is rotated, the second eccentric shaft is moved in the restriction groove 11c in the up-down direction and the head 18a is moved in the front-rear direction. As a result, the position adjustment member 16 is moved in the front-rear direction, and thereby, the second movable member 13 is moved in the front-rear direction with respect to the first movable member 12. Thereby, a position of the second movable member 13 with respect to the base plate 11 is adjusted in the front-rear direction. It is to be understood that an amount of position adjustment of the second movable member 13 in the front-rear direction corresponds to an amount of rotation of the second adjustment shaft 18.

[0032] The first cylindrical portion 16a of the position adjustment member 16 is fitted in a through hole 13b formed in the second movable member 13 such that the first cylindrical portion 16a is immovable in a radial direction of the through hole 13b. Accordingly, when the second movable member 13 is moved in the front-rear direction, the position adjustment member 16 and the first adjustment shaft 17 are also moved in the front-rear direction. Specifically, the position adjustment member 16 is moved inside the guide hole 12a in the front-rear direction only and the first eccentric shaft of the first adjustment shaft 17 is moved inside the restriction hole 11b in the front-rear direction only. Therefore, even if the position adjustment member 16 and the first adjustment shaft 17 are moved in the front-rear direction accompanying the movement of the second movable member 13 in the front-rear direction, the first movable member 12 is not moved in the front-rear direction.

[0033] An elongated hole 13c extending in the front-rear direction is formed in a rear end portion of the second movable member 13. The shaft 15 is rotatably disposed through the elongated hole 13c such that the shaft 15 is movable in a longitudinal direction of the elongated hole 13c but immovable in a short direction of the elongated hole 13c (left-right direction). Accordingly, a distal end portion of the second movable member 13 is rotatable about the shaft 15 in a horizontal direction (left-right di-

rection). A length of the elongated hole 13c in the front-rear direction is determined so as not to interfere with the adjustment of the position of the second movable member 13 with respect to the first movable member 12 in the front-rear direction.

[0034] An adjustment screw 19 having an axis thereof oriented in the left-right direction is threaded in the front end portion (left end portion) of the first movable member 12. A head 19a of the adjustment screw 19 is rotatably engaged with the front end portion of the second movable member 13. Moreover, the head 19a is movable with respect to the second movable member 13 in the front-rear direction but immovable in the left-right direction. Therefore, when the adjustment screw 19 is rotated in normal and reverse directions, the second movable member 13 is rotated about the shaft 15 in the horizontal direction and the position of the front end portion of the second movable member 13 with respect to the first movable member 12 is adjusted in the left-right direction, and thereby adjusted with respect to the base plate 11 in the left-right direction.

[0035] Thus, the position of the front end portion of the second movable member 13 is adjustable with respect to the base plate 11, and thereby with respect to the frame, in the front-rear, left-right and up-down directions. The second movable member 13 may be directly disposed in the frame so as to be fixed in position. In this case, the second movable member 13 serves as a pedestal.

[0036] The body 3 is removably attached to the second movable member 13 of the pedestal 1 via the connecting member 4. Specifically, as shown in FIGS. 2 and 3, a first engagement recess 41 and a second engagement recess 42 are respectively disposed in end surfaces of the second movable member 13 in the front-rear direction. The first engagement recess 41 and the second engagement recess 42 are located generally at a same position in the left-right direction and the up-down direction. The first engagement recess 41 and the second engagement recess 42 may be located in different positions in the left-right direction and/or the up-down direction. When the first engagement recess 41 and the second engagement recess 42 are located in different positions in the left-right direction, the first engagement recess 41 may be located to the right of the second engagement recess 42 or reversely, to the left of the second engagement recess 42.

[0037] The first engagement recess 41 has opposite side surfaces in the left-right direction and a bottom surface at a rear end portion. The first engagement recess 41 is open to the front. On the other hand, the second engagement recess 42 has opposite side surfaces in the left-right direction and a bottom surface at a front end portion. The second engagement recess 42 is open to the rear.

[0038] A first inclined surface 43 is formed in the front end surface of the second movable member 13. The first inclined surface 43 is inclined such that a front end portion (left end portion in FIG. 1) thereof is located to the left of (in FIG. 1, below) a rear end portion thereof. The first inclined surface 43 is located to the right of the first engagement recess 41. The front end portion of the first inclined surface 43 smoothly continues to an end portion of the right side surface of the first engagement recess 41 (upper side surface in FIG. 1) on an open portion side via an arcuate surface having a small radius of curvature. The front end portion of the first inclined surface 43 may be directly intersected with the right side surface of the first engagement recess 41.

[0039] A second inclined surface 44 is formed in the rear end surface of the second movable member 13. The second inclined surface 44 is inclined such that a rear end portion (right end portion in FIG. 1) thereof is located to the left of (in FIG. 1, below) a distal end portion thereof. The first inclined surface 43 and the second inclined surface 44 are inclined in opposite directions. The second inclined surface 44 is located to the right of the second engagement recess 42. The rear end portion of the second inclined surface 44 smoothly continues to an end portion of the right side surface of the second engagement recess 42 on an open portion side via an arcuate surface having a small radius of curvature. The rear end portion of the second inclined surface 44 may be directly intersected with the right side surface of the second engagement recess 42.

[0040] A stop surface 45 is formed in the rear end surface of the second movable member 13. The stop surface 45 extends rightward from a front end of the second inclined surface 44 to a distal end surface of the second movable member 13 facing rightward. The stop surface 45 is inclined with respect to a reference line (which extends generally horizontally in the front-rear direction in this embodiment) to be described later such that a right end portion of the stop surface 45 is located slightly in front of a left end portion thereof. Alternatively, the stop surface 45 may be inclined in the opposite direction or the stop surface 45 may extend at a right angle with respect to the reference line.

[0041] A first engagement shaft (first engagement portion) 46 having a longitudinal direction thereof oriented in the up-down direction is disposed in the front end portion of the body 3 so as to be fixed in position. The first engagement shaft 46 can be inserted rearward in the first engagement recess 41 from the open portion of the first engagement recess 41 until the first engagement shaft 46 is abutted against the bottom surface of the first engagement recess 41. In an engaged state in which the first engagement shaft 46 is inserted in the first engagement recess 41 until the first engagement shaft 46 is abutted against the bottom surface of the first engagement recess 41, movement of the first engagement shaft 46 in the left-right direction is blocked by the left and right side surfaces of the first engagement recess 41 and movement of the first engagement shaft 46 rearward is blocked by the bottom surface of the first engagement recess 41. Accordingly, when the first engagement shaft 46 is en-

gaged with the first engagement recess 41, the front end portion of the body 3 is stopped with respect to the second movable member 13 so as to be immovable in the left-right direction and rearward.

[0042] A support shaft 47 having a longitudinal direction thereof oriented in the up-down direction is disposed in a rear end portion of the body 3 so as to be fixed in position. An operation member 48 is rotatably supported by the support shaft 47. The operation member 48 can be rotated between an initial position shown in FIGS. 6 to 8 and a limit position at which the operation member 48 is rotated from a position shown in FIG. 9 through a predetermined angle in a counter-clockwise direction. The operation member 48 is biased by a coiled spring (biasing member) 49 disposed around the support shaft 47 in a direction from the limit position to the initial position (clockwise direction in FIG. 1). Before the body 3 is attached to the second movable member 13, the operation member 48 is located at the initial position by the coiled spring 49.

[0043] A second engagement shaft (second engagement portion) 50 having a longitudinal direction thereof oriented in the up-down direction is disposed in the operation member 48 so as to be fixed in position. The second engagement shaft 50 is located to the left of the support shaft 47. Moreover, the second engagement shaft 50 is located at a portion of the operation member 48 at which a direction of tangent of a rotation circle depicted by a rotation of the operation member 48 between the initial position and the limit position generally coincides to the front-rear direction when the operation member 48 is at the initial position. Accordingly, when the operation member 48 is rotated between the initial position and the limit position, the second engagement shaft 50 is moved generally in the front-rear direction. It is to be understood that when the operation member 48 is rotated from the initial position toward the limit position, the second engagement shaft 50 is moved rearward and when the operation member 48 is rotated from the limit position toward the initial position, the second engagement shaft 50 is moved forward.

[0044] In this embodiment, in order to have the second engagement shaft 50 moved in the front-rear direction when the operation member 48 is rotated, the second engagement shaft 50 is located to the left and slightly to the rear of the support shaft 47 when the operation member 48 is at the initial position. However, the second engagement shaft 50 is not required to be located in such a position. The second engagement shaft 50 may be located at the same position as or slightly in front of the support shaft 47 in the front-rear direction as long as the second engagement shaft 50 is located to the left of the support shaft 47.

[0045] The second engagement shaft 50 may be directly disposed at the body 3 so as to be movable in the front-rear direction. In this case, a biasing member such as a spring that biases the second engagement shaft 50 forward in a straight fashion may be used in place of the coiled spring 49.

[0046] The second engagement shaft 50 can be inserted forward in the second engagement recess 42 from the open portion of the second engagement recess 42 until the second engagement shaft 50 is abutted against the bottom surface of the second engagement recess 42. In an engaged state in which the second engagement shaft 50 is inserted in the second engagement recess 42 until the second engagement shaft 50 is abutted against the bottom surface of the second engagement recess 42, movement of the second engagement shaft 50 in the left-right direction is blocked by the left and right side surfaces of the second engagement recess 42 and movement of the second engagement shaft 50 forward is blocked by the bottom surface of the second engagement recess 42. Accordingly, when the second engagement shaft 50 is engaged with the second engagement recess 42, the rear end portion of the body 3 is stopped with respect to the second movable member 13 so as to be immovable in the left-right direction and forward. In the engaged state in which the second engagement shaft 50 is abutted against the bottom surface of the second engagement recess 42, the operation member 48 is located at an engaged position, slightly before the initial position in a direction from the limit position to the initial position. Therefore, the second engagement shaft 50 is maintained at the engaged position by the biasing force of the coiled spring 49.

[0047] As shown in FIG. 1, in the state in which the second engagement shaft 50 is engaged with the second engagement recess 42, the support shaft 47 is abutted against the stop surface 45 via the coiled spring 49, and the body 3 is immovable forward. Accordingly, in the state in which the second engagement shaft 50 is engaged with the second engagement recess 42, even if the body 3 is pressed forward, the second engagement shaft 50 is not moved rearward by the bottom surface of the second engagement recess 42 and the operation member 48 is not rotated toward the limit position against a rotationally biasing force of the coiled spring 49. Moreover, since the body 3 is not moved forward, the first engagement shaft 46 is not moved forward out of the first engagement recess 41. Accordingly, the first engagement shaft 46 and the second engagement shaft 50 are maintained at states in which they are respectively engaged with the first engagement recess 41 and the second engagement recess 42. Therefore, the body 3 is not moved out of the second movable member 13 unless the operation member 48 is rotated from the engaged position toward the limit position. As is clear from the above, the support shaft 47 also serves as an abutment portion and the stop surface 45 and the support shaft 47 constitute a blocking mechanism.

[0048] The first inclined surface 43, the second inclined surface 44, the first engagement shaft 46 and the second engagement shaft 50 are arranged to satisfy the following condition. The condition is that when the operation member 48 is at the initial position, the first engagement shaft

46 and the second engagement shaft 50 can be respectively abutted against the first inclined surface 43 and the second inclined surface 44 at the same time as shown in FIG. 6.

[0049] The first inclined surface 43 and the second inclined surface 44 are formed to satisfy the following angular relation. That is, in a state in which the first engagement shaft 46 and the second engagement shaft 50 are respectively in contact with the first inclined surface 43 and the second inclined surface 44, when a straight line connecting a contact point between the first engagement shaft 46 and the first inclined surface 43 and a contact point between the second engagement shaft 50 and the second inclined surface 44 is referred to as the reference line, an inclination angle of the first inclined surface 43 with respect to the reference line is greater than an inclination angle of the second inclined surface 44 with respect to the reference line. For example, the inclination angle of the first inclined surface 43 may be generally between 30 to 45 degrees and the inclination angle of the second inclined surface 44 may be generally between 15 to 25 degrees.

[0050] When the body 3 is moved closer to the pedestal 1 in a horizontal plane to attach the body 3 to the pedestal 1 with the first engagement shaft 46 and the second engagement shaft 50 respectively in contact with the first inclined surface 43 and the second inclined surface 44, a direction in which the body 3 is moved closer to the pedestal 1 is orthogonal to the reference line. Therefore, the angular relations of the first inclined surface 43 and the second inclined surface 44 with respect to the reference line can be rephrased such that an inclination angle of the first inclined surface 43 with respect to the direction in which the body 3 is moved closer to the pedestal 1 is smaller than an inclination angle of the second inclined surface 44 with respect to the same direction. The direction in which the body 3 is moved closer to the pedestal 1 may not be orthogonal to the reference line since the body 3 is moved manually. Instead, the direction in which the body 3 is moved closer to the pedestal 1 may be inclined with respect to the direction orthogonal to the reference line by several to ten and several degrees. Therefore, the angular relations of the first inclined surface 43 and the second inclined surface 44 should be defined more practically such that an inclination angle of the first inclined surface 43 with respect to a direction generally the same as the direction in which the body 3 is moved closer to the pedestal 1 is smaller than an inclination angle of the second inclined surface 44 with respect to the same direction. Alternatively, the angular relations of the first inclined surface 43 and the second inclined surface 44 should be defined such that an inclination angle of the first inclined surface 43 with respect to a direction generally orthogonal to the direction in which the body 3 is moved closer to the pedestal 1 is greater than an inclination angle of the second inclined surface 44 with respect to the same direction. Considering the foregoing, it is preferable that the inclination angle of the first inclined surface 43 should be greater than the inclination angle of the second inclined surface 44 by ten and several degrees.

[0051] Putting it more specifically, when the first inclined surface 43 and the second inclined surface 44 are disposed at a same location in the left-right direction (the direction in which the body 3 is moved closer to and away from the pedestal 1), the reference line extends in the front-rear direction on the horizontal plane. In other words, the reference line extends parallel to the left and right inner side surfaces of the frame on the horizontal plane. Therefore, the inclination angle of the first inclined surface 43 and the inclination angle of the second inclined surface 44 are the inclination angles with respect to a horizontal line extending in the front-rear direction and are the inclination angles with respect to the left and right inner side surfaces of the frame. Moreover, the body 3 is moved closer to the pedestal 1 in the left-right direction in the horizontal plane. On the other hand, when the first inclined surface 43 and the second inclined surface 44 are disposed at different locations in the left-right direction, the reference line is on the horizontal plane but is inclined with respect to the front-rear direction. Therefore, the inclination angle of the first inclined surface 43 and the inclination angle of the second inclined surface 44 are the inclination angles with respect to the horizontal line (reference line) inclined with respect to the front-rear direction. Moreover, the direction in which the body 3 is moved closer to the pedestal 1 also is inclined with respect to the front-rear direction.

[0052] Explanation as to how to attach the body 3 to the second movable member 13 of the pedestal 1 in the hinge device A having the features mentioned above will be given below. To attach the body 3 to the second movable member 13, the body 3 is moved closer to the second movable member 13 (moved leftward) with an open portion of the body 3 oriented leftward. At this time, the operation member 48 is at the initial position. When the body 3 is moved to a predetermined position, the first engagement shaft 46 is abutted against the first inclined surface 43 and the second engagement shaft 50 is abutted against the second inclined surface 44 as shown in FIG. 6.

[0053] When the body 3 is moved further leftward, the first engagement shaft 46 would be moved forward on the first inclined surface 43 and the second engagement shaft 50 would be moved rearward on the second inclined surface 44. Since the inclination angle of the first inclined surface 43 is greater than the inclination angle of the second inclined surface 44, the first engagement shaft 46 is moved forward on the first inclined surface 43 as shown in FIG. 7. As a result, the body 3 is moved forward, and the second engagement shaft 50 is moved forward on the second inclined surface 44. When the second engagement shaft 50 is moved forward on the second inclined surface 44, the second inclined surface 44 pushes the second engagement shaft 50 rearward. However, since a force of the coiled spring 49 causing the second

engagement shaft 50 to be moved forward is greater than a force of the second inclined surface 44 pushing the second engagement shaft 50 rearward, the operation member 48 is maintained at the initial position, and thereby, the second engagement shaft 50 is fixed in position with respect to the body 3 in the front-rear direction.

[0054] When the body 3 is moved further leftward, the first engagement shaft 46 is moved leftward beyond the first inclined surface 43 and the arcuate surface continuing from the first inclined surface 43 and opposed to the open portion of the first engagement recess 41. When the body 3 is moved further leftward in this condition, the second engagement shaft 50 is moved rearward on the second inclined surface 44 as shown in FIG. 8. As a result, the body 3 is moved rearward, the first engagement shaft 46 is inserted in the first engagement recess 41 from the open portion of the first engagement recess 41 until the first engagement shaft 46 is abutted against the bottom surface of the first engagement recess 41. Thus, the first engagement shaft 46 is engaged with the first engagement recess 41.

[0055] In a condition where the first engagement shaft 46 is engaged with the first engagement recess 41, the first engagement shaft 46 is prohibited from moving leftward by the left side surface of the first engagement recess 41. As a result, the front end portion of the body 3 is prohibited from moving leftward. Therefore, after the first engagement shaft 46 is engaged with the first engagement recess 41, only the rear end portion of the body 3 is moved leftward.

[0056] When the rear end portion of the body 3 is moved leftward, the second engagement shaft 50 is pressed rearward by the second inclined surface 44 since the second inclined surface 44 is inclined rearward from right to left. The second engagement shaft 50 is moved rearward on the second inclined surface 44. Accompanying the rearward movement of the second engagement shaft 50, the operation member 48 is rotated in the direction from the initial position toward the limit position (counter-clockwise direction in FIG. 8) against the rotationally biasing force of the coiled spring 49.

[0057] When the rear end portion of the body 3 is moved further leftward, the second engagement shaft 50 is moved rearward beyond the second inclined surface 44 as shown in FIG. 9, and moved further beyond the arcuate surface continuing from the second inclined surface 44. When the second engagement shaft 50 is opposed to the open portion of the second engagement recess 42, the operation member 48 is rotated in the direction from the limit position toward the initial position (clockwise direction in FIG. 9) by the coiled spring 49. The second engagement shaft 50 is moved forward and inserted in the second engagement recess 42. The second engagement shaft 50 is inserted in the second engagement recess 42 until the second engagement shaft 50 is abutted against the bottom surface of the second engagement recess 42, and the second engagement shaft 50 is engaged with the second engagement recess 42. In a state in which the second engagement shaft 50 is engaged with the second engagement recess 42, movements of the second engagement shaft 50 in the left-right direction and forward are respectively blocked by the opposite side surfaces of the second engagement recess 42 and the bottom surface of the second engagement recess 42. As a result, the rear end portion of the body 3 is engaged with the rear end portion of the second movable member 13 so as to be immovable in the left-right direction and immovable forward.

[0058] Since the rearward movement of the second engagement shaft 50 is prohibited by the biasing force of the coiled spring 49, when the body 3 is pressed forward with a force greater than the biasing force of the coiled spring 49, the body 3 would be moved forward and the first engagement shaft 46 would be moved forward out of the first engagement recess 41. However, in this embodiment, since the support shaft 47 is abutted against the stop surface 45 via the coiled spring 49 as mentioned above, the body 3 is not moved in the front-rear direction in a condition where the first engagement shaft 46 and the second engagement shaft 50 are respectively engaged with the first engagement recess 41 and the second engagement recess 42. Therefore, the first engagement shaft 46 and the second engagement shaft 50 will not be respectively moved out of the first engagement recess 41 and the second engagement recess 42 by accident and the body 3 will not be separated from the second movable member 13.

[0059] To remove the body 3 from the second movable member 13, the operation member 48 is rotated in the counter-clockwise direction against the biasing force of the coiled spring 49 to move the second engagement shaft 50 rearward out of the second engagement recess 42. After that, the rear end portion of the body 3 is moved rightward to move the second engagement shaft 50 to the right of the second engagement recess 42, preferably to the right of the second inclined recess 44. Next, the body 3 is moved forward to move the first engagement shaft 46 forward out of the first engagement recess 41. After that, the body 3 is moved rightward to make the body 3 spaced from the second movable member 13 to the right. Thereby, the body 3 can be removed from the second movable member 13.

[0060] In the hinge device A having the features mentioned above, when the body 3 is moved closer to the second movable member 13 (moved leftward) with the first engagement shaft 46 and the second engagement shaft 50 respectively in contact with the first inclined surface 43 and the second inclined surface 44, the first engagement shaft 46 is automatically engaged with the first engagement recess 41. After that, the second engagement shaft 50 is engaged with the second engagement recess 42. Therefore, it is not required to move the door in the front-rear direction to make the first engagement shaft 46 engaged with the first engagement recess 41. Thus, the body 3 can be easily attached to the second movable member 13 (pedestal 1).

[0061] A second embodiment which does not form part of the present invention will be described hereinafter referring to FIGS. 10 to 15. In the description of the second embodiment, only features different from those of the first embodiment are described. Components that are similar to those of the first embodiment will be referred to by the same reference numerals and explanations thereof will be omitted.

[0062] In a hinge device B according to the second embodiment, the connecting member 4 for removably attaching the body 3 to the second movable member 13 is different from that of the hinge device A of the first embodiment.

[0063] A first engagement shaft (first engagement portion) 51 and a second engagement shaft (second engagement portion) 52 with longitudinal directions thereof oriented in the up-down direction are respectively disposed in the opposite end portions of the second movable member 13 in the front and in the rear in place of the first engagement recess 41 and the second engagement recess 42 of the first embodiment. Opposite end portions of the first engagement shaft 51 and the second engagement shaft 52 in the up-down direction are respectively projected upwards and downwards from opposite side surfaces of the second movable member 13 respectively facing upwards and downwards.

[0064] First engagement recesses 53 are formed in the body 3. Specifically, insertion recesses 54 are respectively formed in front end portions of surfaces of side wall portions 3a, 3a facing leftward. The side wall portions 3a, 3a of the body 3 respectively face upward and downward. Of two side surfaces in the front and in the rear defining the insertion recess 54, the front side surface has the first engagement recess 53 formed in an end portion thereof on the bottom portion side. The first engagement recess 53 extends forward from the front side surface. A front end portion of the first engagement recess 53 is closed by a bottom surface. A rear end portion of first engagement recess 53 is open to the insertion recess 54.

[0065] Opposite end portions of the first engagement shat 51 are respectively engageable with the first engagement recesses 53. Specifically, when the body 3 is moved leftward, the end portion of the first engagement shat 51 is inserted in the insertion recess 54. When the body 3 is moved rearward after the first engagement shat 51 is inserted in the insertion recess 54 until the first engagement shat 51 generally contacts the bottom surface of the insertion recess 54, the first engagement shat 51 is inserted in the first engagement recesses 53 via the insertion recess 54. In an engaged state in which the first engagement shat 51 is inserted in the first engagement recesses 53 until the first engagement shat 51 is abutted against the bottom surface of the first engagement recesses 53, the first engagement shat 51 is prohibited from moving in the left-right direction by left and right side surfaces of the first engagement recesses 53 and the first engagement shat 51 is prohibited from moving forward by the bottom surface of the first engagement recesses 53. Accordingly, in the state where the first engagement shat 51 is engaged with the first engagement recesses 53, the body 3 is prohibited from being moved in the left-right direction and rearward with respect to the second movable member 13 (pedestal 1).

[0066] Of the two side surfaces in the front and in the rear defining the insertion recess 54, the front side surface in which the first engagement recess 53 is formed is a first inclined surface 55. The first inclined surface 55 extends from a surface of the side wall portion 3a facing leftward to the first engagement recess 53. The first inclined surface 55 is inclined such that a rear end portion thereof is located to the right of a front end portion thereof. The rear end portion of the first inclined surface 55 smoothly continues to the left side surface of the first engagement recess 53 via an arcuate surface having a small radius of curvature.

[0067] A support shaft (abutment portion) 56 having a longitudinal direction thereof oriented in the up-down direction is disposed in the rear end portion of the body 3 so as to be fixed in position. An engagement member 57 is supported by the support shaft 56 so as to be rotatable in the horizontal direction. The engagement member 57 can be rotated between an initial position shown in FIGS. 11 and 12 and a limit position located slightly to the front of a position shown in FIG. 14 in a counter-clockwise direction. The engagement member 57 is biased in a direction from the limit position to the initial position (clockwise direction in FIGS. 10 to 15) by a coiled spring (biasing member) 58. When the body 3 is separated from the second movable member 13, the engagement member 57 is located at the initial position by a rotationally biasing force of the coiled spring 58.

[0068] A second engagement recess 59 is formed in the engagement member 57. The second engagement recess 59 is disposed in an end portion of the engagement member 57 at the initial position, the end portion being located to the left of the support shaft 56. Specifically, the second engagement recess 59 is disposed in a portion of the engagement member 57 at which a direction of tangent of a rotation circle depicted by a rotation of the engagement member 57 about the support shaft 56 is generally oriented in the front-rear direction. Moreover, this portion is located to the left (pedestal 1 side) of the support shaft 56. Accordingly, when the engagement member 57 is rotated between the initial position and the limit position, the second engagement recess 59 is moved generally in the front-rear direction. The second engagement recess 59 is disposed such that the second engagement recess 59 extends in the front-rear direction when the engagement member 57 is at the initial position. An end portion of the second engagement recess 59 in the front is open to the front and an end portion of the second engagement recess 59 in the rear is closed by a bottom surface.

[0069] A second engagement shaft 52 can be engaged with the second engagement recess 59. Specifically, the

second engagement shaft 52 can be inserted into the second engagement recess 59 from an open portion of the second engagement recess 59. When the second engagement shaft 52 is inserted into the second engagement recess 59 up to an engaged position in which the second engagement shaft 52 is abutted against the bottom surface of the second engagement recess 59, the second engagement shaft 52 is engaged with the second engagement recess 59. In a state in which the second engagement shaft 52 is engaged with the second engagement recess 59, the second engagement shaft 52 is prohibited from being moved in the left-right direction by left and right side surfaces of the second engagement recess 59 and the second engagement shaft 52 is prohibited from being moved rearward by the bottom surface of the second engagement recess 59. As a result, the rear end portion of the body 3 is caught by the second movable member 13 of the pedestal 1 so as to be immovable in the left-right direction and rearward. The engaged position is a position slightly before the initial position in a direction from the limit position to the initial position as with the engaged position in the hinge device A. Therefore, the engagement member 57 is maintained at the engaged position by the rotationally biasing force of the coiled spring 58.

[0070] A second inclined surface 60 is formed in the engagement member 57. The second inclined surface 60 is disposed so as to be located to the left of the second engagement recess 59 when the engagement member 57 is at the initial position. The second inclined surface 60 is inclined such that a front end portion thereof is located to the right of a rear end portion thereof when the engagement member 57 is at the initial position. That is, the second inclined surface 60 is inclined in the opposite direction from the first inclined surface 55. It is to be understood that an inclination angle of the second inclined surface 60 with respect to the reference line is smaller than an inclination angle of the first inclined surface 55 with respect to the reference line.

[0071] A third inclined surface 61 is formed in the engagement member 57. The third inclined surface 61 is disposed such that a rear end portion of the third inclined surface 61 continues smoothly from the front end portion of the second inclined surface 60. The third inclined surface 61 is inclined such that a front end portion thereof is located to the right of a rear end portion thereof. An inclination angle of the third inclined surface 61 is greater than the inclination angle of the first inclined surface 55. The front end portion (right end portion) of the third inclined surface 61 smoothly continues to an end portion of the left side surface of the second engagement recess 59 on the open portion side via an arcuate surface having a small radius of curvature. As a result, the front end portion of the second inclined surface 60 smoothly continues to the end portion of the left side surface of the second engagement recess 59 on the open portion side via the third inclined surface 61 and the arcuate surface.

[0072] In the hinge device B having the features mentioned above, the body 3 can be attached to the second movable member 13 of the pedestal 1 in the following manner. Firstly, as shown in FIG. 11, the first engagement shaft 51 and the second engagement shaft 52 are respectively pressed against the first inclined surface 55 and the second inclined surface 60. With the first engagement shaft 51 and the second engagement shaft 52 maintained in this state, the body 3 is moved leftward (moved closer to the pedestal 1). Since the inclination angle of the first inclined surface 55 is greater than the inclination angle of the second inclined surface 60, the first engagement shaft 51 is moved relatively rearward on the first inclined surface 55. Accompanying the rearward movement of the first engagement shaft 51, the body 3 is moved forward and the second engagement shaft 52 is moved forward on the second inclined surface 60.

[0073] When the first engagement shaft 51 is moved beyond the first inclined surface 55, the first engagement shaft 51 is opposed to the open portion of the first engagement recess 53. When the body 3 is moved further leftward with the first engagement shaft 51 in this state, the first engagement shaft 51 is abutted against the bottom surface of the insertion recess 54. As a result, the front end portion of the body 3 is prohibited from moving leftward. Therefore, thereafter, only the rear end portion of the body 3 can be moved leftward. When the rear end portion of the body 3 is moved leftward, the second engagement shaft 52 is moved relatively forward by the second inclined surface 60, and the body 3 is moved rearward. Thereby, the first engagement shaft 51 is inserted in the first engagement recess 53 until the first engagement shaft 51 is abutted against the bottom surface of the first engagement recess 53 (see to FIG. 12).

[0074] When the body 3 is moved further leftward after the first engagement shaft 51 is inserted in the first engagement recess 53 until the first engagement shaft 51 is abutted against the bottom surface of the first engagement recess 53, the second inclined surface 60 is moved rearward by the second engagement shaft 52. As a result, the engagement member 57 is rotated from the initial position toward the limit position. When the rear end portion of the body 3 is moved further leftward and the engagement member 57 is rotated from the initial position toward the limit position through a predetermined angle, the second engagement shaft 52 is moved beyond the second inclined surface 60 to be contacted with the third inclined surface 61 as shown in FIG. 13.

[0075] When the rear end portion of the body 3 is moved further leftward with the second engagement shaft 52 contacted with the third inclined surface 61, the second engagement shaft 52 is moved beyond the third inclined surface 61 to be contacted with the arcuate surface as shown in FIG. 14. When the second engagement shaft 52 is moved beyond a portion of the arcuate surface at the front-most side, the engagement member 57 is rotated from the limit position side toward the initial position by the coiled spring 58, and the second engagement shaft 52 is inserted in the second engagement re-

cess 59 (see FIG. 15). The second engagement shaft 52 is inserted in the second engagement recess 59 until the second engagement shaft 52 is abutted against the bottom surface of the second engagement recess 59 (see FIG. 10). When the second engagement shaft 52 is abutted against the bottom surface of the second engagement recess 59, the second engagement shaft 52 is engaged with the second engagement recess 59 and the engagement member 57 is stopped at the engaged position. When the second engagement shaft 52 is engaged with the second engagement recess 59, the rear end portion of the body 3 is immovable in the left-right direction and immovable forward.

[0076] In this manner, the front end portion and the rear end portion of the body 3 are respectively disengageably engaged with the front end portion and the rear end portion of the second movable member 13 of the pedestal 1, thereby the body 3 being removably attached to the second movable member 13. The body 3 can be removed from the second movable member 13 by rotating the engagement member 57 from the engaged position toward the limit position through a predetermined angle.

[0077] In the second embodiment described above, the second engagement shaft 52 is disposed in a rear end portion of the pedestal 1 so as to be fixed in position and the engagement member 57 is roatably disposed in the rear end portion of the body 3. Alternatively, the engagement member 57 may be roatably disposed in the rear end portion of the pedestal 1 and the second engagement shaft 52 may be disposed in the rear end portion of the body 3 so as to be fixed in position. Even in such a modified embodiment, the second engagement recess 59 and the second inclined surface 60 are disposed in the engagement member 57. Moreover, the second engagement recess 59 is open in the same direction as the first engagement recess 53.

[0078] When the engagement member 57 is disposed in the rear end portion of the pedestal 1 and the second engagement shaft 52 is disposed in the rear end portion of the body 3, the first engagement recess 53 may be disposed in a front end portion of the pedestal 1 in the similar manner to the first engagement recess 41 and the first engagement shaft 51 may be disposed in the front end portion of the body 3 so as to be fixed in position.

[0079] Moreover, in the second embodiment described above, the first engagement recess 53 is open to the rear and the second engagement recess 59 is open to the front. Alternatively, the first engagement recess 53 may be open to the front and the second engagement recess 59 may be open to the rear. In this case, inclination directions of the first inclined surface 55 and the second inclined surface 60 may be respectively opposite to the inclination directions thereof in the second embodiment.

[0080] Such modifications may be combined.

Industrial Applicability

[0081] The hinge device according to the present invention may be used as a hinge device that connects a door to a frame in a rotatable fashion, particularly as a hinge device for connecting a heavy door.

Explanation of Numerals

[0082]

A	hinge device
B	hinge device
1	pedestal
2	mounting member
3	body
4	connecting member
41	first engagement recess
42	second engagement recess
43	first inclined surface
44	second inclined surface
45	stop surface
46	first engagement shaft (first engagement portion)
47	support shaft (abutment portion)
48	operation member
49	coiled spring (biasing member)
50	second engagement shaft (second engagement portion)
51	first engagement shaft (first engagement portion)
52	second engagement shaft (second engagement portion)
53	first engagement recess
55	first inclined surface
57	engagement member
58	coiled spring (rotationally biasing member)
59	second engagement recess
60	second inclined surface

Claims

1. A hinge device comprising:

a pedestal (1) to be attached to a frame;
a mounting member (2) to be attached to a door; and
a body (3) removably attached to the pedestal (1) via a connecting member (4), the mounting member (2) rotatably connected to a front end portion of the body (3), wherein
the connecting member (4) comprises:

a first engagement recess (41) that is disposed in a front end portion of the pedestal (1) and that is open to a front;
a first engagement portion (46) that is disposed in a front end portion of the body (3) so as to be fixed in position and that can be

engaged with the first engagement recess (41) so as to be engageable and disengageable through an open portion of the first engagement recess (41) in a front-rear direction;
a support shaft (47) that is disposed in a rear end portion of the body (3) so as to be fixed in position;
an engagement member (48) that is rotatably supported by the support shaft (47) so as to be disposed in the rear end portion of the body (3), at least an end portion of the engagement member (48) on the pedestal (1) side being movable in the front-rear direction; the connecting member also comprising :

a second engagement recess (42) that is disposed in a rear end portion of the pedestal (1) and that is open to a rear;
a second engagement portion (50) that is disposed in the engagement member (48)so as to be movable in the front-rear direction and that can be engaged with the second engagement recess (42) so as to be engageable and disengageable through an open portion of the second engagement recess (42) in the front-rear direction; and
a biasing member (49) that biases the engagement member (48) in a direction in which the second engagement portion (50) is engageable with the second engagement recess (42),
the hinge device further comprising a first inclined surface (43) and a second inclined surface (44), which are respectively formed in the front end portion and the rear end portion of the pedestal (1), so that when the body (3) is moved closer to the pedestal (1) to attach the body (3) to the pedestal (1), the first engagement portion (46) and the second engagement portion (50) respectively abutted against the first inclined surface (43) and the second inclined surface (44) at the same time; wherein

the first inclined surface (43) is inclined such that a front end portion thereof is located in front of a rear end portion thereof in a direction in which the body (3) is moved closer to the pedestal (1) and the first inclined surface (43) is disposed such that the front end portion thereof continues from the open portion of the first engagement recess (41);
the second inclined surface (44) is inclined such that a rear end portion thereof is located in front of a front end portion thereof in the direction in which the body (3) is moved closer to the pedestal (1) and the second inclined surface (44) is disposed such that the rear end portion thereof continues from the open portion of the second engagement recess (42);
an inclination angle of the first inclined surface (43) with respect to a reference line that connects a contact point between the first engagement shaft (46) and the first inclined surface (43) and a contact point between the second engagement shaft (50) and the second inclined surface (44) is greater than an inclination angle of the second inclined surface (44) with respect to the reference line;
the hinge device further comprises a blocking mechanism that prohibits the first engagement portion (46) from being moved out of the first engagement recess (41) when the first engagement portion (46) is engaged with the first engagement recess (41); and
the blocking mechanism comprises a stopping surface (45) disposed in the pedestal (1) and an abutment portion that is disposed in the body (3) and that prohibits the first engagement portion (46) engaged with the first engagement recess (41) from being moved toward the open portion of the first engagement recess (41) by being abutted against the stopping surface (45), the hinge being **characterised in that** the stopping surface (45) extends rightward from a front end of the second inclined surface (44) to a distal end surface of the pedestal (1) facing rightward; and

the support shaft (47) serves as the abutment portion.

Patentansprüche

1. Scharniervorrichtung, Folgendes umfassend:

einen Fuß (1) zur Befestigung an einem Rahmen;
ein Montageelement (2) zur Befestigung an einer Tür; und
einen Körper (3), der über ein Verbindungselement (4) lösbar an dem Fuß (1) befestigt ist, wobei das Montageelement (2) drehbar mit einem vorderen Endabschnitt des Körpers (3) verbunden ist, wobei das Verbindungselement (4) Folgendes umfasst:

eine erste Eingriffsaussparung (41), die in einem vorderen Endabschnitt des Fußes (1) angeordnet und nach vorne offen ist;
einen ersten Eingriffsabschnitt (46), der in einem vorderen Endabschnitt des Körpers (3) angeordnet ist, um dort befestigt zu werden und der mit der ersten Eingriffsaussparung (41) in Eingriff gehen kann, um durch einen offenen Abschnitt der ersten Eingriffsaussparung (41) von vorne nach hinten eingreifbar und lösbar zu sein;
eine Stützwelle (47), die in einem hinteren Endabschnitt des Körpers (3) angeordnet ist, um dort befestigt zu werden;
ein Eingriffselement (48), das von der Stützwelle (47) drehbar gelagert wird, um in dem hinteren Endabschnitt des Körpers (3) angeordnet zu sein, wobei zumindest ein Endabschnitt des Eingriffselements (48) auf der Seite des Fußes (1) vor und zurück bewegt werden kann; wobei das Verbindungselement ferner Folgendes umfasst:

eine zweite Eingriffsaussparung (42), die in einem hinteren Endabschnitt des Fußes (1) angeordnet und nach hinten offen ist;
einen zweiten Eingriffsabschnitt (50), der in dem Eingriffselement (48) angeordnet ist, um von vorne nach hinten bewegt zu werden und der mit der zweiten Eingriffsaussparung (42) in Eingriff gehen kann, um durch einen offenen Abschnitt der zweiten Eingriffsaussparung (42) von vorne nach hinten eingreifbar und lösbar zu sein; und
ein Vorspannelement (49), das das Eingriffselement (48) in einer Richtung vorspannt, in der der zweite Eingriffsabschnitt (50) mit der zweiten Eingriffsaussparung (42) eingreifbar ist,

wobei das Scharnier ferner eine erste geneigte Fläche (43) und eine zweite geneigte Fläche (44) umfasst, die in dem vorderen bzw. hinteren Endabschnitt des Fußes (1) ausgebildet sind, sodass, wenn der Körper (3) näher an den Fuß (1) bewegt wird, um den Körper (3) an dem Fuß (1) zu befestigen, der erste Eingriffsabschnitt (46) und der zweite Eingriffsabschnitt (50) gleichzeitig jeweils an der ersten geneigten Fläche (43) bzw. der zweiten geneigten Fläche (44) anliegen;
wobei die erste geneigte Fläche (43) so geneigt ist, dass sich ein vorderer Endabschnitt dieser vor einem hinteren Endabschnitt dieser in einer Richtung befindet, in der der Körper (3) näher an den Fuß (1) bewegt wird, und
wobei die erste geneigte Fläche (43) so angeordnet ist, dass deren vorderer Endabschnitt von dem offenen Abschnitt der ersten Eingriffsaussparung (41) verläuft;

wobei die zweite geneigte Fläche (44) so geneigt ist, dass sich ein hinterer Endabschnitt dieser vor einem vorderen Endabschnitt dieser in der Richtung befindet, in der der Körper (3) näher an den Fuß (1) bewegt wird, und wobei die zweite geneigte Fläche (44) so angeordnet ist, dass deren hinterer Endabschnitt von dem offenen Abschnitt der zweiten Eingriffsaussparung (42) verläuft;
wobei ein Neigungswinkel der ersten geneigten Fläche (43) in Bezug zu einer Bezugslinie, die einen Berührungspunkt zwischen der ersten Eingriffswelle (46) und der ersten geneigten Fläche (43) und einen Berührungspunkt zwischen der zweiten Eingriffswelle (50) und der zweiten geneigten Fläche (44) verbindet, größer als ein Neigungswinkel der zweiten geneigten Fläche (44) in Bezug zu der Bezugslinie ist;
wobei die Scharniervorrichtung ferner einen Blockiermechanismus umfasst, der verhindert, dass der erste Eingriffsabschnitt (46) aus der ersten Eingriffsaussparung (41) heraus bewegt wird, wenn der erste Eingriffsabschnitt (46) mit der ersten Eingriffsaussparung (41) in Eingriff ist; und
wobei der Blockiermechanismus eine Anschlagfläche (45), die in dem Fuß (1) angeordnet ist, und einen Anlageabschnitt umfasst, der in dem Körper (3) angeordnet ist und verhindert, dass der mit der ersten Eingriffsaussparung (41) im Eingriff befindliche erste Eingriffsabschnitt (46) in Richtung des offenen Abschnitts der ersten Eingriffsaussparung (41) bewegt wird, indem dieser an der Anschlagfläche (45) anliegt, wobei das Scharnier **dadurch gekennzeichnet ist, dass** sich die Anschlagfläche (45) von einem vorderen Ende der zweiten geneigten Fläche (44) zu einer nach rechts ausgerichteten distalen Endfläche des Fußes (1) nach rechts erstreckt; und
die Stützwelle (47) als Anlageabschnitt dient.

Revendications

1. Dispositif de charnière, comprenant:

un piédestal (1) à attacher à un cadre;
un élément de montage (2) à attacher à une porte; et
un corps (3) attaché de façon détachable au pié-

destal (1) par l'intermédiaire d'un élément de connexion (4), l'élément de montage (2) étant connecté de façon rotative à une partie d'extrémité avant du corps (3), dans lequel
l'élément de connexion (4) comprend:

un premier évidement d'engagement (41) qui est disposé dans une partie d'extrémité avant du piédestal (1) et qui est ouvert à l'avant;
une première partie d'engagement (46) qui est disposée dans une partie d'extrémité avant du corps (3) de manière à être fixée en position et qui peut être engagée avec le premier évidement d'engagement (41) de manière à être engageable et désengageable à travers une partie ouverte du premier évidement d'engagement (41) dans une direction avant-arrière;
un arbre de support (47) qui est disposé dans une partie d'extrémité arrière du corps (3) de manière à être fixé en position;
un élément d'engagement (48) qui est supporté de façon rotative par l'arbre de support (47) de manière à être disposé dans la partie d'extrémité arrière du corps (3), au moins une partie d'extrémité de l'élément d'engagement (48) sur le côté de piédestal (1) étant déplaçable dans la direction avant-arrière;

l'élément de connexion comprenant également:

un second évidement d'engagement (42) qui est disposé dans une partie d'extrémité arrière du piédestal (1) et qui est ouvert à l'arrière;
une seconde partie d'engagement (50) qui est disposée dans une partie d'extrémité arrière du corps (3) de manière à être déplaçable dans la direction avant-arrière et qui peut être engagée avec le second évidement d'engagement (42) de manière à être engageable et désengageable à travers une partie ouverte du second évidement d'engagement (42) dans la direction avant-arrière; et
un élément de poussée (49) qui pousse la seconde partie d'engagement (50) dans une direction dans laquelle la seconde partie d'engagement (50) est engageable avec le second évidement d'engagement (42),

le dispositif de charnière présentant en outre une première surface inclinée (43) et une seconde surface inclinée (44) qui sont respectivement formées dans la partie d'extrémité avant et la partie d'extrémité arrière du piédestal (1), de telle sorte que lorsque le corps (3) est déplacé plus près du piédestal (1) pour attacher le corps (3) au piédestal (1), la première partie d'engagement (46) et la seconde partie d'engagement (50) butent respectivement contre la première surface inclinée (43) et la seconde surface inclinée (44) en même temps;
dans lequel la première surface inclinée (43) est inclinée de telle sorte qu'une partie d'extrémité avant de celle-ci soit située en face d'une partie d'extrémité arrière de celle-ci dans une direction dans laquelle le corps (3) est déplacé plus près du piédestal (1) et la première surface inclinée (43) est disposée de telle sorte que la partie d'extrémité avant de celle-ci continue à partir de la partie ouverte du premier évidement d'engagement (41);
la seconde surface inclinée (44) est inclinée de telle sorte qu'une partie d'extrémité arrière de celle-ci soit située en face d'une partie d'extrémité avant de celle-ci dans la direction dans laquelle le corps (3) est déplacé plus près du piédestal (1) et la seconde surface inclinée (44) est disposée de telle sorte que la partie d'extrémité arrière de celle-ci continue à partir de la partie ouverte du second évidement d'engagement (42);
un angle d'inclinaison de la première surface inclinée (43) par rapport à une ligne de référence qui connecte un point de contact entre le premier arbre d'engagement (46) et la première surface inclinée (43) et un point de contact entre le second arbre d'engagement (50) et la seconde surface inclinée (44) est supérieur à un angle d'inclinaison de la seconde surface inclinée (44) par rapport à la ligne de référence;
le dispositif de charnière comprend en outre un mécanisme de blocage qui empêche la première partie d'engagement (46) d'être déplacée hors du premier évidement d'engagement (41) lorsque la première partie d'engagement (46) est engagée avec le premier évidement d'engagement (41); et
le mécanisme de blocage présente une surface d'arrêt (45) disposée dans le piédestal (1) et une partie de butée qui est disposée dans le corps (3) et qui empêche la première partie d'engagement (46) engagée avec le premier évidement d'engagement (41) d'être déplacée en direction de la partie ouverte du premier évidement d'engagement (41) en butant contre la surface d'arrêt (45),
la charnière étant en outre **caractérisée en ce que**:

la surface d'arrêt (45) s'étend vers la droite à partir d'une extrémité avant de la seconde surface inclinée (44) jusqu'à une surface

d'extrémité distale du piédestal (1) orientée vers la droite; et
l'arbre de support (47) sert de partie de butée.

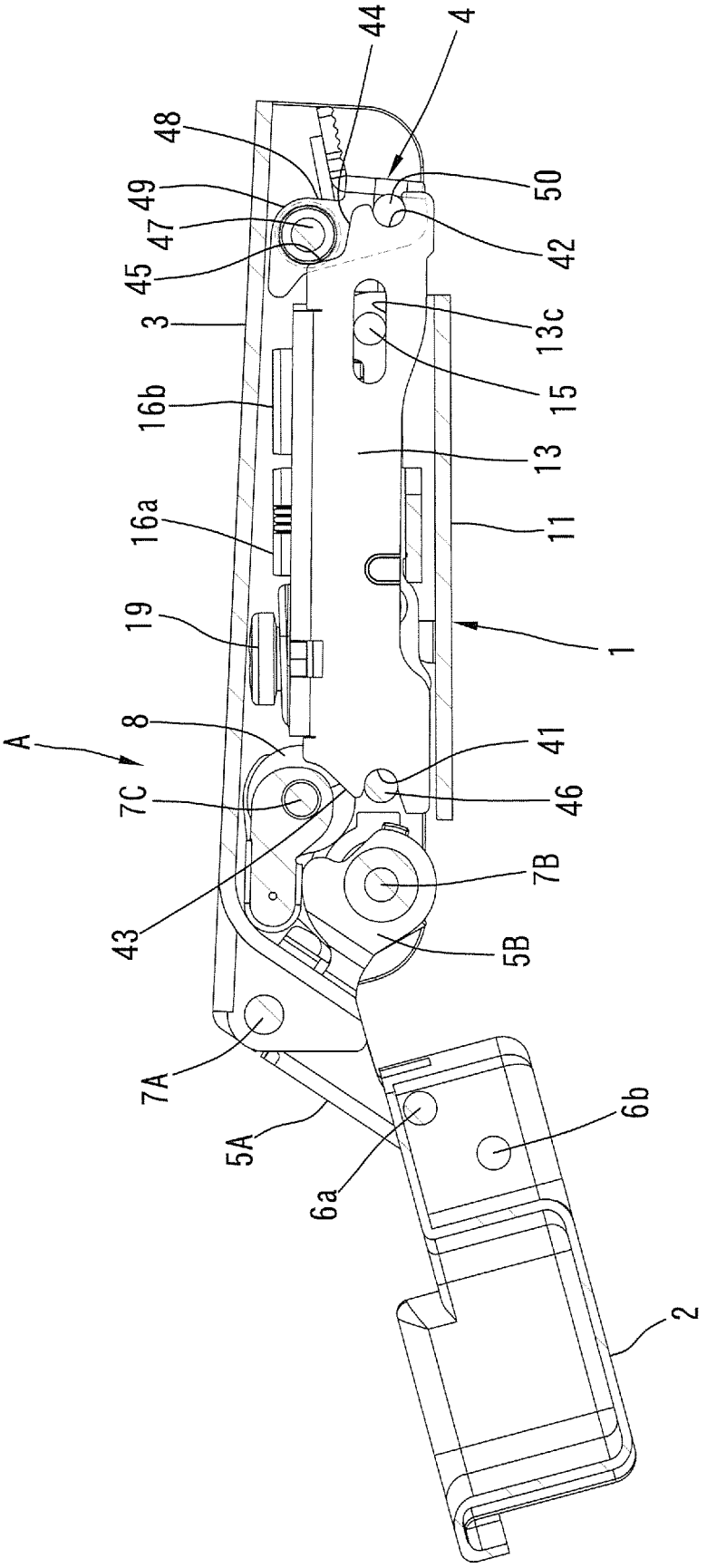

44
4
48
50
49
47
42
45
3
13c
15
16b
13
11
16a
19
1
A
8
41
7C
46
7B
43
5B
7A
5A
6a
6b
2

FIG. 1

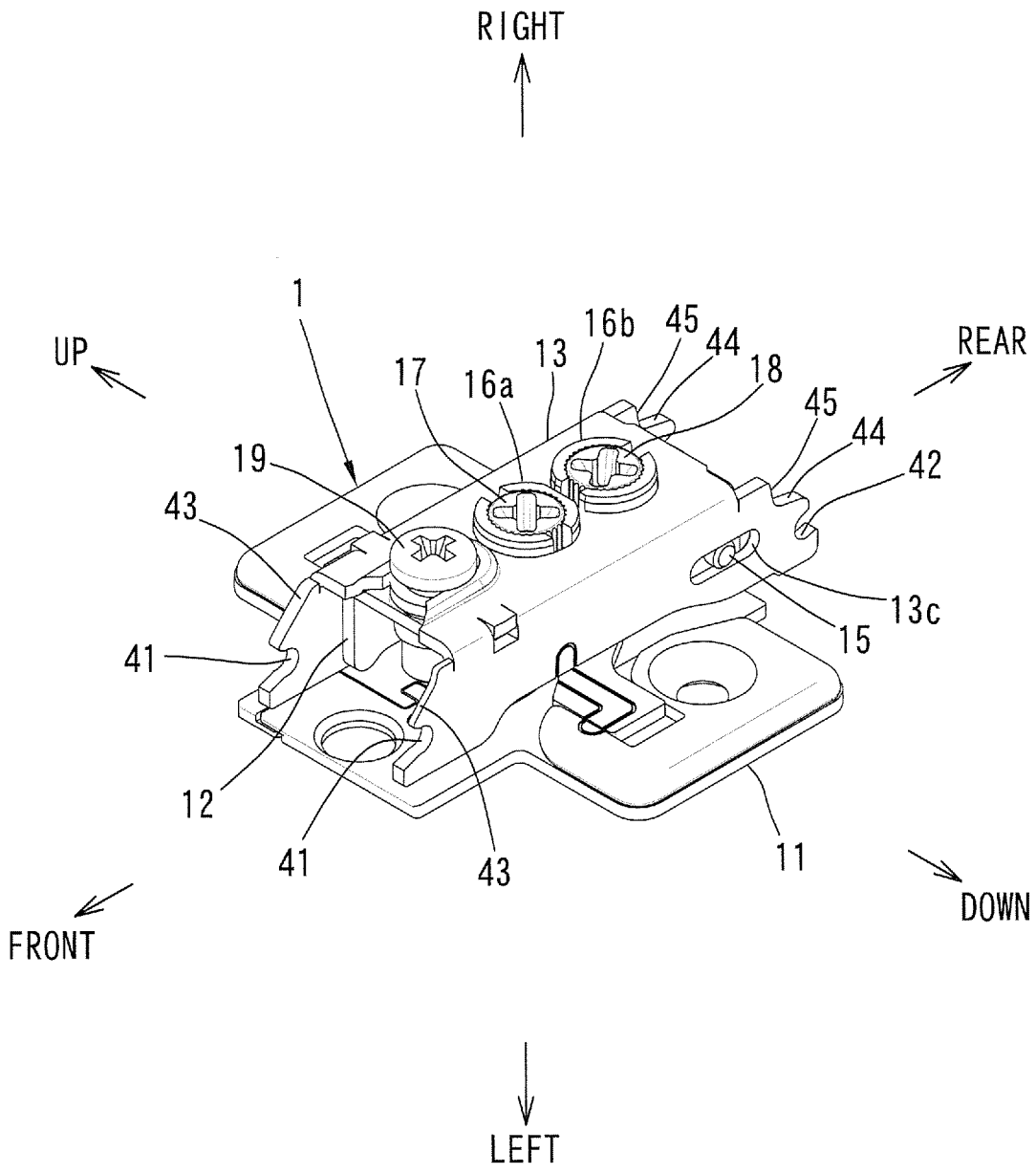

RIGHT
UP
REAR
FRONT
DOWN
LEFT
1
16b
45
44
13
17
16a
18
45
44
42
19
43
13c
15
41
12
41
43
11

FIG. 2

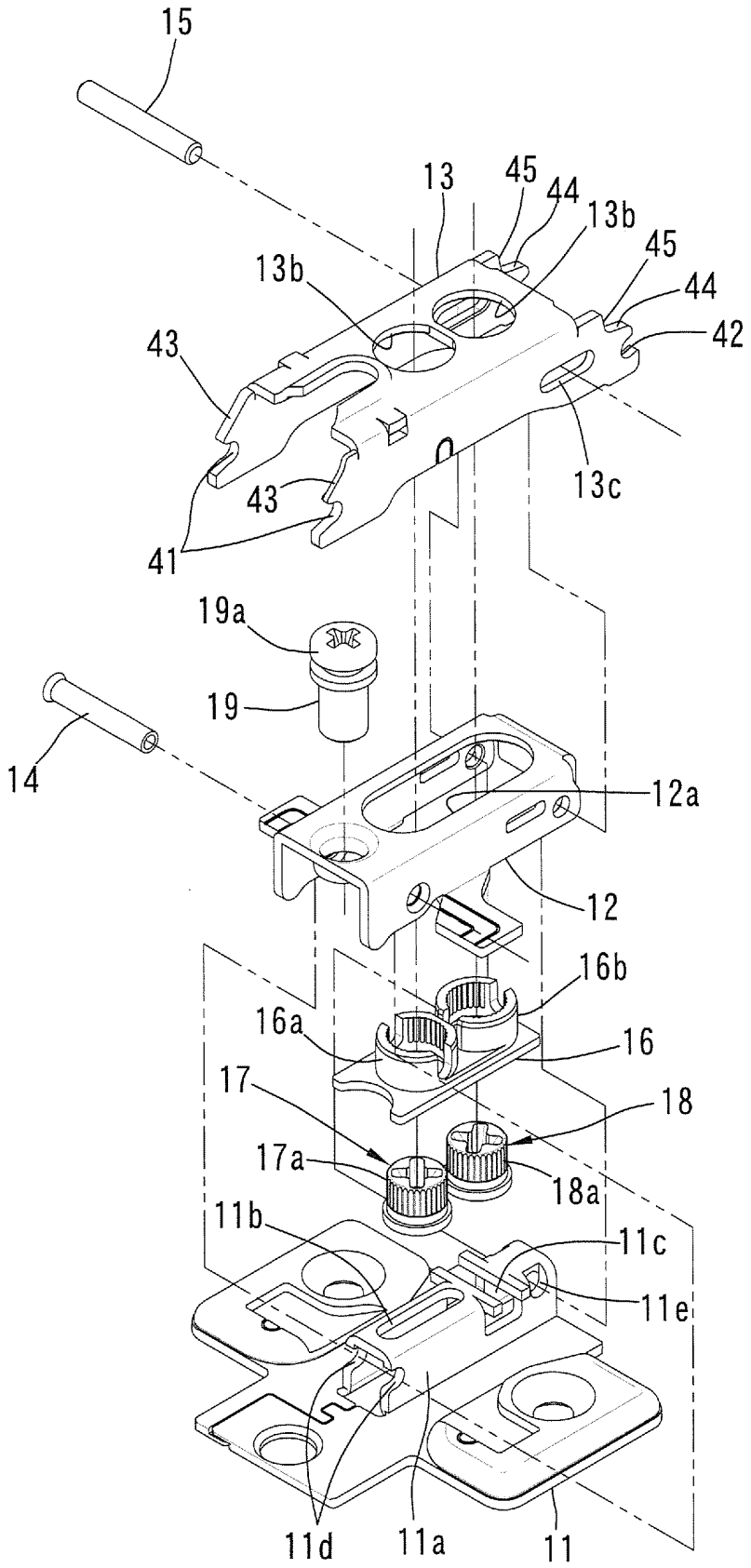

15
13
45
44
13b
45
44
42
13b
43
43
41
13c
19a
19
14
12a
12
16b
16a
16
17
18
17a
18a
11b
11c
11e
11d
11a
11

FIG. 3

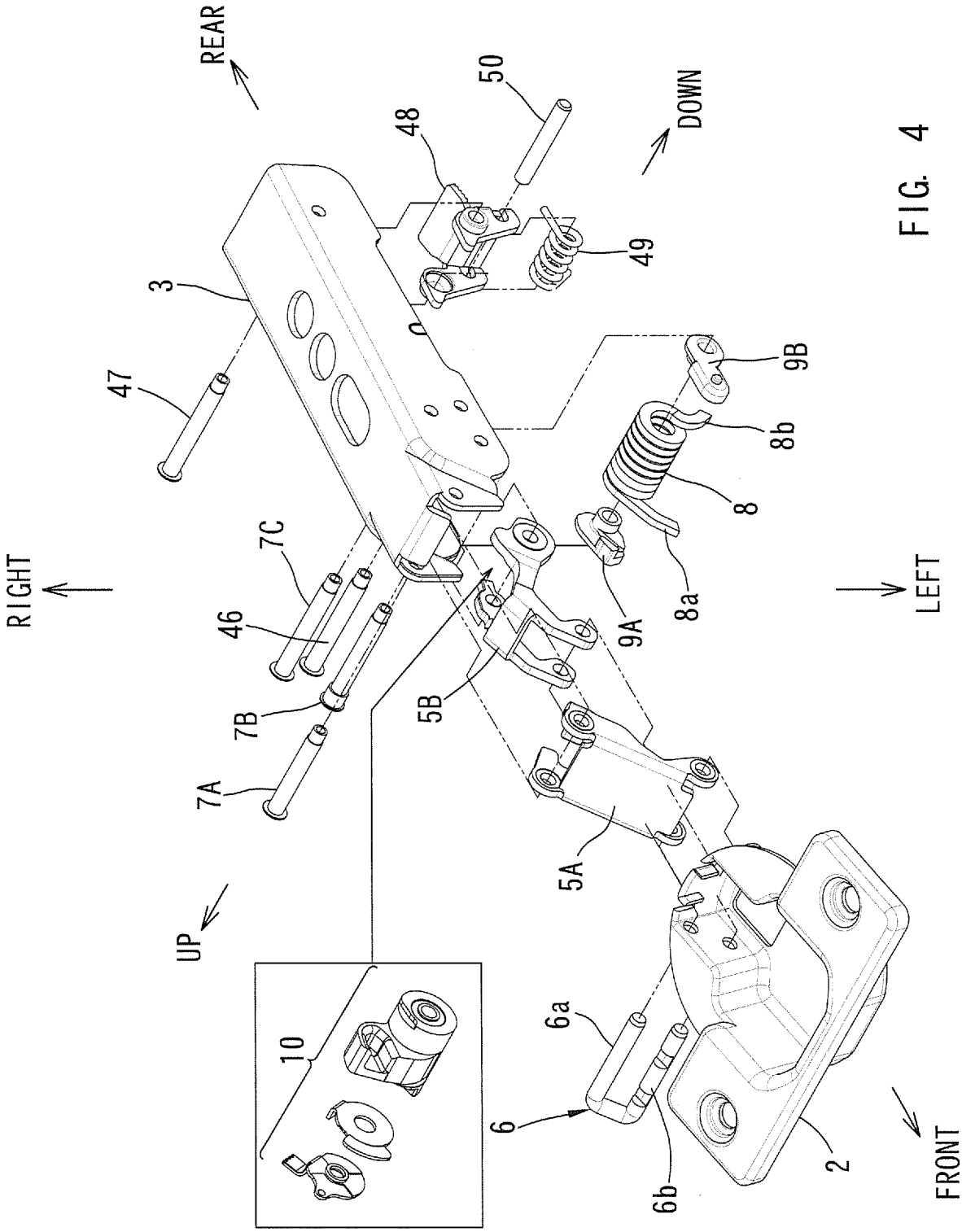

REAR
DOWN
RIGHT
LEFT
UP
FRONT
50
48
49
3
47
9B
8b
8
8a
9A
7C
46
7B
7A
5B
5A
10
6a
6
6b
2

FIG. 4

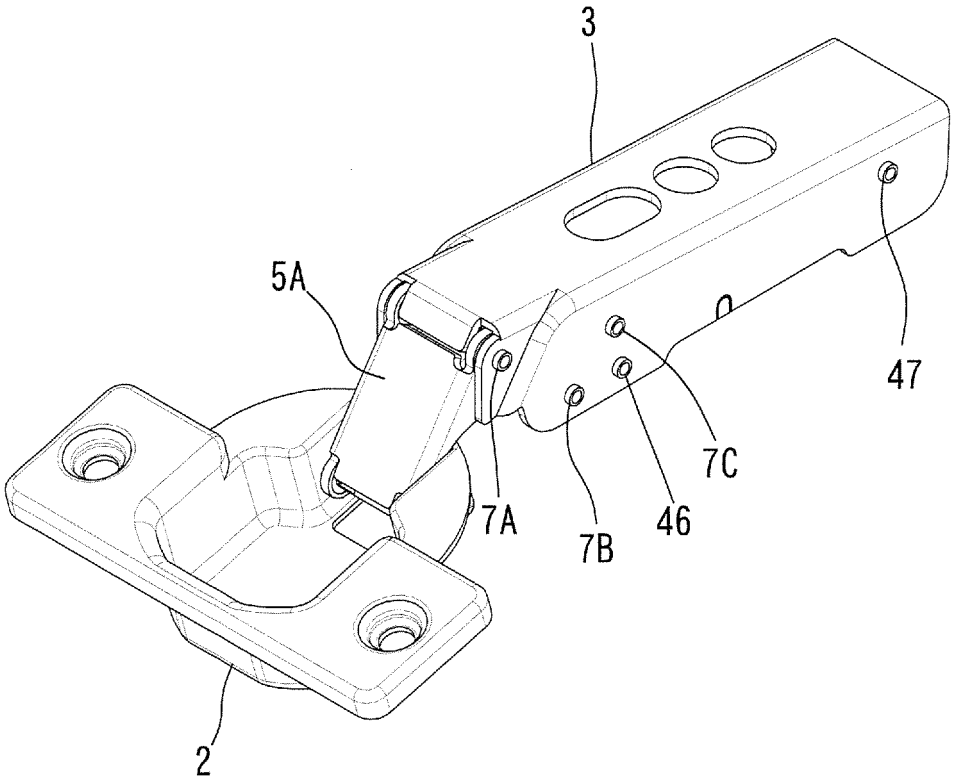

3
5A
47
7C
7A
7B
46
2

FIG. 5

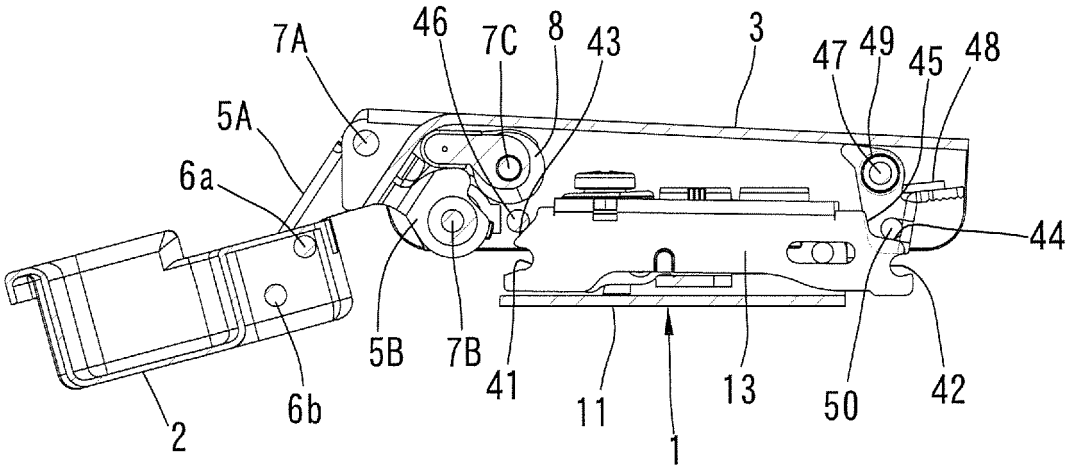

7A
46
7C
8
43
3
47
49
45
48
5A
6a
44
5B
7B
41
11
13
50
42
6b
2
1

FIG. 6

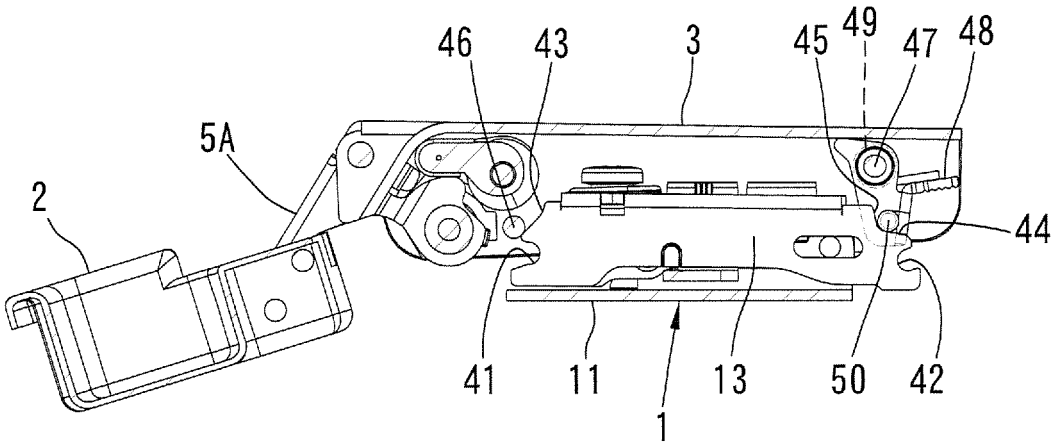


FIG. 7

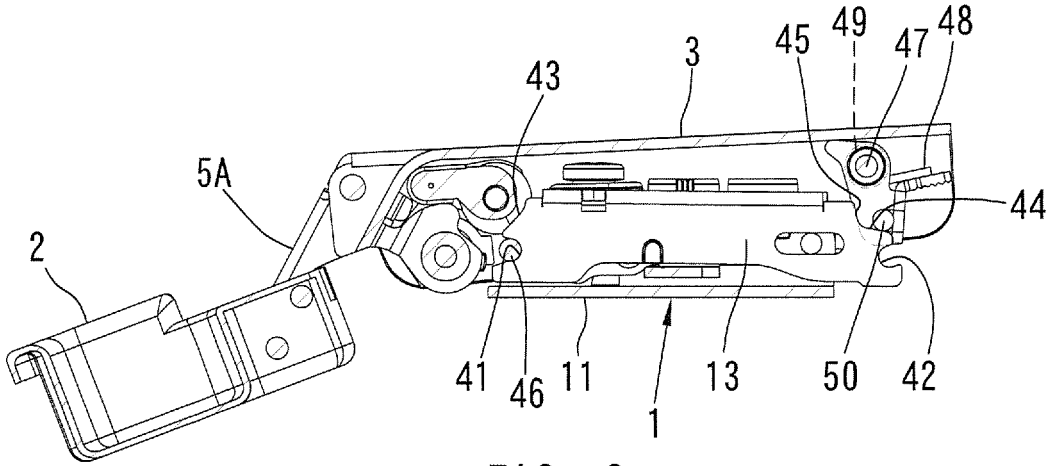


FIG. 8

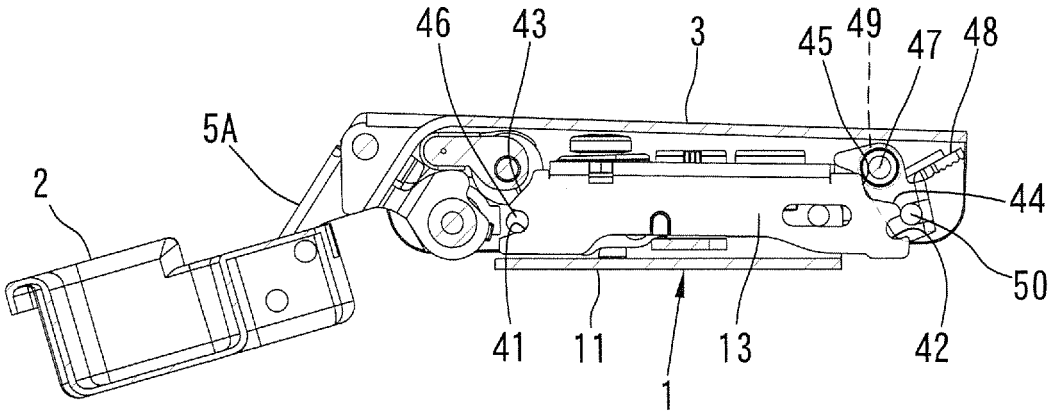
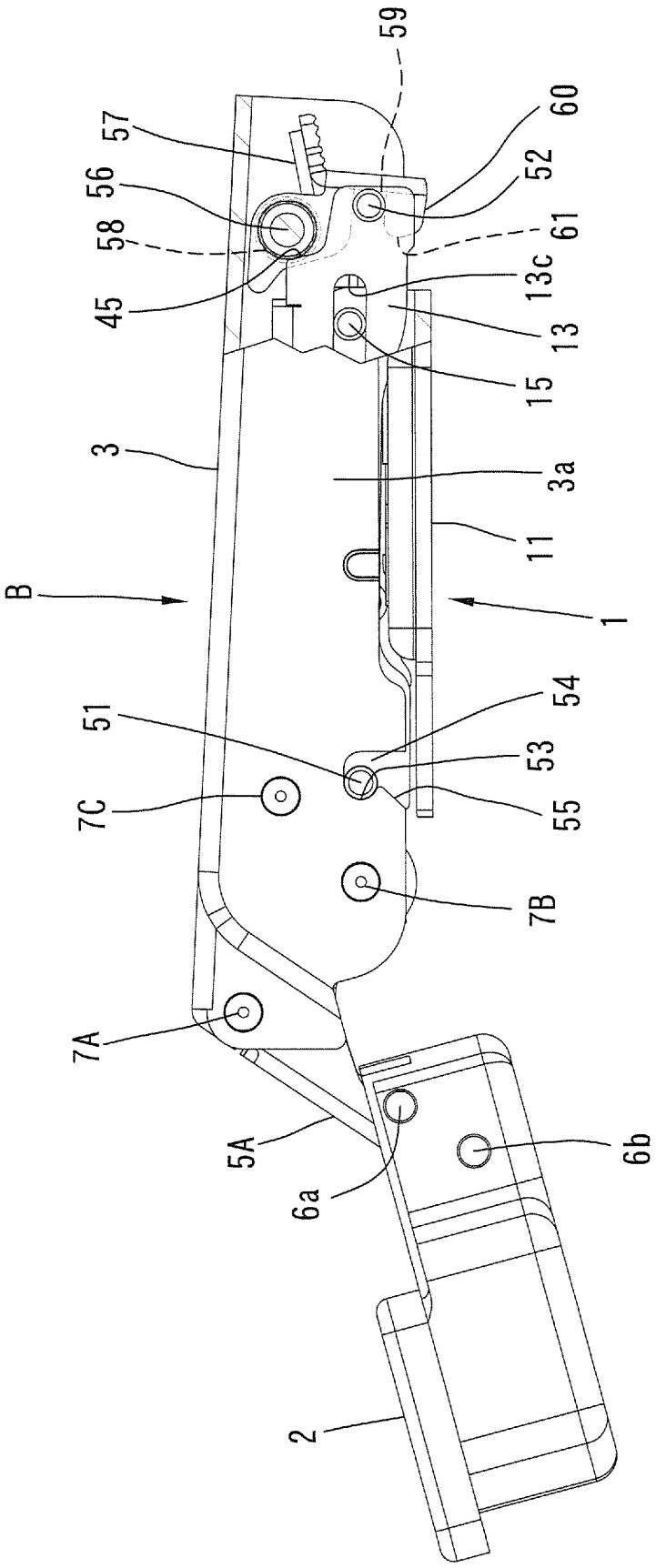


FIG. 9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3a
11
B
1
51
54
53
7C
55
7B
7A
5A
6a
6b
2

FIG. 10

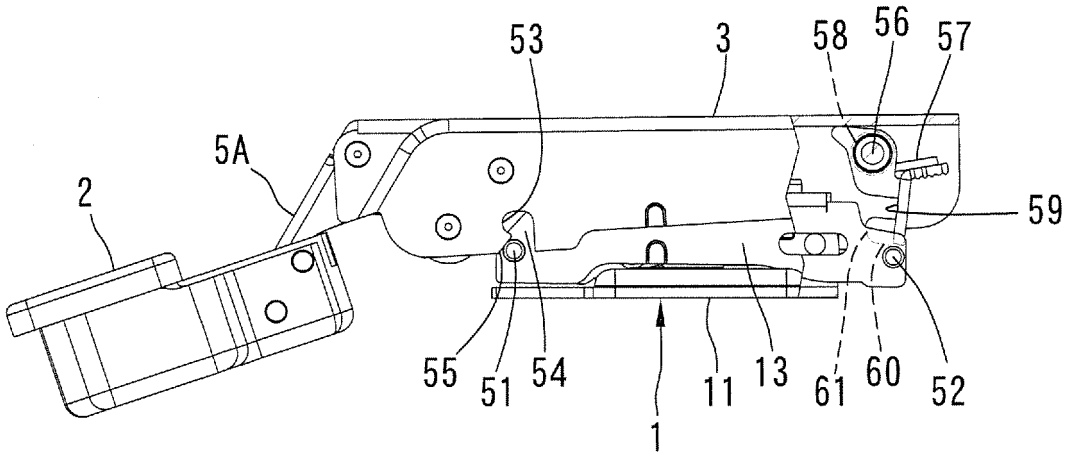


FIG. 11

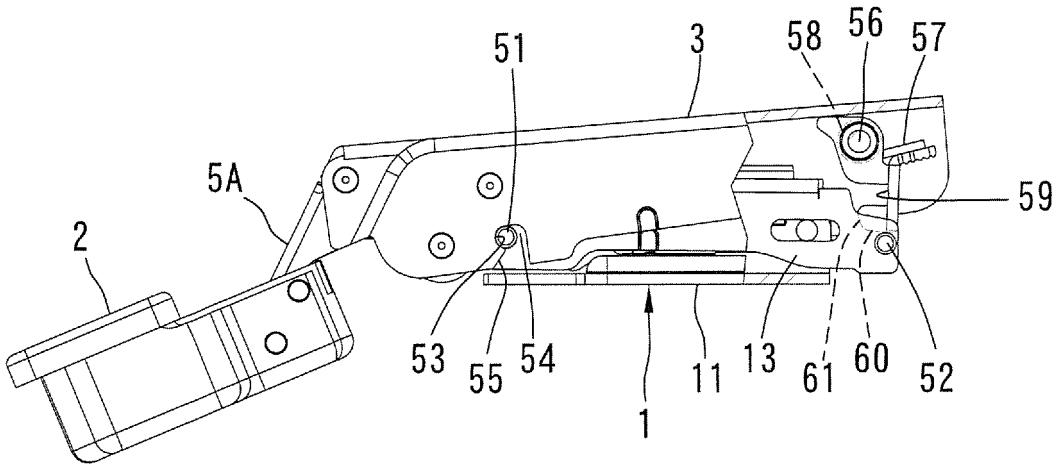


FIG. 12

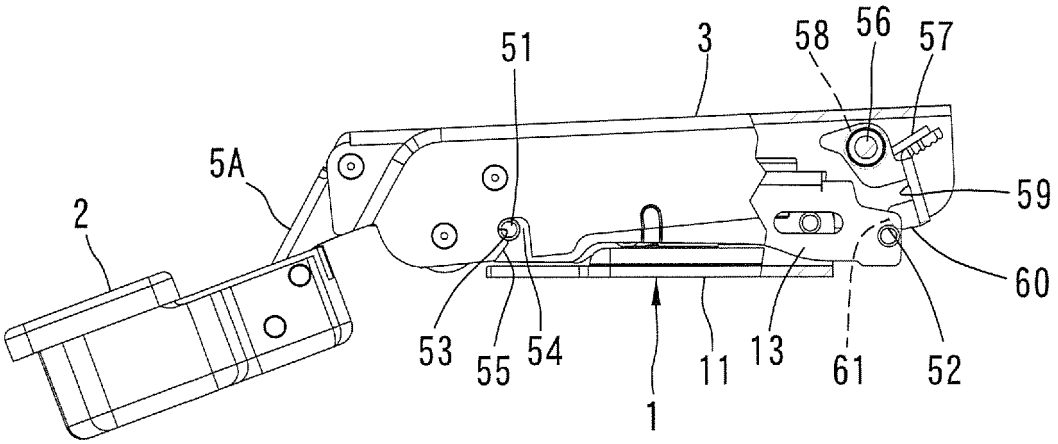
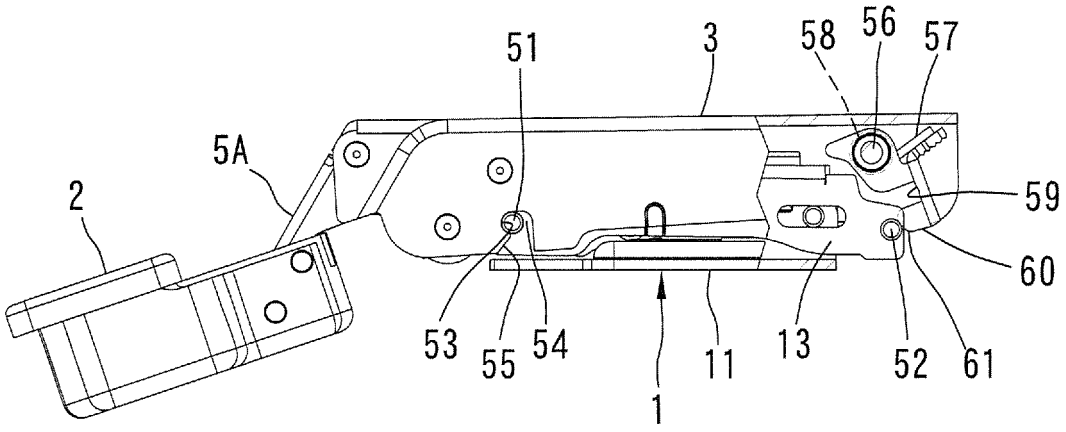


FIG. 13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3
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56
57
5A
2
59
60
53
55
54
11
13
52
61
1

FIG. 14

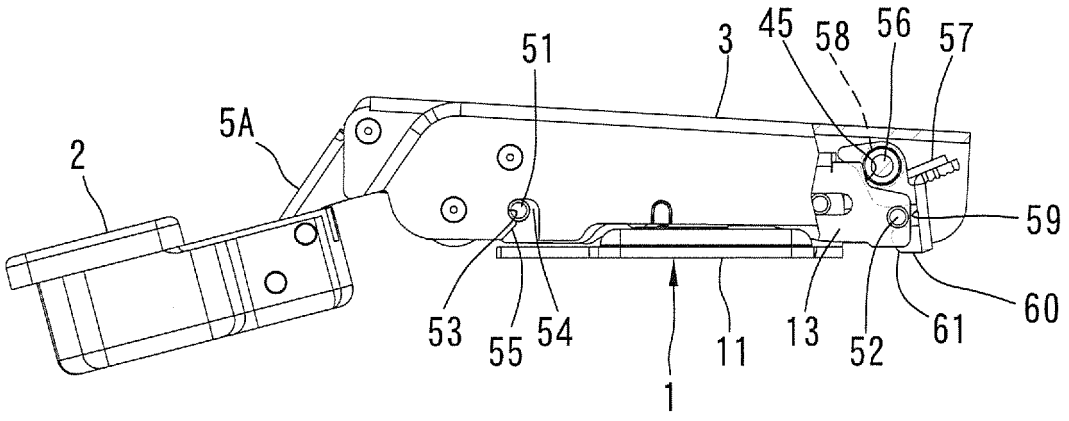
45
51
3
58
56
57
5A
2
59
60
53
55
54
11
13
52
61
1

FIG. 15

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP S62500501 W **[0006]**
- WO 2012057250 A **[0006]**
- EP 0982455 A2 **[0007]**