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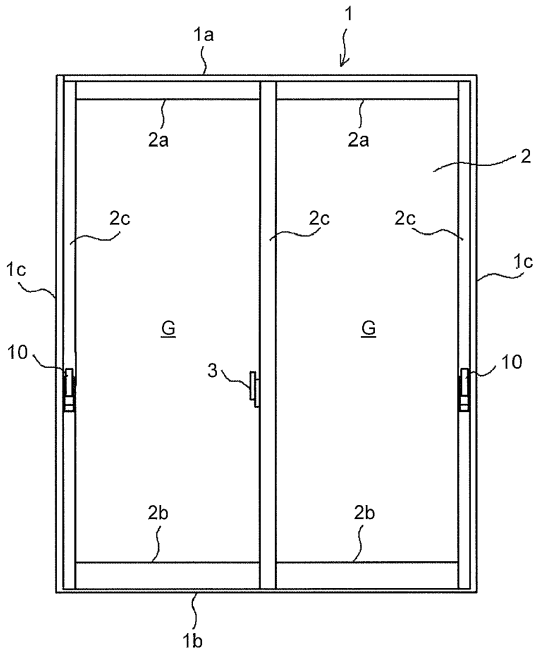
(54) LOCK DEVICE EQUIPPED WITH OPENING SUPPORT MECHANISM, AND SLIDING DOOR INCLUDING LOCK DEVICE EQUIPPED WITH OPENING SUPPORT MECHANISM

(57) A lock device equipped with an opening support mechanism includes: an operation mechanism (20) mounted to a stile of a sliding door being a door end stile or a meeting stile and configured to be operated with an operation handle (20a); a lock configured to lock or unlock the sliding door by the operation mechanism (20); an opening support mechanism (60) configured to kick out the sliding door; and a link bar (50) configure to connect between the operation mechanism (20) and the opening support mechanism (60). The operation mechanism (20) includes a slider (40) that can move vertically in conjunction with turning of a handle shaft (22) of the operation handle (20a). The opening support mechanism (60) is arranged at the link bar (50) while being away from the slider (40) at a predetermined interval, the link bar (50) being connected to the slider (40) and transmitting a vertical motion of the slider (40).

FIG.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a lock device equipped with an opening support mechanism and a sliding door including the lock device equipped with an opening support mechanism, the lock device being applied to a sash window assembly.

2. Description of the Related Art

[0002] A relatively large force is required to overcome an inertial force and open a sash window assembly, especially a sliding door, that is closed and larger in size as well as heavier than a normal fixture. A lock device equipped with an opening support mechanism is used in such sash window assembly (sliding door) requiring the relatively large force at the beginning of opening it. As such lock device equipped with an opening support mechanism, there is known a "hook lock equipped with an opening support mechanism" disclosed in Japanese Patent No. 4426477, for example.

[0003] FIG. 11 is a longitudinal profile of the traditional hook lock equipped with an opening support mechanism disclosed in Japanese Patent No. 4426477, as seen from the front of a sliding door.

[0004] The hook lock equipped with an opening support mechanism includes, in a case 110 mounted to a sliding door 102, a hook bolt 115 engaged with and disengaged with a striker 104 attached to a jamb, a thumb turn shaft 120 formed integrally with a thumb turn lever that switches the hook bolt 115 between a locked position and an unlocked position, a trigger 117 restricting the switching of the hook bolt 115 in an unlocked state to the locked position, and an opening support mechanism. The opening support mechanism of the hook lock equipped with an opening support mechanism includes a kick lever 142 pivotally supported to be able to reciprocate between a standby position in the case 110 and an operated position in which the lever partially protrudes from the case 110, a return spring 146 biasing the kick lever 142 to be moved toward the standby position, and an operation handle 145 switching the position of the kick lever 142 to the operated position against the biasing force of the return spring 146.

[0005] The kick lever 142 and the hook bolt 115 are connected to be able to operate in conjunction with each other via a link bar 147. According to the hook lock equipped with an opening support mechanism, the hook bolt 115 is operated in conjunction with a handle operation of the operation handle 145 to be unlocked from the locked state when the sliding door 102 that is fully closed is forcibly opened with the operation handle 145.

[0006] However, according to the aforementioned hook lock equipped with an opening support mechanism, the operation unit (such as the thumb turn lever) performing locking and unlocking and the operation handle operating the opening support mechanism are provided separately. Such hook lock equipped with an opening support mechanism allows for successive operations to unlock and open a window but, as an operation to close the window and lock is performed independently, the operation becomes cumbersome. The structure of the hook lock equipped with an opening support mechanism is also complex.

[0007] The mechanisms to operate the kick lever and the hook bolt are all accommodated in one case so that the case has a complex structure and, at the same time, it is difficult to dispose the kick lever at an arbitrary position away from the position of the operation handle thereof and is also unable to dispose a plurality of kick levers. Moreover, there needs to be solved a problem that limitations of the case make it difficult to increase the size of each component to transmit a large torque with an operation lever.

[0008] The present invention has been made in view of the aforementioned problems, where an object of the present invention is to allow the operation from unlocking to opening a window or the operation from closing the window to locking to be successively performed all by one operation handle with a simple structure in a single sliding door or double sliding door. Another object of the present invention is to allow the opening support mechanism to be disposed at an arbitrary position and, as needed, dispose a plurality of the mechanisms by using a link bar to operate and link between the opening support mechanism of the sliding door and the mechanism operating of the operation handle.

[0009] Yet another object is to allow the operations of locking, unlocking, and kicking-out of the sliding door to be performed with one operation handle not to impair the design.

SUMMARY OF THE INVENTION

[0010] It is an object of the present invention to at least partially solve the problems in the conventional technology.

[0011] In some embodiments, a lock device equipped with an opening support mechanism includes: an operation mechanism mounted to a stile of a sliding door and configured to be operated with an operation handle; an opening support mechanism configured to kick out the sliding door; a link bar configured to connect between the operation mechanism and the opening support mechanism; and a lock configured to unlock or lock the sliding door in conjunction with turning of the operation handle. The operation mechanism includes a slider configured to move vertically in conjunction with the turning of the operation handle. The opening support mechanism includes: a drive unit connected to the link bar while being away from the slider at a predetermined interval, the link bar being connected to the slider and transmitting a ver-

tical motion of the slider; a kick-out member configured to turn to press one of a sliding door jamb and a vertical frame in conjunction with the vertical motion of the drive unit; and an operation delay unit configured to delay a kick-out operation by the kick-out member in order for the kick-out operation by the kick-out member in the opening support mechanism to be performed after the sliding door is unlocked or locked by the lock.

[0012] The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a front view of a sliding door system to which a lock device equipped with an opening support mechanism is applied;

FIG. 2 is a front view illustrating a lock device according to the present embodiment;

FIG. 3 is an exploded perspective view of an operation mechanism;

FIG. 4 is an enlarged perspective view of a slider;

FIG. 5A is a perspective view of an opening support mechanism, and FIG. 5B is a perspective view of a guide pin attachment unit that drives a kick-out arm of the opening support mechanism;

FIG. 6 is a perspective view of a link bar that is plate-shaped as an example;

FIGS. 7A and 7B are cross-sectional views of an idle lock prevention mechanism (unlinked unit), where FIG. 7B is a cross-sectional view of a side view of the mechanism;

FIGS. 8A to 8D are front views illustrating an overall structure of the sliding door from a locked position to an unlocked position as well as an operation of the opening support mechanism performed with turning of an operation handle;

FIGS. 9A to 9D are diagrams each illustrating a contact state between a resin nut (contact portion) and a pressing member (flat surface), the contact state changing in accordance with the operations in FIGS. 8A to 8D;

FIGS. 10A to 10D are diagrams illustrating an operating procedure of the idle lock prevention mechanism (unlinked unit) at the time of locking (FIG. 10A), unlocking (FIG. 10B), kicking out (FIG. 10C) and preventing idle locking (FIG. 10D); and

FIG. 11 is a longitudinal profile of the traditional hook lock equipped with an opening support mechanism disclosed in Japanese Patent No. 4426477, as seen from the front of a sliding door.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] A lock device equipped with an opening support mechanism according to an embodiment of the present invention will now be described with reference to the drawings.

[0015] FIG. 1 is a front view of a sliding door system 1 to which the lock device equipped with an opening support mechanism is applied.

[0016] Here, the sliding door system 1 includes a pair of slidable sashes (sliding doors 2) inside a square frame body (a top frame 1a, a bottom frame 1b and a jamb (sliding door jamb) 1c) formed in an opening of a structure. The sliding door 2 includes a doorframe formed of a top rail 2a, a bottom rail 2b and left and right stiles 2c that are framed into a square shape, and a glass plate body G fitted inside the doorframe.

[0017] A crescent lock 3 is installed at a meeting portion of the sliding doors 2 as needed. A lock device equipped with an opening support mechanism (hereinafter simply referred to as a lock device) 10 is installed to the stile 2c on a door end side (door end stile) out of the left and right stiles 2c. Note that the lock device may be installed not just to the door end stile but the stile on the meeting portion side (meeting stile).

[0018] FIG. 2 is a front view illustrating the lock device according to the present embodiment.

[0019] The lock device 10 generally includes an operation mechanism 20 primarily formed of an operation handle 20a, a key not illustrated, an opening support mechanism 60 that provides support in opening the sliding door 2, an idle lock prevention mechanism 70 that restrains the operation of the key and the opening support mechanism 60 (causes the key and the mechanism not to operate) while the sliding door 2 is open, and a link bar 50 that is a link member transmitting, to the opening support mechanism 60, a linear motion (vertical motion) of the operation handle 20a, the motion being obtained by converting turning (or swinging) of the operation handle.

[0020] In the lock device 10, the operation handle 20a is turned to close or open the key not illustrated and at the same time operate the opening support mechanism 60 to push out (kick out) the sliding door from a fully closed position and support opening of the sliding door 2. While the sliding door 2 is open, the idle lock prevention mechanism 70 prohibits the lock device 10 and the opening support mechanism 60 from operating.

[0021] Each component of the lock device 10 according to the present embodiment will now be described one by one.

Operation mechanism 20

[0022] FIG. 3 is an exploded perspective view of the operation mechanism 20.

[0023] The operation mechanism 20 will be described

with reference to FIG. 3. The operation mechanism 20 is formed of the operation handle 20a and a drive mechanism 20b including a slider 40 that slides the link bar 50 (refer to FIG. 2) vertically in response to turning of the operation handle 20a.

[0024] The operation handle 20a is L-shaped in a side view as illustrated in the figure, and includes a handle shaft 22 at a base end of the handle. The handle shaft 22 is formed into a square bar with a rectangular outer face (quadrangle cross section), for example, and is inserted into a case 30 through an opening (or a hole not illustrated) provided to the case 30 via a ring washer 24, the case accommodating the whole drive mechanism 20b.

[0025] A ring washer 35 is mounted on the handle shaft 22 inserted into the case 30 from inside the case 30, while at the same time a resin nut 34 is externally fitted to the handle shaft.

[0026] The resin nut 34 includes a contact portion 34a with a rectangular outer shape and a circular flange 34b contiguous with the contact portion 34a. The contact portion 34a of the resin nut 34 is vertically sandwiched by a flat surface 32a of a pressing member 32 biased by a bias member, in this case a coil spring 33. The resin nut 34 including the contact portion 34a thus corresponds to a pressed member in the present invention. Note that the handle shaft 22 with the rectangular cross section can also be used as is as the pressed member.

[0027] This structure provides a click motion at the time of turning the operation handle 20a formed integrally with the handle shaft 22 as well as an automatic return function of the operation handle 20a, as will be described later in detail.

[0028] The handle shaft 22 is fitted into a rectangular opening 37a (1) of a turning piece 37 through the resin nut 34 and an opening 36a of a nut cover 36 bearing the resin nut 34. Through a wave washer 38 and a washer 39, a screw 41 is fastened to an end of the handle shaft 22 passing through the turning piece 37. The turning piece 37 is thus fixed to the handle shaft 22 of the operation handle 20a and turns in conjunction with the operation handle 20a.

[0029] The turning piece 37 includes a main body 37a including the opening 37a (1) and an extension 37b extending on one side of the main body 37a. A guide pin 37 (1) is provided integrally with the extension 37b by arbitrary means such as screwing.

[0030] The guide pin 37 (1) of the turning piece 37 is engaged with a horizontal guide groove 40 (1) formed in the slider (sliding piece) 40 that is integrally connected to the link bar 50. According to such structure, with the turning piece 37 turning, the guide pin 37 (1) of the turning piece 37 causes the slider 40 to slide vertically relative to a case cover 43 (to be described) while sliding through the horizontal guide groove 40 (1).

[0031] Note that in order to ensure durability and abrasion resistance of an outer periphery of the guide pin 37 (1), it is preferable that a collar 37 (2) made of appropriate material such as synthetic resin or metal to which a lubricant is applied be mounted to the outer periphery of the guide pin.

[0032] FIG. 4 is an enlarged perspective view of the slider 40.

[0033] The slider 40 is a plate-like member with a cross section that is substantially L-shaped as illustrated in FIGS. 3 and 4. The slider 40 includes a plate-like body portion 40a and a plate-like connection portion 40b that protrudes at a right angle from one side positioned between upper and lower ends of the body portion 40a and that has a shorter length between upper and lower ends than that of the body portion 40a.

[0034] A pair of upper and lower guide grooves 40a (1) and 40a (2) that have the same vertical length and extend in a straight line are formed in the body portion 40a. The horizontal guide groove 40 (1) is provided at a center part of the body portion 40a in its vertical direction and extends from one side thereof in a width direction. The guide pin 37 (1) with the collar 37 (2) of the turning piece 37 is inserted into the horizontal guide groove 40 (1).

[0035] As illustrated in FIG. 4, connection holes 40b (1) and 40b (2) are provided at upper and lower parts of the connection portion 40b. The connection portion 40b is screwed to the link bar 50 through the connection holes 40b (1) and 40b (2).

[0036] Referring back to FIG. 3, the case cover 43 covers a surface of the case 30 opposite to the surface through which the operation handle 20a is inserted.

[0037] Guide pins 42a and 42b are provided integrally with a surface of the case cover 43 by arbitrary means such as screwing, the surface facing the slider 40. The guide pins 42a and 42b are inserted into the upper and lower guide grooves 40a (1) and 40a (2) (refer to FIG. 4) of the slider 40, respectively.

[0038] Holes 43a and 43b are provided at upper and lower ends of the case cover 43. A screw 44 is screwed into a screw pipe 30a of the case 30 through the holes 43a and 43b provided in the case cover 43. The case cover 43 is fixed to the case 30 as a result.

[0039] FIG. 3 also illustrates a protective cap 31 covering upper and lower parts of the case 30.

[0040] The handle shaft 22 of the operation handle 20a is provided with a lock such as a known latch that turns in conjunction with the handle shaft 22. Accordingly, the door is unlocked when the operation handle 20a is turned 90° or the like to disengage the latch from a latching tool provided in the doorframe before a kick-out roller 64 of the opening support mechanism 60 is operated.

[0041] Note that the lock can adopt any structure (such as locks disclosed in Japanese Utility Model Application Publication No. 59-15584 and Japanese Patent Application Laid-open No. 2006-241748) as long as locking or unlocking can be performed by turning the operation handle 20a. Here, the operation handle 20a is turned to perform locking or unlocking with operating the latch and the like directly by the handle shaft 22 of the operation handle 20a, or to perform locking or unlocking in conjunction with

the vertical motion of the link bar 50.

[0042] Next, the opening support mechanism 60 will be described with reference to FIGS. 2, 5A and 5B.

[0043] FIG. 5A is a perspective view of the opening support mechanism 60, and FIG. 5B is a perspective view of a guide pin attachment unit 54 that drives a kick-out arm 63 of the opening support mechanism 60.

[0044] The opening support mechanism 60 generally includes a board 61 for attachment and the kick-out arm 63 pivotally mounted to the board 61.

[0045] The board 61 includes an attachment portion 61a to be attached to the stile 2c of the sliding door and an arm support 61b bent at a right angle from the attachment portion 61a and supporting the kick-out arm, and is thus substantially L-shaped in the cross section.

[0046] The kick-out arm 63 is pivotally mounted to the arm support 61b near an upper end thereof via a connecting pin 62, as illustrated in FIG. 5A. The kick-out roller 64 being a kick-out unit is rotatably fixed to a free end (turning end) of the kick-out arm 63.

[0047] A first guide groove 61b (1) is provided in the arm support 61b along a vertical direction (along the direction of movement of the link bar 50) as illustrated in the figure. A second guide groove 63 a extending vertically in the figure and further bent obliquely upward from an upper end of the vertical portion to be substantially L-shaped overall is provided in the kick-out arm 63. The vertical portions of the first and second guide grooves 61b (1) and 63a are in alignment with each other as illustrated in the figure.

[0048] The guide pin attachment unit 54 has a substantially L-shaped cross section as illustrated in FIG. 5B. An attachment face 54a of the guide pin attachment unit 54 is fixed to the link bar 50 by appropriate means such as screwing. A guide pin 56 stands on a guide pin attachment face 54b that is bent at a right angle from the attachment face 54a of the guide pin attachment unit 54.

[0049] As illustrated in FIG. 5A, the guide pin 56 is inserted through both of the first guide groove 61b (1) of the arm support 61b of the board 61 and the second guide groove 63 a bent in the near L-shape and formed in the kick-out arm 63.

[0050] When the operation mechanism 20 moves the link bar 50 upward by turning the operation handle 20a while the sliding door 2 is closed in the aforementioned structure, the guide pin 56 moves upward through the vertical groove portions of the first guide groove 61b (1) and the second guide groove 63a. While the guide pin 56 moves upward through the vertical groove portion of the second guide groove 63a, the kick-out arm 63 is not driven and immovable, but the key not illustrated is unlocked by the turning of the operation handle 20a.

[0051] When the guide pin 56 thereafter moves further upward with the turning of the operation handle 20a and reaches the groove portion extending obliquely upward of the second guide groove 63a, the guide pin 56 moving upward pushes up the groove portion extending obliquely upward. This allows the kick-out arm 63 to turn about the connecting pin 62, move outside of the stile 2c of the sliding door, and kick the sliding door jamb 1c to push the sliding door 2 out in a direction to be opened.

[0052] In the present embodiment, as described above, the key is unlocked first with the turning of the operation handle 20a, followed by the operation of the kick-out arm 63. In this case, a delay in the operation from the start of the turning of the operation handle 20a to the start of the operation of the kick-out arm 63 is realized by a lost motion of the guide pin 56 moving through the vertical groove portion of the second guide groove 63a. Accordingly, the guide pin 56 performing the lost motion through the vertical groove portion of the second guide groove 63a makes up an operation delay unit of the present invention.

[0053] Note that in the present embodiment, the length of the vertical groove portion of the second guide groove 63a is set to the length along which the slider 40 and the link bar 50 slide when the operation handle 20a is turned 90°.

[0054] While one opening support mechanism 60 (kick-out arm 63) is provided in the aforementioned description, the lock device of the present invention is not limited to such case.

[0055] That is, a plurality of the opening support mechanisms 60 can be attached to upper and lower parts of the stile 2c at a predetermined interval and operated in conjunction with the link bar 50. By adopting such structure, the plurality of the opening support mechanisms 60 can be operated simultaneously by a single turning operation of the operation handle 20a. The opening support mechanisms 60 being operated simultaneously, the sliding door 2 can be pushed out in a balanced manner and pushed out smoothly from a fully closed position compared to the case where one opening support mechanism 60 is provided.

[0056] The link bar 50 will now be described.

[0057] The link bar 50 is formed as a link member transmitting the turning force of the operation handle 20a of the operation mechanism 20 to the opening support mechanism 60. The link bar 50 can formed into any shape such as a plate or a bar as long as it can transmit a vertical motion based on the turning of the operation handle 20a to the opening support mechanism 60 while at the same time an idle lock prevention mechanism 70 (to be described) can be operated, the vertical motion being converted in the operation mechanism 20. The link bar of the present invention is thus used as a general term for those forms.

[0058] FIG. 6 is a perspective view of the link bar 50 that is plate-shaped as an example.

[0059] The connection portion 40b of the slider 40 is connected to a lower end side of the link bar 50. The guide pin attachment unit 54 is connected to an upper end side of the link bar 50.

[0060] A horizontal notch 55 is formed midway between upper and lower ends of the link bar 50. The notch 55 forms a part of the idle lock prevention mechanism 70

illustrated in FIG. 2. That is, the notch 55 is engaged with a wall 72b (1) (FIGS. 7A and 7B) being a stopper of the idle lock prevention mechanism 70 when the sliding door is open, whereby the vertical motion of the link bar 50 is inhibited to be able to prevent idle locking of the lock when the sliding door is open.

[0061] A detailed structure of the idle lock prevention mechanism 70 will now be described.

[0062] FIG. 7A is a cross-sectional view of the idle lock prevention mechanism 70 (unlinked unit), and FIG. 7B is a cross-sectional view of a side view of the mechanism.

[0063] As illustrated in FIG. 2, the idle lock prevention mechanism 70 is provided at an appropriate position between the operation mechanism 20 and the opening support mechanism 60 along the link bar 50 that is disposed along the stile 2c (refer to FIG. 1). As illustrated in FIGS. 7A and 7B, the idle lock prevention mechanism 70 generally includes a door stop portion (also called a trigger) 72 having a contact face 72a to be in contact with the sliding door 2 when it is closed, a biasing unit which in this case is a coil spring 74 pressing and biasing the door stop portion 72 to the side of the sliding door jamb 1c at all times, and a case 75 accommodating those units and having a side wall to be a guide when the door stop portion 72 comes out.

[0064] The door stop portion 72 includes the contact face 72a to be in contact with the sliding door jamb 1c, a groove 72b formed on an inner side of the contact face 72a in the direction in which it protrudes and allowing the link bar 50 to pass (a wall 72b (1) to be described is preferably reinforced with reinforcement material), and the wall 72b (1) being in contact with the notch 55 (specifically upper and lower wall faces 55a (1) and 55a (2) thereof (refer to FIG. 6)) of the link bar 50 and serving as a stopper inhibiting the vertical motion of the link bar 50 when the sliding door 2 is positioned away from the sliding door jamb 1c to cause the door stop portion 72 to protrude from the stile 2c.

[0065] When the sliding door 2 is fully closed, the contact face 72a is in contact with the sliding door jamb 1c or a vertical frame so that the door stop portion 72 retreats to the side of the stile 2c while compressing the coil spring 74. When the sliding door is open, on the other hand, the door stop portion 72 protrudes from the stile 2c by the biasing force (elastic force) of the coil spring 74. Note that FIGS. 7A and 7B both illustrate the state in which the door stop portion 72 protrudes by the biasing force of the coil spring 74.

[0066] A width W1 of the groove 72b of the door stop portion 72 illustrated in FIG. 7B is wider than a width W2 of the link bar 50. This allows the link bar 50 to move freely in a vertical direction while the fully closed sliding door 2 is opened by a width (distance) corresponding to the predetermined width W1.

[0067] When the sliding door 2 is opened by the width corresponding to the width W1, the notch 55 of the link bar 50 comes into contact with the wall 72b (1) of the door stop portion 72 to inhibit the vertical motion of the link bar 50. From that point on, the link bar 50 being restrained cannot be turned even when one attempts to turn the operation handle 20a, whereby the idle locking of the lock as well as the operation of the kick-out arm 63 are inhibited.

[0068] When the contact face 72a of the door stop portion 72 protruding from the stile 2c is brought into contact with the sliding door jamb 1c or the vertical frame in closing the sliding door 2 toward the fully closed position, the door stop portion 72 retreats against the biasing force of the coil spring 74. In this case, the link bar 50 is released from contact with the door stop portion 72 to be able to move freely in the vertical direction through the groove 72b of the door stop portion 72, when the retreating width of the door stop portion 72 exceeds a width W2 of the wall 72b (1) of the groove 72b in contact with the link bar 50 (the width is preferably formed equal to the width of the link bar 50). As a result, the sliding door can be locked at this position, namely before reaching the fully closed position.

[0069] An overall operation of the lock device according to the aforementioned embodiment of the present invention will now be described with reference to the drawings.

[0070] FIGS. 8A to 8D are front views illustrating an overall structure of the sliding door from a locked position to an unlocked position as well as an operation of the opening support mechanism 60 performed with the turning of an operation handle 20a. FIGS. 9A to 9D are diagrams each illustrating a contact state between the resin nut 34 (contact portion 34a) and the pressing member 32 (flat surface 32a), the contact state changing in accordance with the operations in FIGS. 8A to 8D.

[0071] That is, FIG. 8A illustrates a state in which the sliding door is closed and locked by the lock device with the operation handle 20a at an upright position as illustrated in the figure, for example. Moreover, flat surfaces of the contact portion 34a of the handle shaft 22 and the flat surface 32a of the pressing member 32 at that time are in contact with each other (refer to FIG. 9A).

[0072] When the sliding door is to be opened, the operation handle 20a is first turned downward from the upright position (turned counterclockwise in FIG. 8A).

[0073] With the turning of the operation handle 20a, the handle shaft 22 and the resin nut 34 externally fitted to the handle shaft 22 illustrated in FIG. 9A are turned. At this time, the resin nut 34 is turned while vertically stretching out the flat surface 32a of the pressing member 32 against the pressing force from the pressing member 32.

[0074] The turning piece 37 integrally connected to the handle shaft 22 turns at the same time. With the turning of the turning piece 37, the guide pin 37 (1) with the collar 37 (2) of the turning piece 37 turns upward to push up the horizontal guide groove 40 (1) of the slider 40. The slider 40 moves up smoothly while the upper and lower guide grooves 40a (1) and 40a (2) of the slider 40 are guided by the guide pins 42a and 42b attached to the

case cover 43. When the slider 40 moves up, the link bar 50 connected integrally with the slider 40 moves up as well.

[0075] When the link bar 50 moves up, the guide pin 56 of the guide pin attachment unit 54 attached to the upper part of the link bar 50 moves up through the first guide groove 61b (1) and the second guide groove 63a. At the same time, with the turning of the handle shaft 22, the latch not illustrated is pulled up from the latching portion on the doorframe and unlocked.

[0076] When the link bar 50 moves further upward with the turning of the operation handle 20a, the guide pin 56 of the guide pin attachment unit 54 of the link bar 50 reaches the bent portion extending obliquely upward of the second guide groove 63a of the kick-out arm 63.

[0077] FIGS. 8B and 9B illustrate the position of the operation handle 20a and a positional relationship between the resin nut 34 (contact portion 34a) and the pressing member 32 (flat surface 32a) at this time.

[0078] That is, the operation handle 20a and the resin nut 34 are both turned 90° from the start of the operation.

[0079] In this state, as with FIG. 9A, the flat surface 32a of the pressing member 32 is in contact with the rectangular face of the contact portion 34a in the vertical direction. The flat surface of the contact portion 34a and the flat surface 32a of the pressing member 32 are in contact with each other and kept stable under the action of the pressing force of the pressing member 32.

[0080] When the operation handle 20a is turned further from this state, the guide pin 56 of the guide pin attachment unit 54 connected to the link bar 50 moves further upward. Upon reaching the portion tilted obliquely upward of the second guide groove 63 a, the guide pin 56 is brought into contact with an upper wall of the oblique portion of the second guide groove 63a and pushes the upper wall of the second guide groove 63a upward. This allows the kick-out arm 63 provided with the second guide groove 63a to turn upward about the connecting pin 62.

[0081] With the turning of the kick-out arm 63, the kick-out roller 64 pivotally fixed at the free end (turning end) of the kick-out arm 63 pushes the sliding door jamb and separates (or kicks out) the sliding door from the sliding door jamb. The kick-out roller 64 keeps kicking out the sliding door until the guide pin 56 reaches an end of the oblique upward portion of the second guide groove 63a with the turning of the operation handle 20a.

[0082] FIGS. 8C and 9C illustrate the position of the operation handle 20a and the positional relationship between the resin nut 34 (contact portion 34a) and the pressing member 32 (flat surface 32a) at this time.

[0083] Each of the operation handle 20a and the resin nut 34 is turned less than 120° from the state in FIGS. 8A and 9A to reach the position illustrated in FIGS. 8C and 9C, in the present embodiment.

[0084] Next, there will be described how the state returns from the state in FIGS. 8C and 9C to the state in FIGS. 8D and 9D. This operation is performed automatically in the present embodiment. That is, as has been described, the pressing member 32 including the flat surface 32a that is in vertical contact with the rectangular face of the contact portion 34a is vertically biased by the coil spring 33 (refer to FIG. 3) and brought into contact with the contact portion 34a of the resin nut 34 accommodating the handle shaft 22, each of the contact portion and the handle shaft having the quadrangle cross section.

[0085] FIGS. 8C and 9C illustrate the state in which the operation handle 20a (and thus the contact portion 34a) is turned about 30° from the state in FIGS. 8B and 9B. In this state, the guide pin 56 of the guide pin attachment unit 54 of the link bar 50 is in contact with the upper end of the bent portion of the second guide groove 63a of the kick-out arm 63 extending obliquely upward, and the operation handle 20a (contact portion 34a) is turned to the farthest position.

[0086] In this case, the flat surface of the contact portion 34a is in contact with the flat surface 32a of the pressing member 32 at an angle of about 30°. The positional relationship between the two is thus unstable where moment in a reverse turning direction is acting on the contact portion 34a. Accordingly, when one lets go of the operation handle 20a in the state illustrated in FIGS. 8C and 9C, the operation handle 20a turns in a direction opposite to the direction in which the handle turns to reach the state in FIGS. 8C and 9C from the state in FIGS. 8B and 9B, whereby the contact portion 34a returns to the state illustrated in FIGS. 8D and 9D (FIGS. 8B and 9B). That is, the resin nut 34 turns automatically to return to the state in FIGS. 8B and 9B, thereby causing the link bar 50 to move down. When the link bar 50 moves down, the guide pin 56 of the guide pin attachment unit 54 moves down through the bent portion of the second guide groove 63a of the kick-out arm 63 extending obliquely upward. This allows the kick-out roller 64 of the opening support mechanism 60 to return to a standby position inside the stile 2c of the sliding door.

[0087] Moreover, as is apparent from the aforementioned description, every turning of the operation handle 20a is exerted as a click motion.

[0088] The idle lock prevention mechanism 70 is then operated to prevent idle locking at the stage where the series of unlocking and kick-out operations of the sliding door is completed. This point will now be described.

[0089] As has been described, the idle lock prevention mechanism 70 is provided at the appropriate position between the operation mechanism 20 and the opening support mechanism 60 along the link bar 50 that is disposed along the stile 2c.

[0090] FIGS. 10A to 10D are diagrams illustrating an operating procedure of the idle lock prevention mechanism 70 (unlinked unit) at the time of locking (FIG. 10A), unlocking (FIG. 10B), kicking out (FIG. 10C) and preventing idle locking (FIG. 10D).

[0091] That is, in the state illustrated in FIG. 10A, the stile 2c of the sliding door and the sliding door jamb 1c are in contact with each other so that the door stop portion

72 is in contact with the sliding door jamb 1c or vertical frame against the biasing force of the coil spring 74. The door stop portion 72 is thus held still on the side of the stile 2c, thereby allowing the link bar 50 to move freely through the groove 72b of the door stop portion 72.

[0092] In the state illustrated in FIG. 10B, the notch 55 of the link bar 50 passes through the groove 72b of the door stop portion 72 as the link bar moves upward. The opening support mechanism 60 is not yet operated at this stage even though the lock is unlocked. Accordingly, the stile 2c of the sliding door and the sliding door jamb 1c are in contact with each other so that the link bar 50 can move freely through the groove 72b of the door stop portion 72 as with FIG. 10A.

[0093] In the state illustrated in FIG. 10C, the link bar 50 is at the highest position.

[0094] The sliding door is separated from the sliding door jamb 1c in this state, whereby a force from the sliding door jamb 1c against the coil spring 74 does not act on the door stop portion 72. This causes the door stop portion 72 to be on the verge of protruding outward from the stile 2c of the sliding door but, since a lower portion of the notch 55 of the link bar 50 is in contact with a lower side wall of the groove 72b of the door stop portion 72, the protrusion of the door stop portion 72 is prevented.

[0095] FIG. 10D illustrates the state in which the link bar 50 is moved down from the state in FIG. 10C as the kick-out roller 64 once kicked out returns to the original standby position automatically. That is, the door stop portion 72 restrained by the link bar 50 is released at the instant when the notch 55 of the link bar 50 is in alignment with the groove 72b while the link bar 50 moves downward, whereby the biasing force of the coil spring 74 causes the door stop portion 72 to pop out of the stile 2c through the notch 55 of the link bar 50.

[0096] When one end of the door stop portion 72 pops out of the stile 2c, upper and lower ends 55a and 55b of the notch 55 of the link bar 50 are positioned to sandwich the door stop portion 72 in the vertical direction. Accordingly, the wall 72b (1) of the door stop portion 72 is brought into contact with the upper end 55a of the link bar 50 when the link bar 50 is to be moved upward, whereas a lower wall face of the door stop portion 72 is brought into contact with the lower end 55b of the link bar 50 when the link bar 50 is to be moved downward. The link bar 50 cannot be moved as a result.

[0097] The idle locking of the lock can thus be prevented.

[0098] There has been described the operation of the lock device from the unlocking of the lock to the kicking out of the sliding door, according to the embodiment of the present invention. When the sliding door that is open is to be brought into contact with the sliding door jamb, on the other hand, the sliding door is first brought into contact with the sliding door jamb, then the operation handle is turned clockwise with respect to FIG. 8 from the state in FIG. 8B to the state in FIG. 8A. This allows the latch connected to the handle shaft of the operation handle to be engaged with the latching portion on the sliding door jamb to complete locking.

[0099] In such case, the aforementioned hook lock in the related art performing the engagement of the lock with turning of the thumb turn lever cannot use relatively large moment as that of the operation handle. When the operation handle is provided in place of the thumb turn lever, it is difficult to arrange the total of two operation handles in the device, while at the same time the design is impaired.

[0100] Moreover, according to the present embodiment, the continuity of operation can be ensured because the operation of locking or unlocking and kicking out can be performed all by one operation handle in an orderly manner. In addition, the operation handle itself is increased in size to allow for the use of relatively large moment by the operation handle.

[0101] As a result, locking can be performed strongly compared to a lock mechanism of the related art, and a sash window assembly can be locked while crushing airtight material being interposed.

[0102] Furthermore, the idle locking of the lock can be prevented automatically by a simple structure of the contact between the door stop portion and the link bar, whereby one can obtain an effect such as the simplified operation of the lock device as a whole.

[0103] According to the present invention, the operation associated with the sliding door (single sliding door or double sliding door) including unlocking to opening the window or closing the window to locking can be successively performed all by one operation handle. Moreover, the opening support mechanism can be disposed at an arbitrary position and, as needed, a plurality of the mechanisms can be disposed by using the link bar to link the operation of the opening support mechanism of the sliding door and the mechanism operating the operation handle. Furthermore, the design is not impaired since the operations of locking, unlocking, and kicking-out of the sliding door are performed with one operation handle.

Claims

1. A lock device (10) equipped with an opening support mechanism, the device (10) comprising:

an operation mechanism (20) mounted to a stile (2c) of a sliding door (2) and configured to be operated with an operation handle (20a);
an opening support mechanism (60) configured to kick out the sliding door (2);
a link bar (50) configured to connect between the operation mechanism (20) and the opening support mechanism (60); and
a lock configured to unlock or lock the sliding door (2) in conjunction with turning of the operation handle (20a), wherein

the operation mechanism (20) includes a slider (40) configured to move vertically in conjunction with the turning of the operation handle (20a),
the opening support mechanism (60) includes:

a drive unit (54) connected to the link bar (50) while being away from the slider (40) at a predetermined interval, the link bar (50) being connected to the slider (40) and transmitting a vertical motion of the slider (40);
a kick-out member (63) configured to turn to press one of a sliding door jamb (1c) and a vertical frame in conjunction with the vertical motion of the drive unit (54); and
an operation delay unit (70) configured to delay a kick-out operation by the kick-out member (63) in order for the kick-out operation by the kick-out member (63) in the opening support mechanism (60) to be performed after the sliding door (2) is unlocked or locked by the lock.

2. The lock device (10) according to claim 1, wherein
the operation delay unit (70) is formed as an unlinked unit which is unlinked from the link bar (50) moving vertically in the opening support mechanism (60).

3. The lock device (10) according to claim 1 or 2, wherein
the lock device (10) is mounted to the stile (2c) of the sliding door (2) while being biased in a direction at which the lock device (10) protrudes from the stile (2c),
the lock device (10) is configured to:

be engaged with the link bar (50) to inhibit the vertical motion of the link bar (50) when the sliding door (2) is positioned away from a frame body (1a,1b,1c) at a predetermined distance; and
be brought into contact with one of the sliding door jamb (1c) and the vertical frame to be disengaged from the link bar (50) to allow both of the vertical motion of the link bar (50) and the turning of the operation handle (20a) when the sliding door (2) is positioned within the predetermined distance from the frame body (1a,1b, 1c).

4. The lock device (10) according to any one of claims 1 to 3, the device (10) further comprising:

a rectangular pressed member (34) configured to turn integrally with the operation handle (20a); and
a pressing member (32) that includes a contact face (32a) in surface contact with the pressed member (34), is arranged to sandwich the pressed member (34), and is biased toward an outer face of the pressed member (34) by a biasing unit (33), wherein

the pressing member (32) is configured to exert moment in a reverse turning direction on the pressed member (34) when the operation handle (20a) is turned to the farthest position.

5. A sliding door (2) comprising the lock device (10) according to any one of claims 1 to 4.

FIG.1

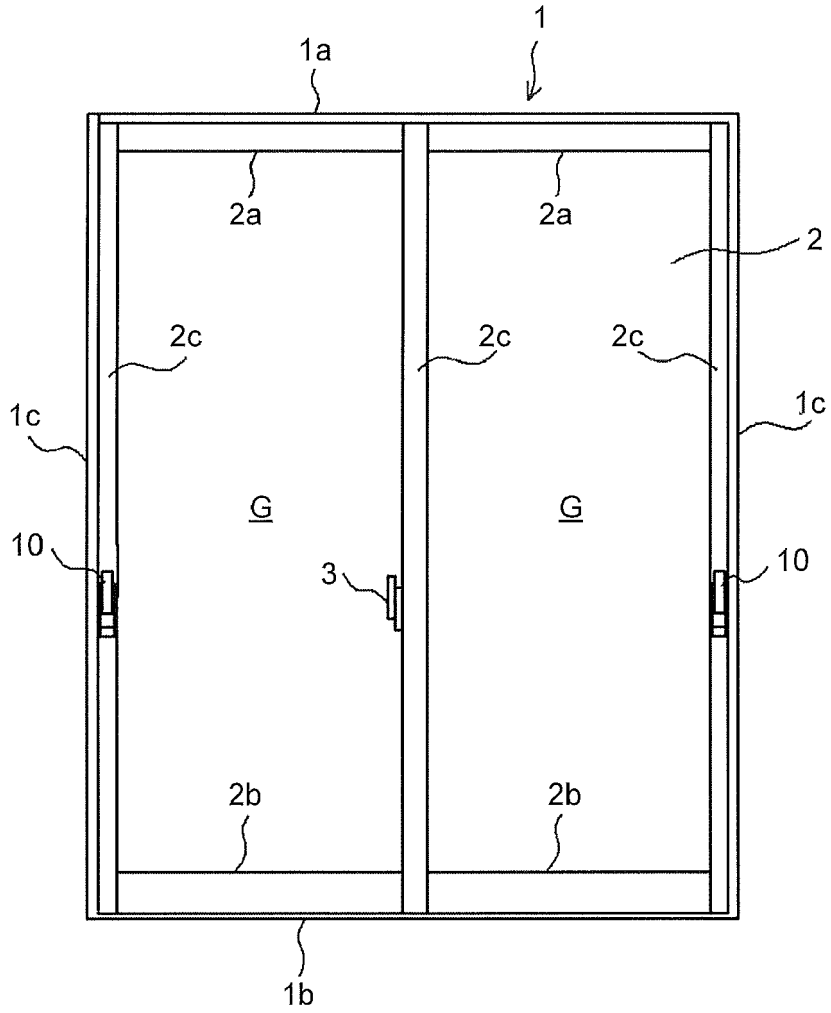


FIG.2

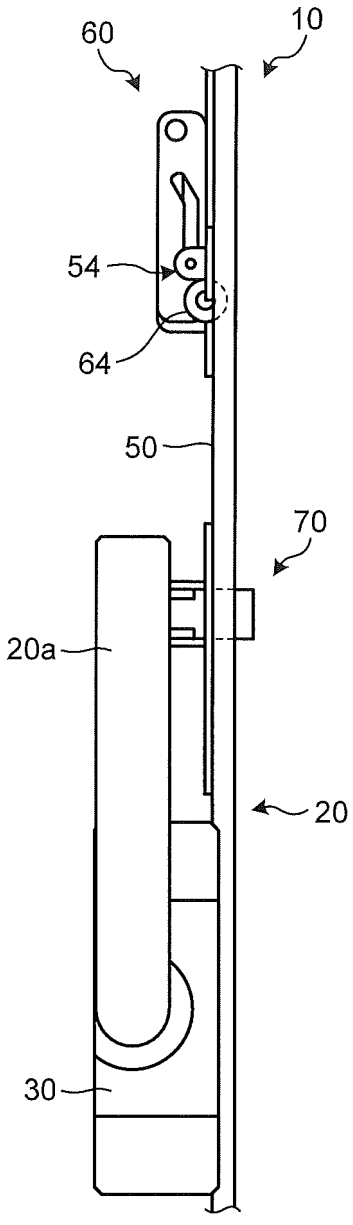
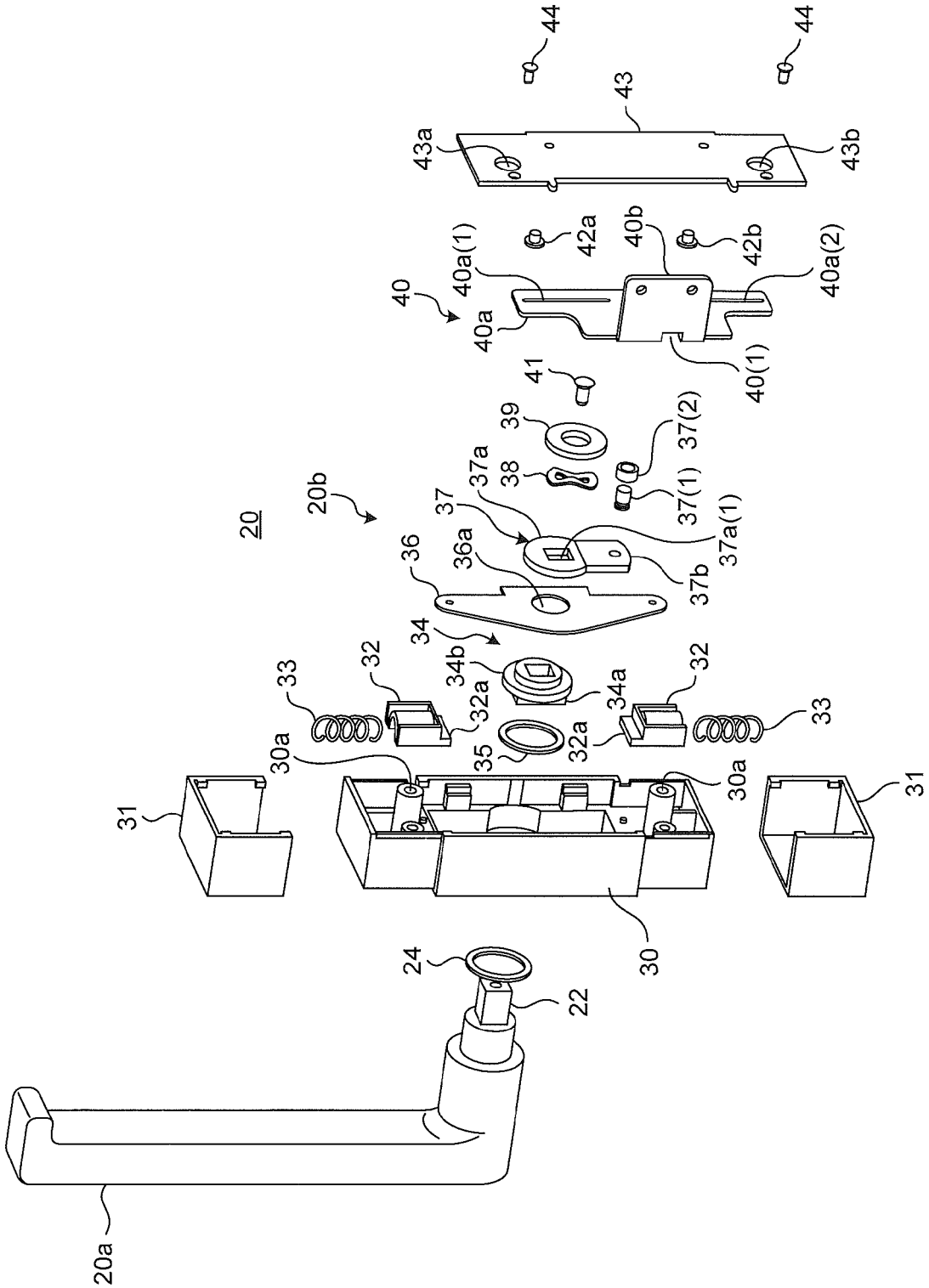


FIG.3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44
43
43a
43b
42a
40b
42b
40a(1)
40a(2)
40
40a
40(1)
41
39
37(2)
38
37a
37
37(1)
37a(1)
20
20b
36
36a
37b
34
34b
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30
24
22
20a

FIG.4

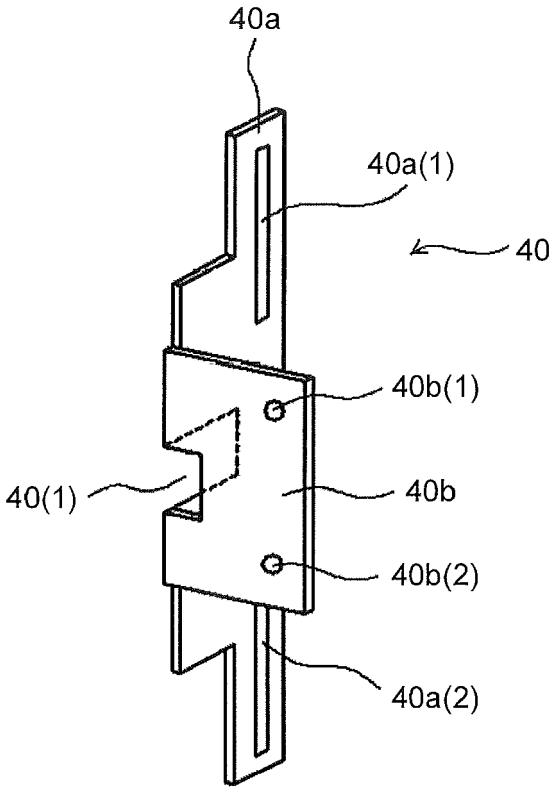


FIG.5A

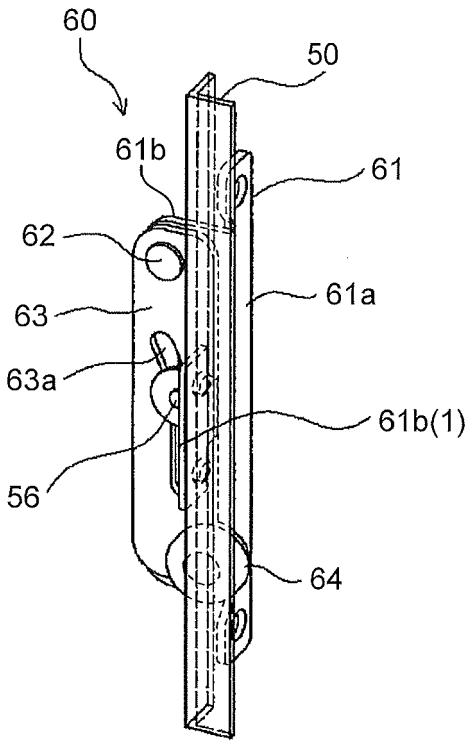


FIG.5B

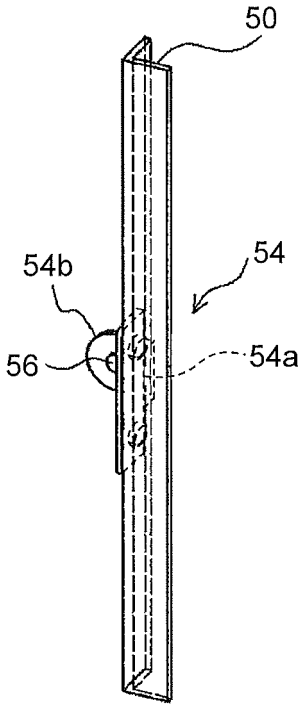


FIG.6

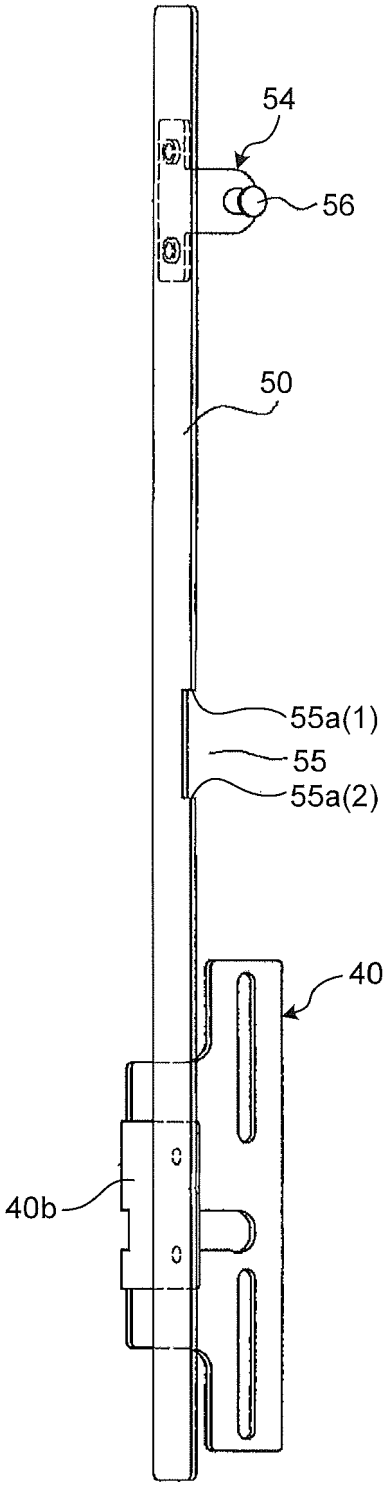


FIG.7A

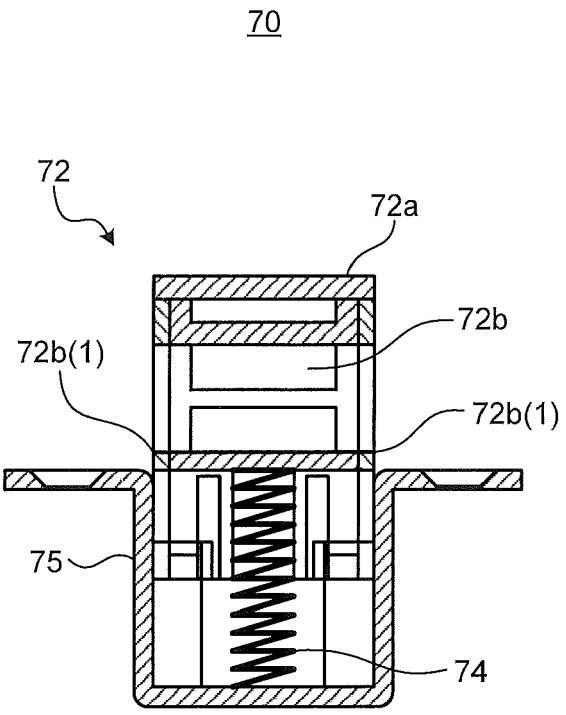


FIG.7B

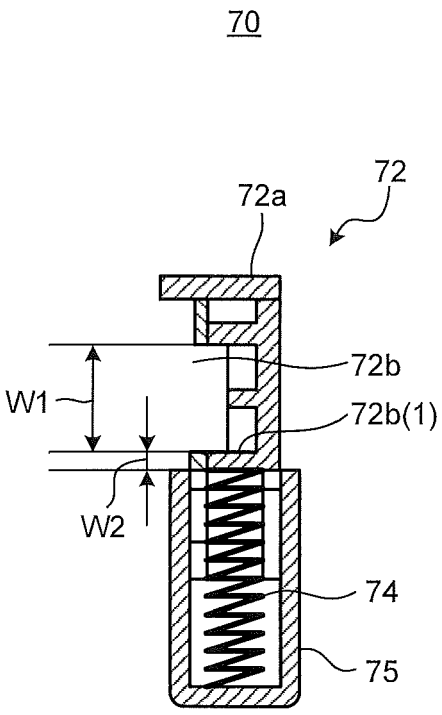


FIG.8A FIG.8B FIG.8C FIG.8D

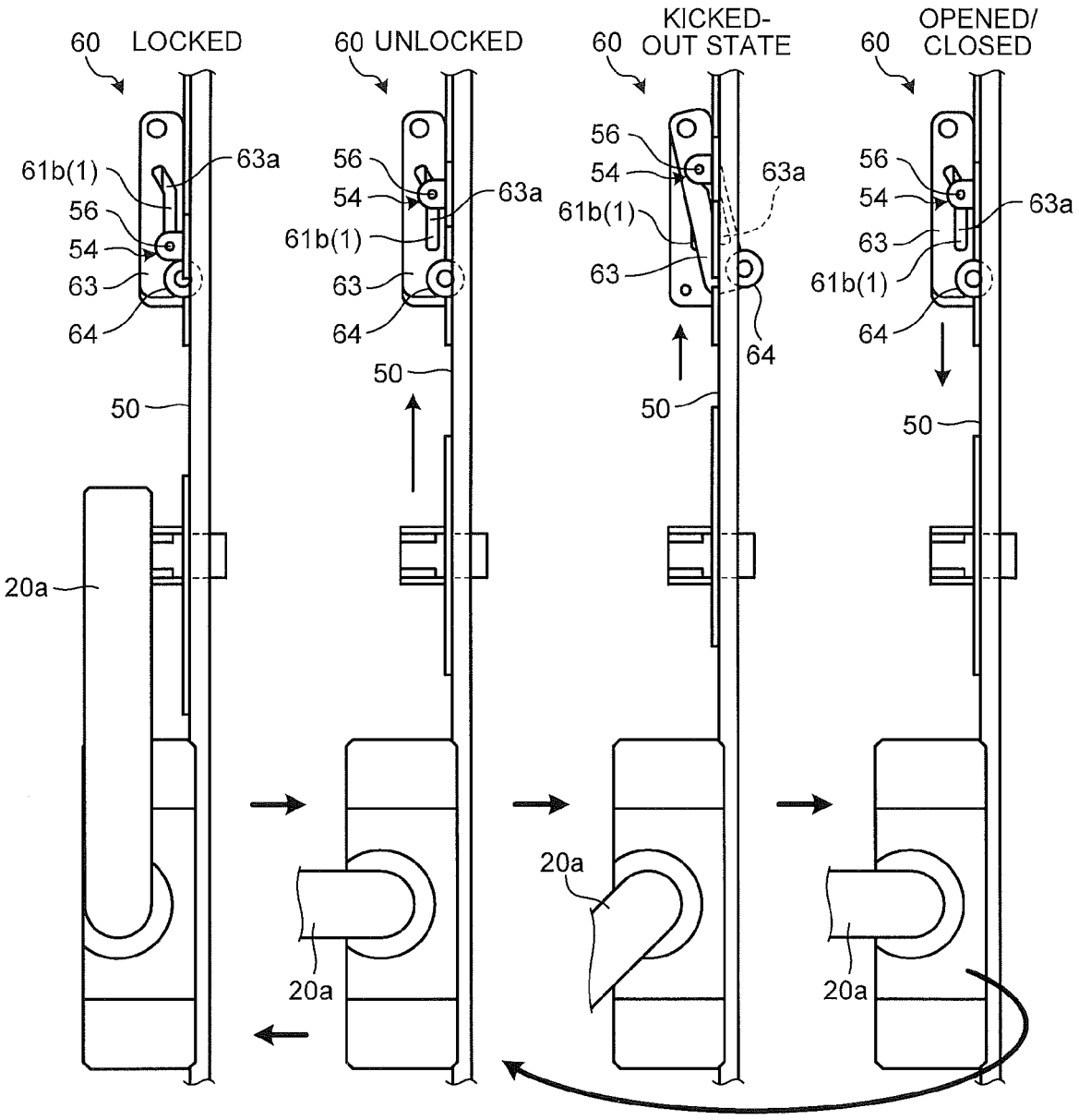


FIG.9A

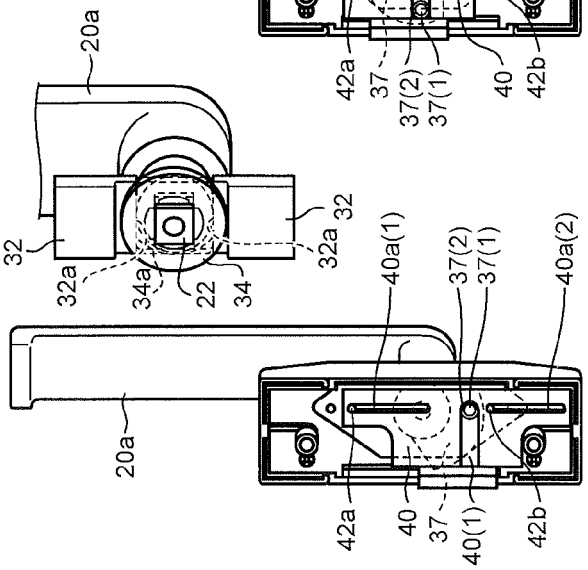


FIG.9B

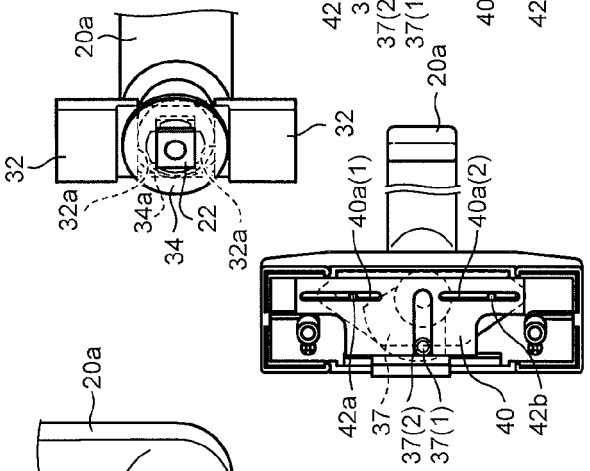


FIG.9C

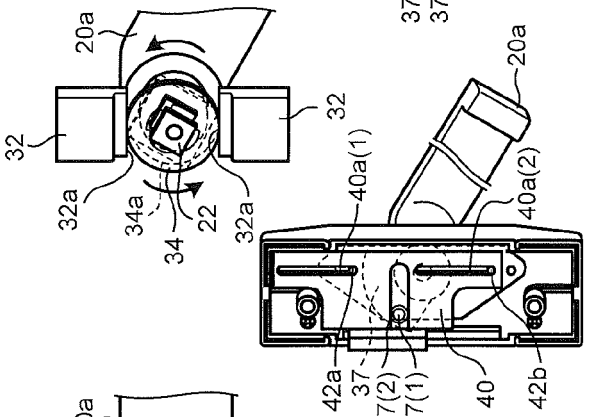


FIG.9D

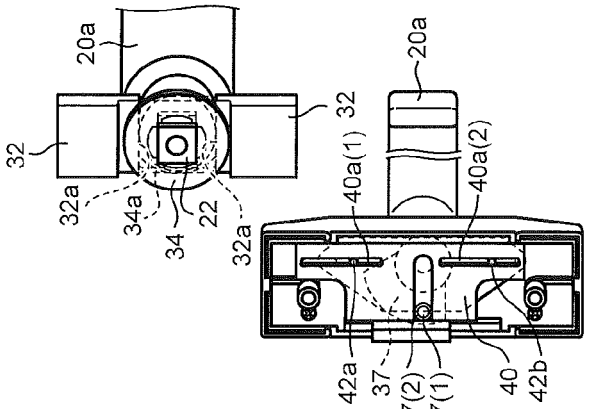


FIG.10A

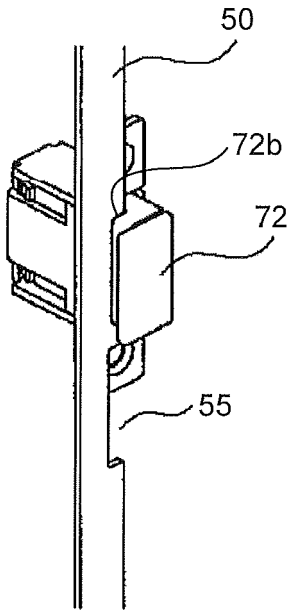


FIG.10B

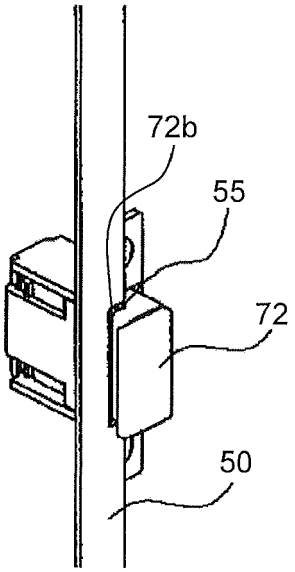


FIG.10C

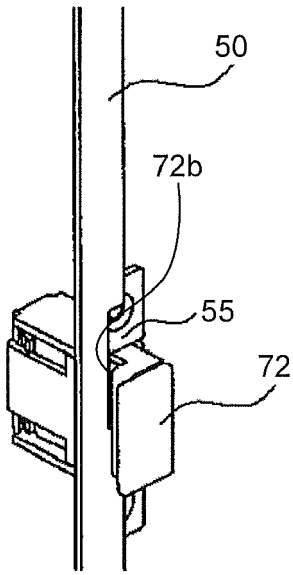


FIG.10D

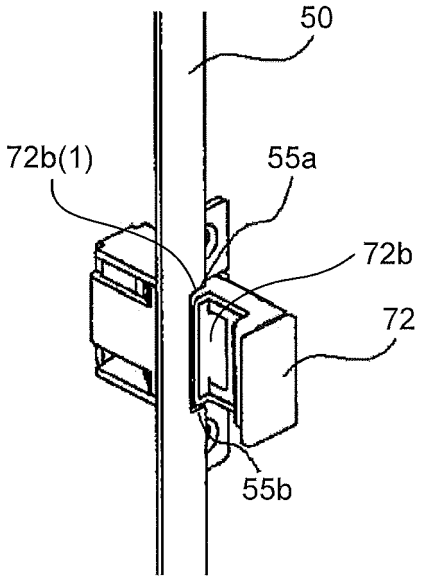
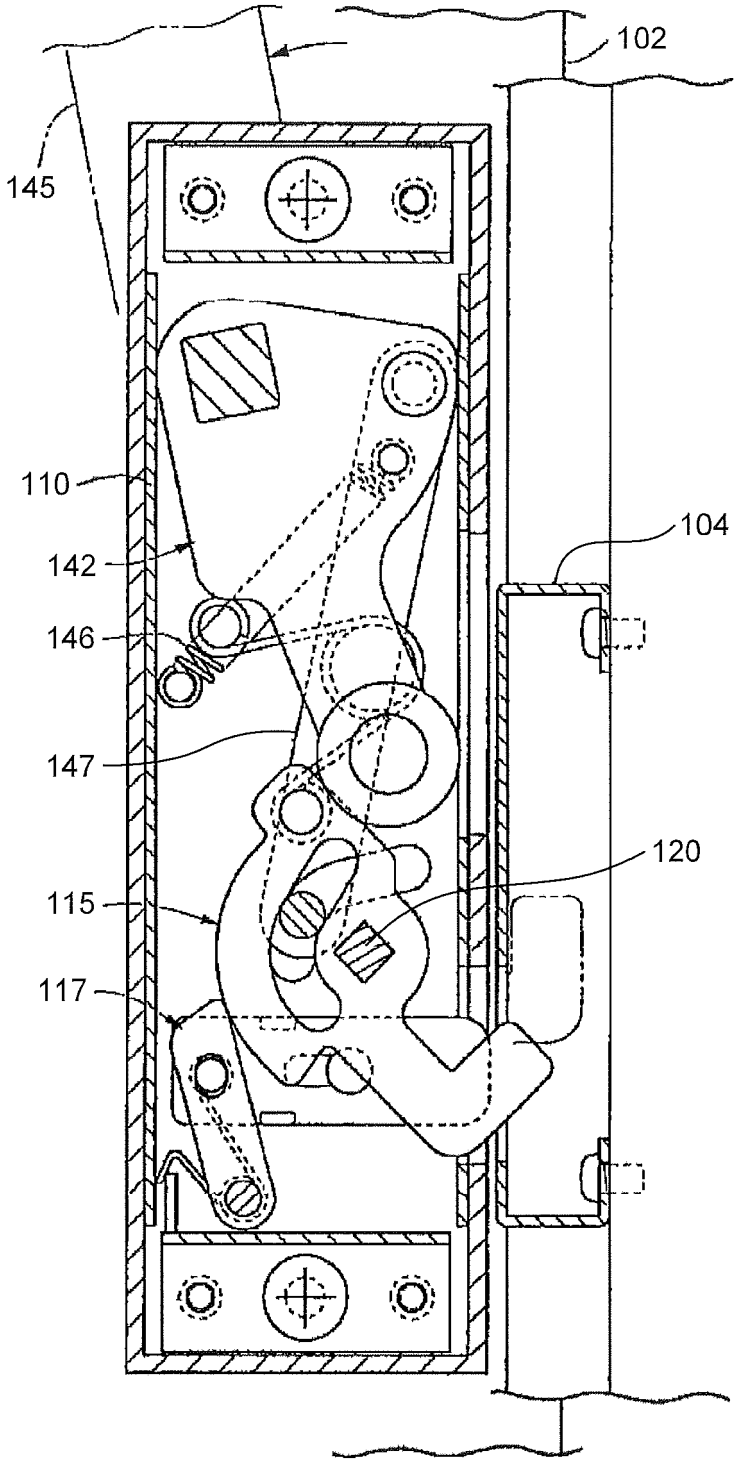


FIG.11



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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 5643

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A	* the whole document *	3,4	ADD. E05B63/20
A	US 2004/212198 A1 (GLOVER J RAYMOND [US]) 28 October 2004 (2004-10-28) * paragraph [0036] - paragraph [0039]; figures 1-6 * * paragraph [0045] *	1-3,5	E05B53/00
A	JP 2004 353378 A (TOSTEM CORP) 16 December 2004 (2004-12-16) * abstract; figures 1-21 *	1-5	
A	EP 1 431 481 A2 (GEZE GMBH [DE]) 23 June 2004 (2004-06-23) * paragraph [0030]; figures 1-3 *	1	

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E05B
E05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 January 2017	Koster, Michael

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EPO FORM 1503 03.82 (P04C01)

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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