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(54) **ASSIST MECHANISM FOR PIVOTING BODY**

(57) An assist mechanism includes a striker which is provided in a door, and a receiving member provided in a door frame and moving after capturing the striker at a predetermined forward-moving position of the door, to assist a forward movement of the door to a closing posi-

tion. The striker is supported in a striker base including an attachment portion relative to the door so as to be capable of adjusting a supporting position in a direction approximately along a rotational direction of the door by an adjusting device.

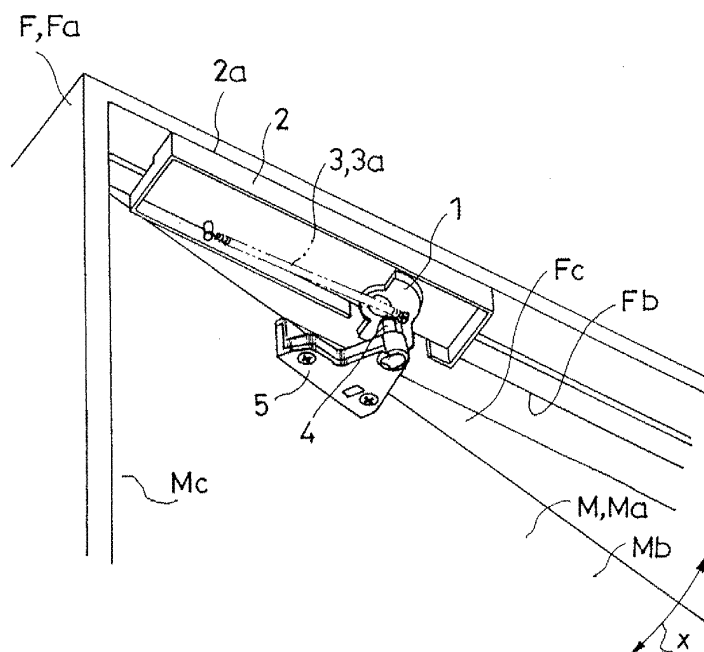


Fig. 1

Description

Field of Technology

[0001] The present invention relates to an improvement of a mechanism which functions so as to assist (aid) a forward movement thereof during a period from a predetermined forward-moving position to a forward-moving ending position relative to a rotational body which is moved forward toward the forward-moving ending position.

Background Art

[0002] There is a door closer constituted by attaching an engagement body to a door frame side, which assists a closure of a door by engaging a pin provided in the door just before the door is closed, and also by rotating due to urging means. (See Patent Document 1) On the other hand, there is a door-body closing device constituted by providing a pin on the door frame side, and by attaching an arm to a door side, which assists the closure of the door by engaging such pin, and also by rotating due to urging of a spring. (See Patent Document 2)

[0003] In this kind of mechanism, in a case when, for example, strain, warpage, misalignment of a combinational position, or the like occurs on the above-mentioned door side, or the door frame side, after the installation thereof, even if the door is closed up to a predetermined position, the pin is not allowed to be appropriately captured in the above-mentioned engagement body or an engagement portion of the arm, so that a desired movement of a forward-moving mechanism cannot be realized. However, in a case when such situation occurs, in the mechanism shown in Patent Documents 1 and 2, there is no alternative other than to reattach the pin to an appropriate position by removing the pin from the door or a door frame.

Prior Art Document

Patent Document

[0004]

Patent Document 1: Japanese Unexamined Patent Publication No. 2007-177459

Patent Document 2: Japanese Unexamined Patent Publication No. 2007-120140

Summary of the Invention

Problems to be Solved by the Invention

[0005] The main problem to be solved by this invention is to ensure that a positional adjustment of a striker captured in a receiving member can be easily and appropriately carried out in this kind of assist mechanism.

Means for Solving the Problems

[0006] In order to achieve the above-mentioned problem, in the present invention, an assist mechanism for a rotational body is an assist mechanism comprising a striker provided on one of either the rotational body or a supporting body rotatably supporting this rotational body; and a receiving member provided on the other of those, moving after capturing this striker at a predetermined forward-moving position of the rotational body, and assisting a forward movement of the rotational body to a forward-moving ending position. The striker is supported in a striker base comprising an attachment portion relative to one of either the rotational body or the supporting body so as to be capable of adjusting a supporting position by adjusting means.

[0007] When the rotational body is moved forward up to the predetermined forward-moving position, the striker is captured by the receiving member, and due to a movement of the receiving member after this capture, the forward movement of the rotational body toward the forward-moving ending position is assisted through the striker. However, assisting such forward movement cannot be realized unless the striker and the receiving member are respectively disposed appropriately. In a case when, for example, strain, warpage, misalignment of a combinational position, and the like occur on a rotational body side or a supporting body side, after installation thereof, even if the rotational body is moved forward, the striker cannot be appropriately captured in the receiving member, so that a desired movement of a forward-moving mechanism cannot be realized. According to such structure, due to the above-mentioned adjusting means, the supporting position of the striker can be adjusted without the necessity of reattachment of the striker base, so that an inadequate disposition of the striker relative to the receiving member which is caused due to the above-mentioned misalignment and the like can be corrected.

[0008] If the above-mentioned striker is supported in the striker base so as to be capable of adjusting the supporting position in a direction approximately along a rotational direction of the rotational body by the adjusting means, the supporting position of the striker in the direction approximately along the rotational direction of the rotational body can be adjusted without the necessity of the reattachment of the striker base. Also, when the above-mentioned striker is supported in the striker base so as to be capable of adjusting the supporting position in a direction crossing the rotational direction of the rotational body by the adjusting means, the supporting position of the striker in the direction crossing the rotational direction of the rotational body can be adjusted without the necessity of the reattachment of the striker base. Also, if such striker is supported in the striker base so as to be capable of adjusting the supporting position at least in the direction approximately along the rotational direction of the rotational body, and capable of adjusting the supporting position in the direction crossing the rotational

direction of the rotational body, by the adjusting means, the supporting position of the striker can be adjusted at least in two directions.

[0009] The above-mentioned adjusting means may be structured by combining a second part, including a latch-engaging portion relative to a latch-engaged portion formed in a first part, and supported in the striker base so as to be capable of being operated to be moved from a latch-engaging position wherein the latch-engaging portion is latched and engaged with this latch-engaged portion to a non-latch-engaging position which releases this latch and engagement, with the first part including the striker and supported in the striker base so as to be capable of moving in the direction approximately along the rotational direction of the rotational body. Further, at least one of the above-mentioned latch-engaging portion and the latch-engaged portion may be structured by providing in plurality in a moving direction of the first part.

[0010] In this case, urging means against a movement toward the non-latch-engaging position of the above-mentioned second part may be further provided.

[0011] In such case, in a case when the necessity for adjusting the supporting position of the striker in the direction approximately along the rotational direction of the rotational body is presented, after the first part is moved until the striker is positioned in an appropriate position by releasing the latch and engagement between the latch-engaging portion of the second part and the latch-engaged portion of the first part, the latch-engaging portion is latched and engaged with the latch-engaged portion again, so that the above-mentioned adjustment can be easily carried out. Also, if the above-mentioned urging means is provided, by operating the second part to move to the non-latch-engaging position against urging thereof, the latch and engagement between the above-mentioned latch-engaged portion and the latch-engaging portion is released, and also if this operation is halted, due to the above-mentioned urging, the latch-engaging portion and the latch-engaged portion can be latched and engaged.

[0012] The above-mentioned striker base may be structured by a main body portion supporting the striker, and a mount part including the attachment portion relative to one of either the rotational body or the supporting body, and also combined with this main body portion in a state allowing the main body portion to move in the direction crossing the rotational direction of this rotational body. Further, in the adjusting means, a movable part, including the latch-engaging portion relative to the latch-engaged portion formed in this mount part, and also supported in the main body portion of the striker base so as to be capable of being operated to be moved from the latch-engaging position wherein the latch-engaging portion is latched and engaged with this latch-engaged portion to the non-latch-engaging position which releases this latch and engagement, may be combined with this mount part. Further, at least one of the above-mentioned latch-engaging portion and the latch-engaged portion may be

structured so as to be provided in plurality in the direction crossing the rotational direction of the rotational body.

[0013] In this case, the urging means against the movement toward the non-latch-engaging position of the movable part may be further provided.

[0014] In such case, in a case when the necessity for adjusting the supporting position of the striker in the direction crossing the rotational direction of the rotational body is presented, after the main body portion is moved up to a position wherein the striker is positioned in the appropriate position by releasing the latch and engagement between the latch-engaging portion of the movable part and the latch-engaged portion of the mount part, the latch-engaging portion is latched and engaged with the latch-engaged portion again, so that the above-mentioned adjustment can be easily carried out. Also, if the above-mentioned urging means is provided, by operating the second part to move to the non-latch-engaging position against the urging thereof, the latch and engagement between the above-mentioned latch-engaged portion and the latch-engaging portion can be released, and also if this operation is halted, due to the above-mentioned urging, the latch-engaging portion and the latch-engaged portion can be latched and engaged.

Effect of the Invention

[0015] According to the present invention, the positional adjustment of the striker captured by the receiving member can be carried out without the necessity of removing a striker side, and such positional adjustment can be easily and appropriately carried out.

Brief Description of the Drawings

[0016]

Fig. 1 is a perspective structural view showing a usage state of an assist mechanism structured by applying the present invention, and shows an upper portion side of a door viewed from a lower side.

Fig. 2 is a structural view showing a receiving member viewed from the lower side so that a movement of the receiving member of the assist mechanism of Fig. 1 can be easily understood, and shows a state wherein the receiving member is in a standby position.

Fig. 3 is a structural view showing the receiving member viewed from the lower side so that the movement of the receiving member of the assist mechanism of Fig. 1 can be easily understood, and shows a state wherein the receiving member is moved up to a wrap-around position by capturing a striker.

Fig. 4 a perspective structural view showing members on a striker side structuring the assist mechanism viewed from an obliquely upper side.

Fig. 5 is a vertical cross-sectional structural view of the members on the striker side structuring the assist

mechanism.

Fig. 6 is a vertical cross-sectional structural view of the members on the striker side structuring the assist mechanism, and shows an aspect wherein a second part is operated to be pushed into a non-latch-engaging position.

Fig. 7 is a perspective structural view showing the members on the striker side structuring the assist mechanism viewed from an obliquely lower side.

Fig. 8 is a perspective structural view showing the members on the striker side structuring the assist mechanism viewed from the obliquely lower side, and shows an aspect wherein the second part is operated to be pushed into the non-latch-engaging position, and a first part is pulled out forward from a striker base.

Fig. 9 is a perspective structural view showing a condition wherein a base lower side structuring the members on the striker side structuring the assist mechanism is removed, and viewed from the obliquely lower side.

Fig. 10 is an exploded perspective structural view of the members on the striker side structuring the assist mechanism.

Fig. 11 is a perspective structural view showing a base upper side in the members on the striker side structuring the assist mechanism by being further exploded from the condition of Fig. 10.

Fig. 12 is a perspective structural view showing a modified example of one portion of the members on the striker side structuring the assist mechanism, and viewed from the obliquely lower side.

Fig. 13 is a vertical cross-sectional structural view of the modified example of one portion of the members on the striker side, and only shows a main body portion of the striker base.

Fig. 14 is a perspective structural view showing a condition wherein a mount part structuring the modified example of one portion of the members on the striker side, and the main body portion are separated, and shows a condition wherein the mount part is attached to a rotational body.

Fig. 15 is a perspective structural view showing the condition wherein the mount part structuring the modified example of one portion of the members on the striker side, and the main body portion are separated.

Fig. 16 is a perspective structural view showing a mid-flow state wherein the mount part structuring the modified example of one portion of the members on the striker side, and the main body portion are combined, and viewed from an attachment side to the rotational body.

Fig. 17 is a perspective structural view showing the modified example of one portion of the members on the striker side in a condition wherein the base lower side structuring the above is removed, and viewed from the obliquely lower side.

Fig. 18 is a perspective structural view showing the base upper side structuring the modified example of one portion of the members on the striker side by being further exploded from the condition of Fig. 17. Figs. 19(a) to 19(c) are perspective structural views respectively showing an aspect wherein the striker structuring the modified example of one portion of the members on the striker side is supported at a standard position; an aspect wherein the striker structuring the modified example of one portion of the members on the striker side is adjusted to a left side rather than this standard position; and an aspect wherein the striker structuring the modified example of one portion of the members on the striker side is adjusted to a right side rather than this standard position.

Best Modes of Carrying out the Invention

[0017] Hereinafter, with reference to Figs. 1 to 19(c), a typical embodiment of the present invention will be explained. Incidentally, Figs. 1 to 11 show a basic structural example of members on a striker 4 side of an assist mechanism structured by applying the present invention, and Figs. 12 to 19(c) show a modified example of one portion of the members on this striker 4 side.

[0018] The assist mechanism of a rotational body M according to the present embodiment functions in such a way as to assist (aid) a forward movement thereof during a period from a predetermined forward-moving position to a forward-moving ending position relative to the rotational body M which is moved forward toward the forward-moving ending position.

[0019] Such rotational body M is supported by a supporting body F so as to be capable of rotating to a forward movement and rotating to a backward movement. Typically, although a door, a hinged door, or the like is used, the rotational body M is not limited to the above provided that the rotational body M is supported by the supporting body F so as to be capable of rotating to the forward movement and rotating to the backward movement. In an illustrated example, an example in which the assist mechanism is provided in a door Ma and a door frame Fa is shown.

[0020] In the illustrated example, the door Ma as the rotational body M blocks an opening portion Fc which is in an inward portion of the door frame Fa in a closing position (forward-moving ending position) wherein one surface Mb, which becomes the forefront at a time of the forward movement, is bumped into a doorstop portion Fb of the door frame Fa as the supporting body F. Then, if the door Ma as the rotational body M is operated to be moved forward toward the above-mentioned closing position from an open position which does not block such opening portion Fc, in a process of this forward movement, the striker 4 structuring the assist mechanism abuts against a receiving member 1 structuring the assist mechanism, and the door Ma is subjected to the action

of the assist mechanism up to such closing position.

[0021] In the illustrated example, such striker 4 is attached to a side of the door Ma as the rotational body M. Therefore, in the illustrated example, the receiving member 1 is provided on a side of the door frame Fa as the supporting body F. Incidentally, aside from the illustrated example, even if the striker 4 is attached to the side of the door frame Fa as the supporting body F, and the receiving member 1 is provided on a door Ma side as the rotational body M, the forward movement of such rotational body M can be assisted from mid-flow thereof of the forward movement.

[0022] In the illustrated example, the striker 4 is positioned in front of one surface Mb, which becomes the forefront at the time of the forward movement in the door Ma, by a striker base 5. More specifically, in the illustrated example, such striker 4 is provided on an upper end side of the door Ma on a door hinge Mc side of the door Ma. The striker base 5 includes an attachment portion 5a relative to the door Ma as the rotational body M, and also supports the striker 4 in an end portion 5b positioned in front of this attachment portion 5a. Such striker 4 is structured as an axis-like body protruding upward from the end portion 5b of this striker base 5. An upper end of the striker 4 is positioned in approximately the same level as an upper end of the door Ma, or in a level slightly lower than this, and at a time of the forward movement toward the closing position of the door Ma, the striker 4 is captured by the receiving member 1 provided in a frame upper portion of the door frame Fa just before the door Ma is completely closed. An upper surface of the end portion of such striker base 5 is positioned in a lower portion of a level of a lower part of the after-mentioned main body 2 which rotatably houses the receiving member 1.

[0023] On the other hand, the receiving member 1 is structured so as to move after capturing the striker 4 at the predetermined forward-moving position of the rotational body M, and to assist the forward movement of the rotational body M to the forward-moving ending position.

[0024] In the illustrated example, such receiving member 1 is rotatably combined with the main body 2 so as to move between a standby position and a wrap-around position. Such main body 2 comprises a ceiling portion 2a as an attachment portion to the frame upper portion of the door frame Fa, and the receiving member 1 is rotatably supported in the main body 2 with a vertical axis 2b protruding downward from the ceiling portion 2a of this main body 2. Such receiving member 1 comprises an approximately fan-shaped outline in a state viewed from a bottom face, and also comprises an axis hole 1a relative to the above-mentioned vertical axis 2b in a main part of this fan shape. Also, in such receiving member 1, a capture recess 1c is formed in such a way as to be open in a fan-shaped border 1b with the above-mentioned fan shape, and also to be recessed toward an axis hole 1a side from this fan-shaped border 1b. Then, in the illustrated example, in the above-mentioned standby position, an entrance 1d of the capture recess 1c of the

receiving member 1 is faced to an approaching side, i.e., a front side of the door Ma at the time of the forward movement, and also (Fig. 2) if the door Ma is moved forward to the capture recess 1c of the receiving member 1, which is in this standby position, up to the predetermined forward-moving position, the striker 4 is made so as to be entered. (In the forward movement, an inner wall 1e on a front side among recess inner walls 1e, 1f, which is located on an entrance 1d side of the capture recess 1c which is in the standby position, is located laterally from a movement locus z of the striker 4, and the inner wall 1f on a back side is allowed to be positioned on this movement locus z (Fig. 2).) Then, if the striker 4 is entered into the capture recess 1c in this manner, the receiving member 1 is positively rotated toward the wrap-around position which turns the entrance 1d of the capture recess 1c toward a backward side, and also this normal rotation is subjected to an urging force of urging means 3 from mid-flow thereof, so that by the receiving member 1 which is positively rotated in this manner, the forward movement toward the forward-moving ending position of the door Ma is assisted. In the illustrated example, such urging means 3 is structured by a helical extension spring 3a provided in the main body 2 in such a way that one spring end 3b is fastened to a fan-shaped border 1b side of the receiving member 1, and the other spring end 3c is fastened to the main body 2, and also that a size between both these spring ends 3b, 3c reaches its maximum size in an intermediate position between the standby position and the wrap-around position of the receiving member 1. Then, such spring 3a allows to assist the forward movement of the above-mentioned door Ma, and to maintain states wherein the receiving member 1 is in the standby position and the wrap-around position. Namely, in the illustrated example, such spring 3a is extended the most at the above-mentioned intermediate position wherein both the spring ends 3b, 3c and the vertical axis 2b are located on the approximately same virtual straight line. Thereby, if the receiving member 1, which has received the striker 4 in the capture recess 1c, is moved along with the forward movement of the door Ma up to a position which exceeds the intermediate position from the standby position, the receiving member 1 is forcibly rotated positively up to the wrap-around position after the intermediate position by urging of the above-mentioned spring 3a so as to assist the forward movement of the door Ma. Also, when the receiving member 1 is in the standby position, the positive rotation of the receiving member 1 extends the above-mentioned spring 3a, and also when the receiving member 1 is in the wrap-around position, a reverse rotation of the receiving member 1 also extends the above-mentioned spring 3a. Accordingly, states wherein the receiving member 1 is in the standby position and in the wrap-around position, are respectively maintained by such spring 3a. If the above-mentioned positive rotation of the receiving member 1 is subjected to a braking force by using a damper device and the like which are not shown in the drawings, the forward

movement of the assisted door Ma can be carried out slowly. If the door Ma which is in the forward-moving ending position is moved backward, the receiving member 1 which has captured the striker 4 is rotated reversely along with the above-mentioned backward movement up to the standby position, and if the receiving member 1 reaches the standby position, the striker 4 slips out of the capture recess 1c, and is released, so that the door Ma is allowed to move backward.

[0025] Also, in the assist mechanism according to the present embodiment, the above-mentioned striker 4 is supported in the striker base 5 so as to be capable of adjusting a supporting position in a direction approximately along a rotational direction x of the rotational body M by an adjusting means 6.

[0026] If the door Ma, as the rotational body M, is moved forward up to the predetermined forward-moving position, the striker 4 is captured by the receiving member 1, and due to the movement of the receiving member 1 after this capture, the forward movement of the door Ma toward the forward-moving ending position is assisted through the striker 4. However, assisting such forward movement cannot be realized unless the striker 4 and the receiving member 1 are respectively disposed appropriately. In a case when, for example, strain, warpage, misalignment of a combinational position, and the like occur on the door Ma side as the rotational body M, or a door frame Fa side as the supporting body F, after the installation thereof, even if the door Ma is moved forward, the striker 4 cannot be appropriately captured by the receiving member 1, so that a desired movement of the assist mechanism cannot be realized. In the present embodiment, due to the above-mentioned adjusting means 6, the supporting position of the striker 4 in the direction approximately along the rotational direction of the rotational body M can be adjusted without the necessity of reattachment of the striker base 5, so that an inadequate disposition of the striker 4 relative to the receiving member 1 which is caused due to the above-mentioned misalignment and the like, can be corrected.

[0027] In the present embodiment, such adjusting means 6 is structured by combining a first part 61 including the striker 4 and a second part 62.

[0028] The first part 61 is supported in the striker base 5 so as to be capable of moving in the direction approximately along the rotational direction x of the rotational body M. On the other hand, the second part 62 includes a latch-engaging portion 62a relative to a latch-engaged portion 61a formed in the first part 61. Also, the second part 62 is supported in the striker base 5 so as to be capable of being operated to be moved from a latch-engaging position wherein the latch-engaging portion 62a is latched and engaged with this latch-engaged portion 61a to a non-latch-engaging position which releases this latch and engagement.

[0029] In the illustrated example, the striker base 5 is structured by combining a base lower side 51 comprising a vertical attachment plate portion 51a which becomes

the attachment portion 5a relative to one surface Mb of the door Ma, and a cap plate portion 51c protruding laterally from a lower border portion of this attachment plate portion 51a; and a base upper side 52 comprising a vertical plate portion 52a additionally placed in a front surface of the attachment plate portion 51a of the base lower side 51, and a case portion 52c opening a lower surface protruding forward from this vertical plate portion 52a.

[0030] The first part 61 is housed in the case portion 52c of such base upper side 52 so as to be capable of moving back and forth. Also, the second part 62 is housed in the case portion 52c of such base upper side 52 so as to be capable of moving up and down. Moreover, in a state wherein the after-mentioned urging means 63 of the second part 62 is housed in the case portion 52c of the base upper side 52, the base lower side 51 and the base upper side 52 are combined in such a way that the vertical plate portion 52a of the base upper side 52 is additionally placed in a front surface 51b of the attachment plate portion 51a of the base lower side 51, and that the lower surface of the case portion 52c of this base upper side 52 is blocked by the cap plate portion 51c of the base lower side 51. In the illustrated example, from a state wherein the base upper side 52 and the base lower side 51 are combined in this manner, both are integrated by being screwed shut by using screw holes shown by symbols 51f, 52i in the drawings. At a protruding end of the case portion 52c of the base upper side 52, an open portion 52j allowing the first part 61 to pass through is formed, and the first part 61 is combined with the striker base 5 in a state wherein a front end 61b side thereof is protruded forward from this open portion 52j. The striker 4 is provided on the front end 61b of the first part 61 protruded to an outer side of the striker base 5 through this open portion 52j in such a way as to protrude upward from there. In such first part 61, a portion ranging from an approximately intermediate position of a front-back direction thereof to a back end is divided into right and left, and the second part 62 is housed between divided right-and-left wall portions 61c, 61c so as to be capable of moving up and down. Also, in the illustrated example, a compression coil spring 63a which becomes the urging means 63 is housed between an upper-portion inner surface 52h of the case portion 52c of the base upper side 52 and the second part 62. The second part 62 is usually positioned in the latch-engaging position wherein a lower portion 62b thereof is pressed against an inner surface 51d of the cap plate portion 51c of the base lower side 51 by this spring 63a. (Fig. 5) In a center of a lower portion of the second part 62, an operating convex portion 62c is formed, and also in the cap plate portion 51c of the base lower side 51, a window hole 51e with a size for only housing this operating convex portion 62c is formed.

[0031] Then, in the present embodiment, at least one of the above-mentioned latch-engaging portion 62a and the latch-engaged portion 61a is provided in plurality in a moving direction y of the first part 61. In the illustrated

example, a plurality of latch-engaged portions 61a is provided in the first part 61 in the moving direction y thereof, and also a plurality of latch-engaging portions 62a is provided in the second part 62 in the moving direction y of the first part 61 as well.

[0032] Thereby, in the present embodiment, in a case when the necessity for adjusting the supporting position of the striker 4 in the direction approximately along the rotational direction x of the rotational body M is presented, after the first part 61 is moved until the striker 4 is positioned in an appropriate position by releasing the latch and engagement between the latch-engaging portions 62a of the second part 62 and the latch-engaged portions 61a of the first part 61, the latch-engaging portions 62a are latched and engaged with the latch-engaged portions 61a again, so that the above-mentioned adjustment can be easily carried out.

[0033] More specifically, in the present embodiment, the latch-engaged portions 61a of the first part 61 are formed only on a lower side of the right-and-left wall portions 61c, 61c in an inner surface (a face on a side facing the other wall portion 61c) of the above-mentioned right-and-left wall portions 61c, 61c. If the second part 62 is operated to be moved upward against urging of the spring 63a as the above-mentioned urging means 63, the latch and engagement between the latch-engaged portions 61a and the latch-engaging portions 62a of the second part 62 are released, and also if this operation is halted, due to the above-mentioned urging, the latch-engaging portions 62a and the latch-engaged portions 61a can be latched and engaged. Namely, in the present embodiment, the adjusting means 6 comprises the urging means 63 against the movement toward the non-latch-engaging position of the second part 62. Then, in the illustrated example, a moving operation toward the non-latch-engaging position of the second part 62 for such adjustment can be carried out from a lower side of the striker base 5 by pushing the operating convex portion 62c by a tip of a driver and the like through the above-mentioned window hole 51e.

(Fig. 8)

[0034] Specifically, in the illustrated example, in the case portion 52c of the base upper side 52, a guide housing portion 52d for the first part 61 ranging from the above-mentioned open portion 52j to the vertical plate portion 52a is formed. The first part 61 has the minimum protruding size from the open portion 52j at a position wherein a back end thereof is bumped into an inner surface of the vertical plate portion 52a. In the right-and-left wall portions 61c, 61c, convex portions 61d protruding outward from a respective outer surface are formed in the approximately intermediate position of the front-back direction of the first part 61. Also, on an open portion 52j side in the guide housing portion 52d, retaining portions 52e, in which the convex portions 61d bump into from behind when the first part 61 is moved forward, are

formed. (Fig. 11) The first part 61 has the maximum protruding size from the open portion 52j at a position wherein the convex portions 61d are bumped into the retaining portions 52e.

[0035] Inside such guide housing portion 52d, and in a portion between the right-and-left wall portions 61c, 61c of the first part 61 positioned inside this guide housing portion 52d, a guide wall portion 52f is formed by leaving a space relative to the inner surface of the vertical plate portion 52a. The second part 62 is sandwiched between this guide wall portion 52f and the vertical plate portion 52a facing this from a back and a front so as to be capable of moving up and down. (Fig. 5) In the illustrated example, the second part 62 is structured so as to form a rectangle plate shape long in the front-back direction, and in both side portions on a width side thereof, grooves 62d are formed respectively in an up-and-down direction. Also, in the above-mentioned guide wall portion 52f and the vertical plate portion 52a facing this, ribs 52b, 52g respectively entering into the grooves 62d are formed.

[0036] In the illustrated example, a size of the up-and-down direction in formation portions of the right-and-left wall portions 61c, 61c of the first part 61 is approximately equal to a size between the upper-portion inner surface 52h of the case portion 52c of the base upper side 52 and the inner surface 51d of the cap plate portion 51c of the base lower side 51. On the other hand, a size of the up-and-down direction of the second part 62 is approximately half the size of the up-and-down direction of the formation portions of the right-and-left wall portions 61c, 61c of the first part 61. Then, the latch-engaged portions 61a of the first part 61 are formed on a lower side from an approximately intermediate position of the up-and-down direction of the above-mentioned right-and-left wall portions 61c, 61c, and the latch-engaging portions 62a of the second part 62 are formed on both side portions on a length side thereof.

[0037] The latch-engaged portions 61a of the first part 61 are structured so as to form a rib shape respectively protruding from the inner surface of the right-and-left wall portions 61c, 61c. A plurality of latch-engaged portions 61a is provided by leaving an equal space between the adjacent latch-engaged portions 61a in a front-back direction respectively in the right-and-left wall portions 61c, 61c. Each latch-engaged portion 61a forms a rib shape with an approximately triangle mountain shape in cross section extending in the up-and-down direction. On the inner surfaces of the right-and-left wall portions 61c, 61c of the first part 61, a rack-shaped portion 61e, comprising a plurality of such latch-engaged portions 61a with a wave shape in cross-section, is formed.

[0038] On the other hand, the latch-engaging portions 62a of the second part 62 are respectively structured in such a way as to form a rib shape respectively protruding from the both side portions on the length side thereof. A plurality of latch-engaging portions 62a is provided by leaving an equal space between the adjacent latch-engaging portions 62a in a front-back direction respectively

in such both side portions. Each latch-engaging portion 62a forms a rib shape with an approximately triangle mountain shape in cross section extending in the up-and-down direction. On both side portions on the length side of the second part 62, a rack-shaped portion 62e, comprising a plurality of latch-engaging portions 62a with a wave shape in cross-section, is also formed respectively.

[0039] Then, in the illustrated example, in the above-mentioned latch-engaging position, the rack-shaped portion 62e of the second part 62 engages the rack-shaped portion 61e of the right-and-left wall portions 61c, 61c of the first part 61, which corresponds to the above. Namely, even when the first part 61 is located in any position of the front-back direction, the second part 62 is located between the right-and-left wall portions 61c, 61c of the first part 61. Also, the corresponding rack-shaped portion 62e respectively formed in the second part 62 engages the rack-shaped portion 61e formed in the right-and-left wall portions 61c, 61c of the first part 61 in such a way as to house the latch-engaging portion 62a between the neighboring latch-engaged portions 61a, 61a, and as to house the latch-engaged portion 61a between the neighboring latch-engaging portions 62a, 62a. Thereby, in the illustrated example, the first part 61 is allowed to be stably positioned in each adjustment position thereof. Namely, in a state allowing a smooth moving operation (in the illustrated example, an upward push-in operation) to the non-latch-engaging position of the second part 62, a plurality of latch-engaging portions 62a and the latch-engaged portions 61a are allowed to be latched and engaged. After a protruding amount of the first part 61 from the striker base 5 is adjusted by operating the second part 62 to move to the non-latch-engaging position, if this moving operation is halted, due to the urging of the spring 63a as the above-mentioned urging means 63, the second part 62 is moved to the latch-engaging position while the rack-shaped portions 62e thereof are being engaged with the rack-shaped portions 61e of the first part 61 again.

[0040] Also, in the illustrated example, the striker is housed in a housing hole 61f whose hole axis formed in the front end 61b of the first part 61 is formed along the up-and-down direction so as to be capable of moving in the up-and-down direction. In the illustrated example, the striker 4 is structured by forming a flange 4a at a lower end of a cylinder-shaped body. In a hole-opening portion of an upper portion of the housing hole 61f, an engaging-abutting portion 61g against such flange 4a is formed, and a compression coil spring 61i is installed between a cover 61h blocking a hole opening of a lower portion of the housing hole 61f and the lower end of the cylinder-shaped body structuring the striker 4. The striker 4 is provided in the first part 61 so as to protrude an upper portion of the flange 4a of the cylinder-shaped body from the hole opening of the upper portion of the housing hole 61f by urging of this spring 61i. (Fig. 5)

[0041] If the above-mentioned striker base 5 is structured by a stationary-side member comprising the attach-

ment portion 5a relative to one of either the rotational body M or the supporting body F; and a movable-side member supporting the striker 4, and also combined so as to be capable of adjusting a combinational position in a direction crossing the rotational direction x of the rotational body M relative to this stationary-side member, a positional adjustment of the striker 4 can be easily and appropriately carried out not just in the direction approximately along the rotational direction x of the rotational body M, which is in the front-back direction in the illustrated example, but also in the direction crossing the rotational direction x of this rotational body M, which is in a right-and-left direction in the illustrated example. Typically, the above-mentioned movable-side member is structured by the above-mentioned base upper side 52 and the base lower side 51, and also such movable-side member is combined with the stationary-side member so as to be capable of adjusting the position in the right-and-left direction, so that in the illustrated example, this stationary-side member is attached to the door Ma as the rotational body M.

[0042] Figs. 12 to 19(c) show the modified example of one portion wherein a main body portion 5' of the striker base 5, as such movable-side member, is provided on a rotational body M side through a mount part 53, as such stationary-side member. In this modified example of one portion, the striker base 5 is structured by the above-mentioned striker 4; the base lower side 51; the main body portion 5' comprising the base upper side 52 and the adjusting means 6; and the mount part 53. The attachment portion 5a relative to the rotational body M is provided in such mount part 53. Then, the striker 4 is supported so as to be capable of adjusting the supporting position at least in the direction approximately along the rotational direction x of the rotational body M, and capable of adjusting the supporting position in a direction x' crossing the rotational direction x of the rotational body M by such adjusting means 6.

[0043] In this modified example of one portion, the main body portion 5' of such striker base 5 is combined with the mount part 53 in a state capable of moving in the direction x' crossing the rotational direction x of the rotational body M.

[0044] Such mount part 53 is structured in such a way as to form an approximately rectangular plate shape which is long in the right-and-left direction and short in the up-and-down direction. Two through holes 53a long in the up-and-down direction are provided between both ends of the right and left of this mount part 53 by leaving a space in the right-and-left direction thereof. The mount part 53 is fastened to the rotational body M by a screw by using the through holes 53a in a state wherein one surface side thereof is contacted with the rotational body M. (Fig. 14) Namely, in this modified example of one portion, one surface of such mount part 53 functions as the above-mentioned attachment portion 5a of the striker base 5. In the illustrated example, the after-mentioned latch-engaged portions 53b are formed in a front surface

portion opposite to the attachment portion 5a of such mount part 53.

[0045] Also, in this modified example of one portion, the base lower side 51 differs from the basic structural examples shown in Figs. 1 to 11, and does not include the attachment plate portion 51a. In this modified example of one portion, on a back end border of the cap plate portion 51c, the base lower side 51 comprises a pressing rib 51g protruding upward along this back end border.

[0046] Also, in this modified example of one portion, on an upper end of the vertical plate portion 52a, the base upper side 52 comprises a canopy-like portion 52k protruding backward along this upper end. Also, on a back end border of this canopy-like portion 52k, a pressing rib 52m protruding downward along this back end border is provided.

[0047] Then, in this modified example of one portion, on an upper surface side of the cap plate portion 51c of the base lower side 51, a groove portion 51h housing a lower end of the vertical plate portion 52a of the base upper side 52 is formed in front of the pressing rib 51g. In a combined state by housing the lower end of the vertical plate portion 52a in this groove portion 51f, a space corresponding to a thickness of an up-and-down border portion of the mount part 53 is formed among the pressing rib 52m of the base upper side 52; the pressing rib 51g of the base lower side 51; and the vertical plate portion 52a of the base upper side 52. Also, a space corresponding to a width of the mount part 53 is formed between the canopy-like portion 52k of the base upper side 52 and the cap plate portion 51c of the base lower side 51. (Fig. 13)

[0048] Then, in this modified example of one portion, from a state wherein the mount part 53 is attached to the rotational body M as mentioned above, this mount part 53 is fitted in a fitting space 5c of the mount part 53 formed among the pressing rib 52m of the base upper side 52; the pressing rib 51g of the base lower side 51; and the vertical plate portion 52a of the base upper side 52. Accordingly, the main body portion 5' of the striker base 5 is combined with the mount part 53 in the state capable of moving in the direction x' crossing the rotational direction x of the rotational body M. In the illustrated example, in a left side of the main body portion 5' in Fig. 14, an introduction opening 5d of the mount part 53 to the fitting space 5c is formed between the pressing rib 52m of the base upper side 52 and the pressing rib 51g of the base lower side 51. Also, by sliding and moving the main body portion 5' to the left side in Fig. 14 in such a way that a right end of the mount part 53 in Fig. 14 is entered into the fitting space 5c from this introduction opening 5d, the mount part 53 and the main body portion 5' are combined. A side opposite to the introduction opening 5d in the fitting space 5c is blocked, and the main body portion 5' can slide and move toward the left side up to a position wherein the right end of the mount part 53 in Fig. 14, which has been combined with the main body portion 5' in this manner, bumps into this blocking portion.

[0049] Also, in this modified example of one portion, the adjusting means 6 includes latch-engaging portions 62f relative to the latch-engaged portions 53b formed in this mount part 53. Also, the adjusting means 6 is structured by combining a movable part supported in the striker base 5 so as to be capable of being operated to be moved from the latch-engaging position wherein the latch-engaging portions 62f are latched and engaged with the latch-engaged portions 53b to the non-latch-engaging position which releases this latch and engagement, with the above-mentioned mount part 53. In the illustrated example, the latch-engaging portions 62f relative to such mount part 53 are integrally provided in the second part 62 of the basic structural example shown in Figs. 1 to 11, and this second part 62 functions as the above-mentioned movable part.

[0050] In this modified example of one portion, a split-notch portion 52n allowing inside and outside of the main body portion 5' to communicate is formed in an approximately intermediate position of a right-and-left direction in the vertical plate portion 52a of the base upper side 52. Then, through this split-notch portion 52h, a back end portion 62g of the second part 62 is entered into the above-mentioned fitting space 5c, and the above-mentioned latch-engaging portions 62f are formed in this back end portion 62g.

[0051] In the illustrated example, the above-mentioned split-notch portion 52h is divided into right and left by one portion 52o of the vertical plate portion 52a comprising the above-mentioned rib 52b which is left in the approximately intermediate position of the right-and-left direction thereof. On the other hand, a guide hole 62h passing through the second part 62 in the up-and-down direction is formed between the back end portion 62g positioned at a back (an attachment portion 5a side) among the both side portions on the width side of the second part 62, and the operating convex portion 62c. The second part 62 is supported in the base upper side 52 so as to be capable of moving up and down in a state wherein one portion 52o of the above-mentioned vertical plate portion 52a is passed through this guide hole 62h.

[0052] Also, in this modified example of one portion, both of the above-mentioned latch-engaging portions 62f and the latch-engaged portions 53b are provided in plurality in the direction x' crossing the rotational direction x of the rotational body M.

[0053] The latch-engaged portions 53b of the mount part 53 are formed in a lower border portion of the front surface portion thereof. Such latch-engaged portions 53b are structured in such a way as to form a rib shape protruding from the front surface portion, and a plurality of latch-engaged portions 53b is provided by leaving an equal space between the adjacent latch-engaged portions 53b in a right-and-left direction. Each latch-engaged portion 53b forms a rib shape whose traverse-section shape has an approximately triangle mountain shape which continues in the up-and-down direction. A rack-shaped portion 53c, comprising a plurality of such latch-

engaged portions 53b, 53b ... and whose traverse-section shape is wavelike, is formed between the right end of the mount part 53 in Fig. 14 and the approximately intermediate position of the right-and-left direction thereof. A top-to-bottom size of such latch-engaged portions 53b is approximately equal to a thickness of the second part 62, and when the second part 62 is in the latch-engaging position, the latch-engaged portions 53b are engaged with the latch-engaging portions 62f of the second part 62. However, if the second part 62 is pushed into the non-latch-engaging position, engagement of both portions is released.

[0054] On the other hand, the latch-engaging portions 62f of the second part 62 are structured so as to form a rib shape protruding from the back end portion 62g thereof, and a plurality of latch-engaging portions 62f is provided by leaving an equal space between the adjacent latch-engaging portions 62f in the right-and-left direction. Each latch-engaging portion 62f forms a rib shape whose traverse-section shape has an approximately triangle mountain shape which continues in the up-and-down direction. Also, in the back end portion 62g of the second part 62, a rack-shaped portion 62i, comprising a plurality of latch-engaging portions 62f, 62f and whose traverse-section shape is wavelike, is formed as well.

[0055] Then, in the illustrated example, in the above-mentioned latch-engaging position, the rack-shaped portion 62i of the second part 62 is engaged with the rack-shaped portion 53c of the mount part 53. Namely, the corresponding rack-shaped portion 62i formed in the second part 62 engages the rack-shaped portion 53c formed in the mount part 53 in such a way as to house the latch-engaging portion 62f between the neighboring latch-engaged portions 53b, and as to house the latch-engaged portion 53b between the neighboring latch-engaging portions 62f.

[0056] Thereby, in the illustrated example, within a range wherein the rack-shaped portion 53c of the mount part 53 and the rack-shaped portion 62i of the second part 62 are engaged, the main body portion 5' of the striker base 5 can be moved and adjusted to the direction x' crossing the rotational direction x of the rotational body M, and also is allowed to be stably positioned in each adjustment position thereof. Namely, in the state allowing the smooth moving operation (in the illustrated example, the upward push-in operation) to the non-latch-engaging position of the second part 62, a plurality of latch-engaging portions 62a, 62a ... of the second part 62 and a plurality of latch-engaged portions 61a, 61a ... of the first part are latched and engaged. Also, a plurality of latch-engaging portions 62f, 62f ... of the second part 62 and a plurality of latch-engaged portions 53b, 53b ... of the mount part 53 are latched and engaged. After the main body portion 5' of the striker base 5, i.e., a supporting position of the striker 4 is adjusted to right and left by operating the second part 62 to move to the non-latch-engaging position, if this moving operation is halted, due to the urging of the spring 63a as the above-mentioned

urging means 63, the second part 62 is moved to the latch-engaging position while the rack-shaped portions 62e, 62i thereof are being engaged with the rack-shaped portions 61e of the first part 61 and the rack-shaped portions 53c of the mount part 53 again.

[0057] Namely, in this modified example of one portion, the striker 4 is supported in the striker base 5 so as to be capable of adjusting the supporting position in the direction approximately along the rotational direction x of the rotational body M, and also capable of adjusting the supporting position in the direction x' crossing the rotational direction x of the rotational body M by the adjusting means 6.

[0058] Also, in the illustrated example, due to a jutting portion 62j jutting laterally from a corner portion between the back end portion 62g of the second part 62 and one of the both side portions on the length side, a size of the right-and-left direction of this back end portion 62g, i.e., a length of the rack-shaped portion 62i is increased. If the length of such rack-shaped portion 62i is elongated, a supporting positional adjustment in the right-and-left direction of the striker 4 can be carried out in a wider range.

[0059] Also, in the illustrated example, a cam portion 53d, gradually getting higher toward a top portion 53e, which is positioned in the approximately same level of an upper end of the latch-engaged portions 53b, and forming a slope face 53f facing a left side, is formed between the latch-engaged portions 53b positioned at a left end in the rack-shaped portions 53c of the mount part 53 in Fig. 16, and the left end of the mount part 53. Thereby, in the illustrated example, after the mount part 53 is attached to the rotational body M with the attachment portion 5a, when the mount part 53 is entered into the above-mentioned fitting space 5c, at first, the slope face 53f of this cam portion 53d hits against the latch-engaging portions 62f of the second part 62, and the second part 62 is pushed into the non-latch-engaging position against the urging of the above-mentioned spring 63a, so that the mount part 53 is allowed to be entered into the fitting space 5c. When the top portion 53e of the cam portion 53d reaches a left side over the latch-engaging portions 62f which are positioned at the left end in the rack-shaped portion 62i of the second part 62 in Fig. 16, the second part 62 is moved to the latch-engaging position by the urging of the above-mentioned spring 63a, and combining the mount part 53 with the main body portion 5' is carried out with one-touch operation.

[0060] Also, in this example, when the supporting position of the striker 4 in the right-and-left direction is in a standard position, the left end of the mount part 53 in Figs. 19(a) to 19(c) is positioned in an opening border of the introduction opening 5d of the above-mentioned fitting space 5c. In a case when the left end of the mount part 53 protrudes further than this (Fig. 19(c)), the supporting position of the striker 4 is adjusted to a right side rather than the standard position, and also in a case when the left end of the mount part 53 is receded from this (Fig.

19(a)), the completion of the supporting positional adjustment of the striker 4 to the left side rather than the standard position can be easily viewed.

[0061] The rest of the structure of the modified example of one portion explained above is substantially the same as the basic structural example shown in Figs. 1 to 11, so that the same symbols, which are used for the figures according to the basic structural example in Figs. 1 to 11, are assigned to the substantially same structural portions of this modified example of one portion, and their explanations are omitted.

Incidentally, all contents of the specifications, claims, drawings, and abstracts of Japanese Patent Applications No. 2009-29978 filed on February 12, 2009, and No. 2009-125211 filed on May 25, 2009 are cited in their entireties herein and are incorporated as a disclosure of the specification of the present invention.

Claims

1. An assist mechanism for a rotational body, comprising:

a striker provided on one of a rotational body or a supporting body rotatably supporting the rotational body; and

a receiving member provided on the other of the rotational body or the supporting body, the receiving member moving after capturing the striker at a predetermined forward-moving position of the rotational body, and assisting a forward movement of the rotational body to a forward-moving ending position, and

wherein the striker is supported by an adjusting device in a striker base comprising an attachment portion relative to one of the rotational body or the supporting body so as to be capable of adjusting a supporting position.

2. An assist mechanism for a rotational body according to claim 1, wherein the striker is supported by the adjusting device in the striker base so as to be capable of adjusting the supporting position in a direction approximately along a rotational direction of the rotational body.
3. An assist mechanism for a rotational body according to claim 1, wherein the striker is supported by the adjusting device in the striker base so as to be capable of adjusting the supporting position in a direction crossing the rotational direction of the rotational body.
4. An assist mechanism for a rotational body according to claim 1, wherein the striker is supported by the adjusting device in the striker base so as to be capable of adjusting the supporting position at least in

the direction approximately along the rotational direction of the rotational body, and capable of adjusting the supporting position in the direction crossing the rotational direction of the rotational body.

5. An assist mechanism for a rotational body according to claim 2, wherein the adjusting device is structured by combining
 - a first part including the striker and supported in the striker base so as to be capable of moving in the direction approximately along the rotational direction of the rotational body, with
 - a second part, including a latch-engaging portion relative to a latch-engaged portion formed in the first part, and supported in the striker base so as to be capable of being operated to be moved from a latch-engaging position wherein the latch-engaging portion is latched and engaged with the latch-engaged portion to a non-latch-engaging position which releases the latch and engagement, and
 - wherein at least one of the latch-engaging portion and the latch-engaged portion is provided plurally in a moving direction of the first part.
6. An assist mechanism for a rotational body according to claim 5, wherein an urging device against a movement toward the non-latch-engaging position of the second part is provided.
7. An assist mechanism for a rotational body according to claim 3, wherein the striker base comprises a main body portion supporting the striker, and a mount part including the attachment portion relative to one of either the rotational body or the supporting body, and combined with the main body portion in a state allowing the main body portion to move in the direction crossing the rotational direction of the rotational body,
 - wherein the adjusting device includes a latch-engaging portion relative to a latch-engaged portion formed in the mount part, and is structured by combining the mount part with a movable part supported in the main body portion of the striker base so as to be capable of being operated to be moved from a latch-engaging position wherein the latch-engaging portion is latched and engaged with the latch-engaged portion, to a non-latch-engaging position which releases the latch and engagement, and
 - wherein at least one of the above-mentioned latch-engaging portion and the latch-engaged portion is provided plurally in the direction crossing the rotational direction of the rotational body.
8. An assist mechanism for a rotational body according to claim 7, wherein an urging device against the movement toward the non-latch-engaging position of the movable part is provided.

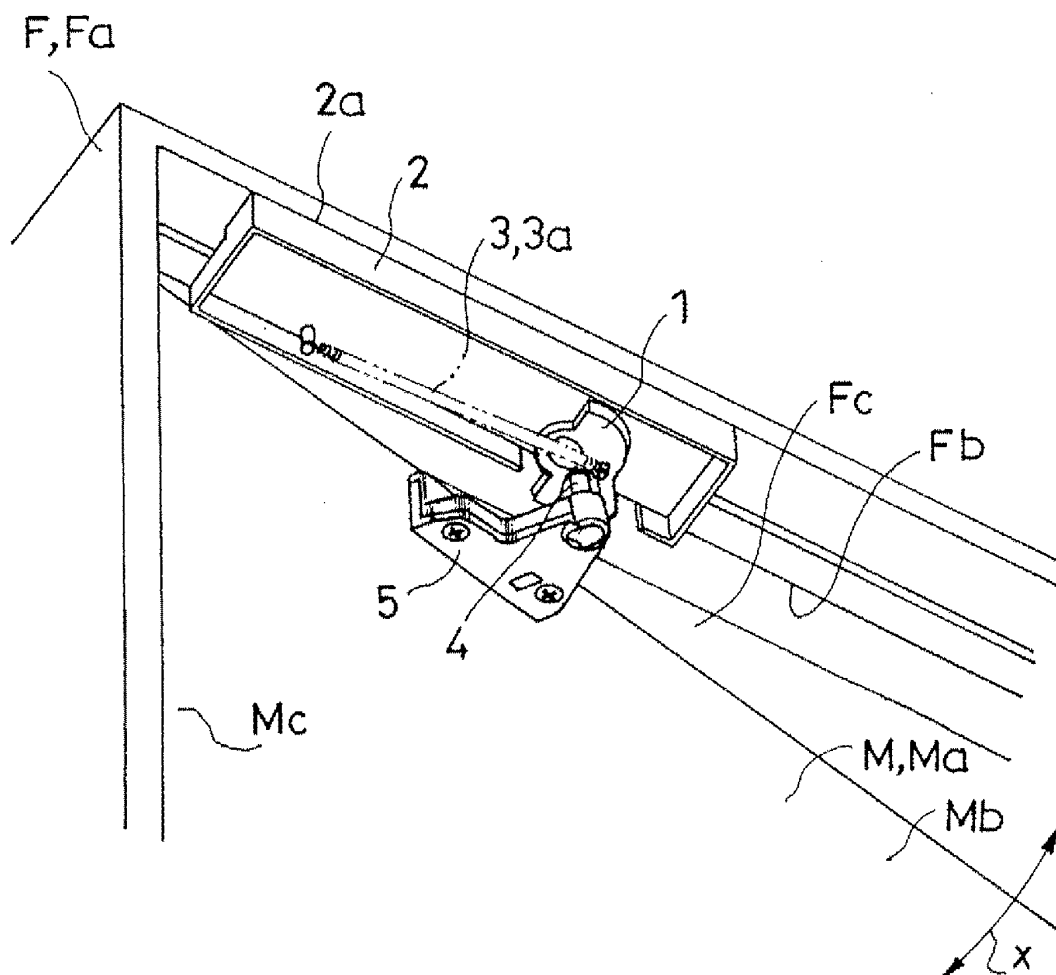


Fig. 1

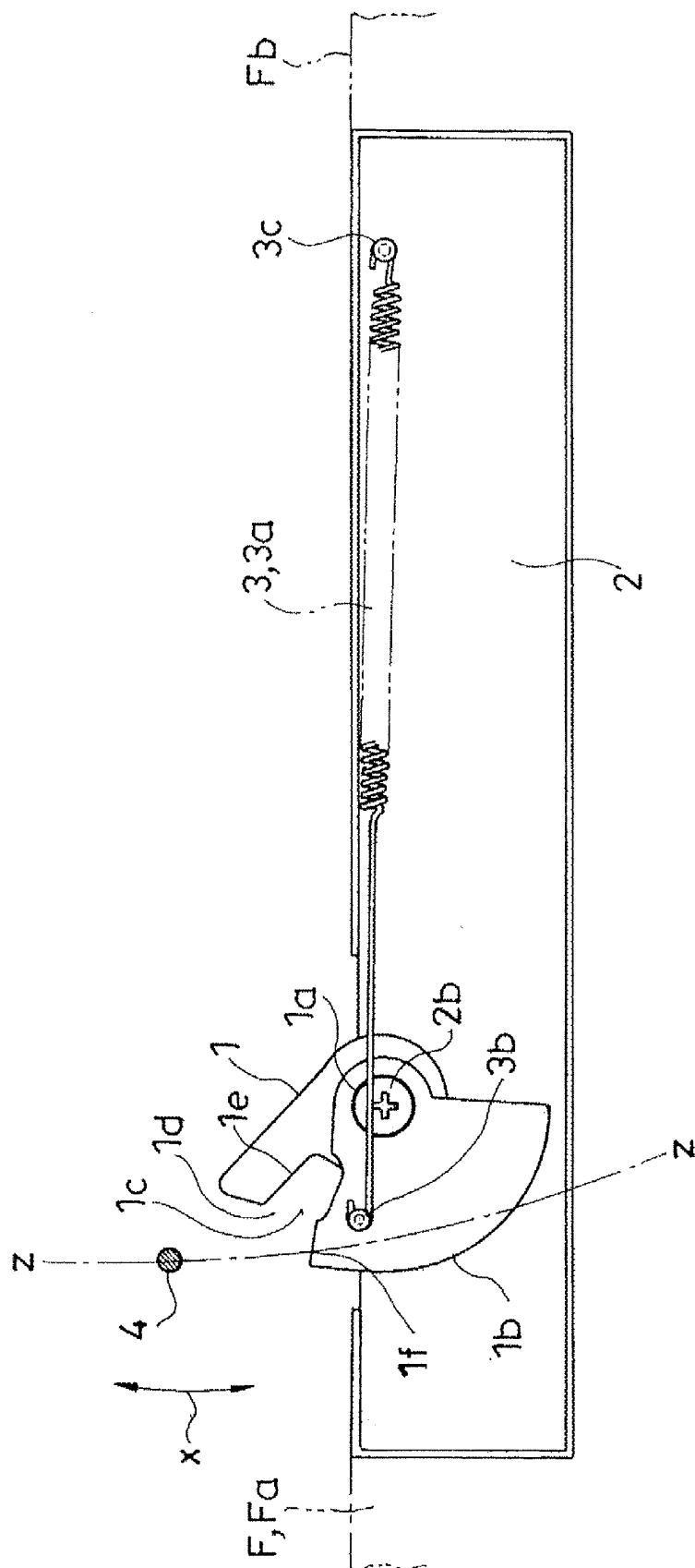


Fig. 2

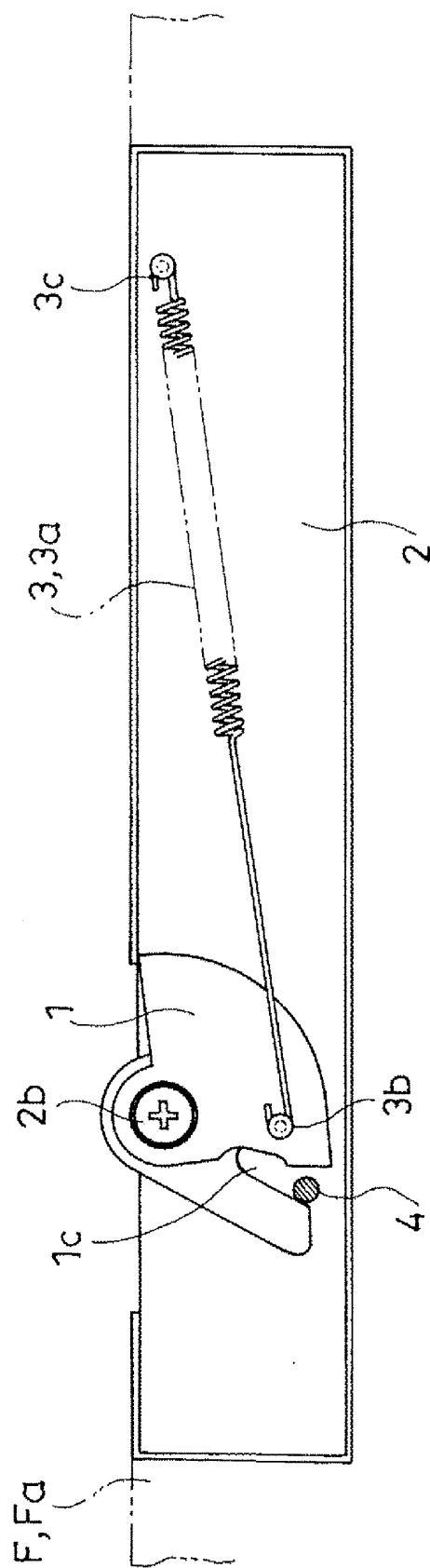


Fig. 3

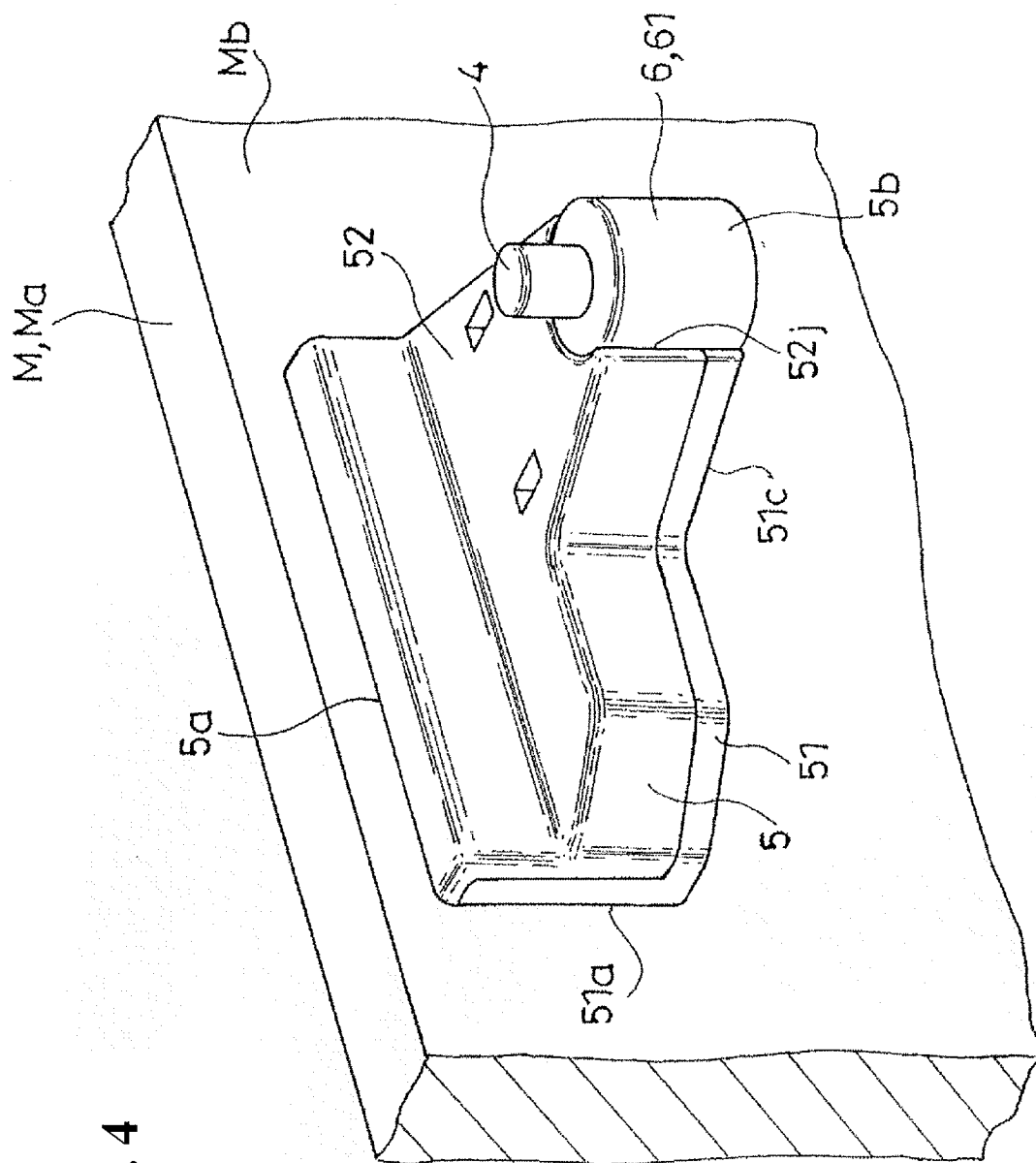
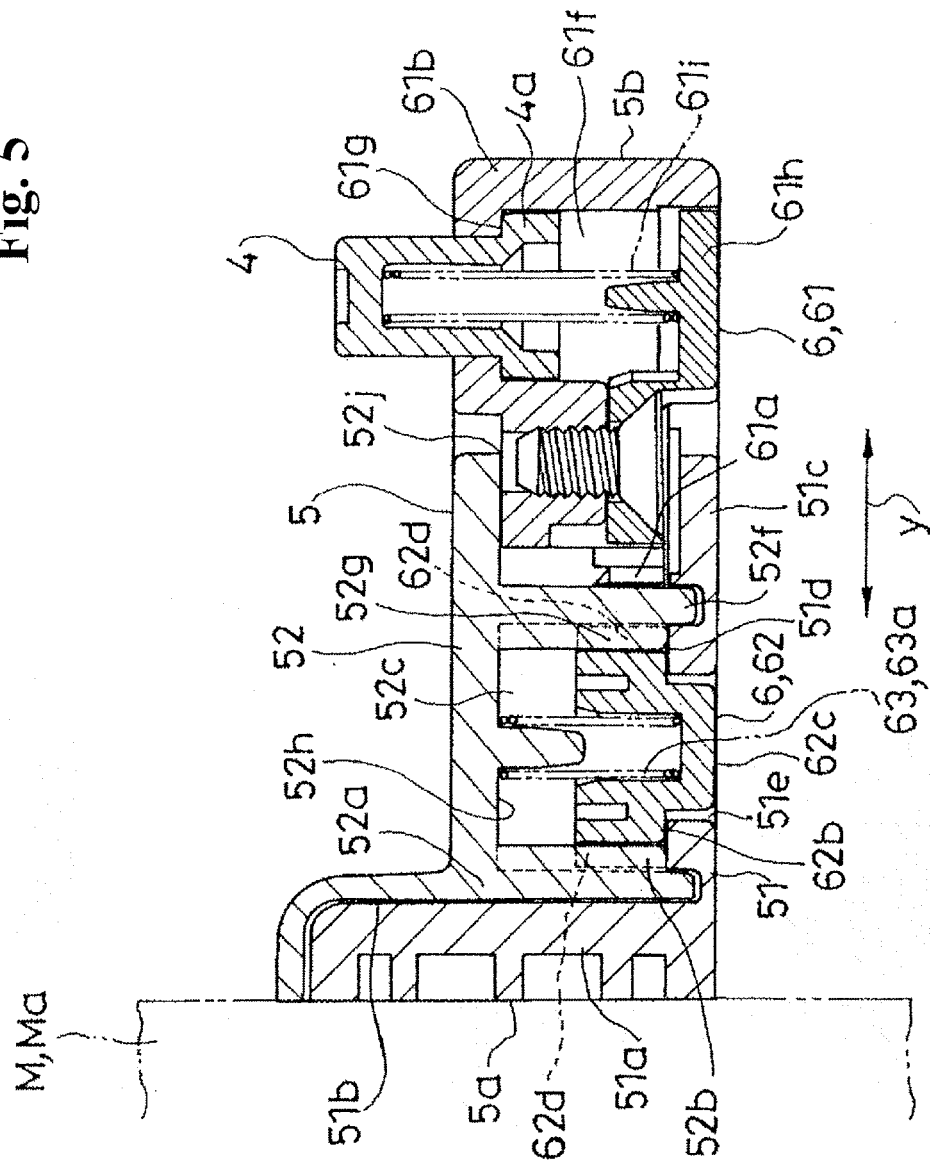
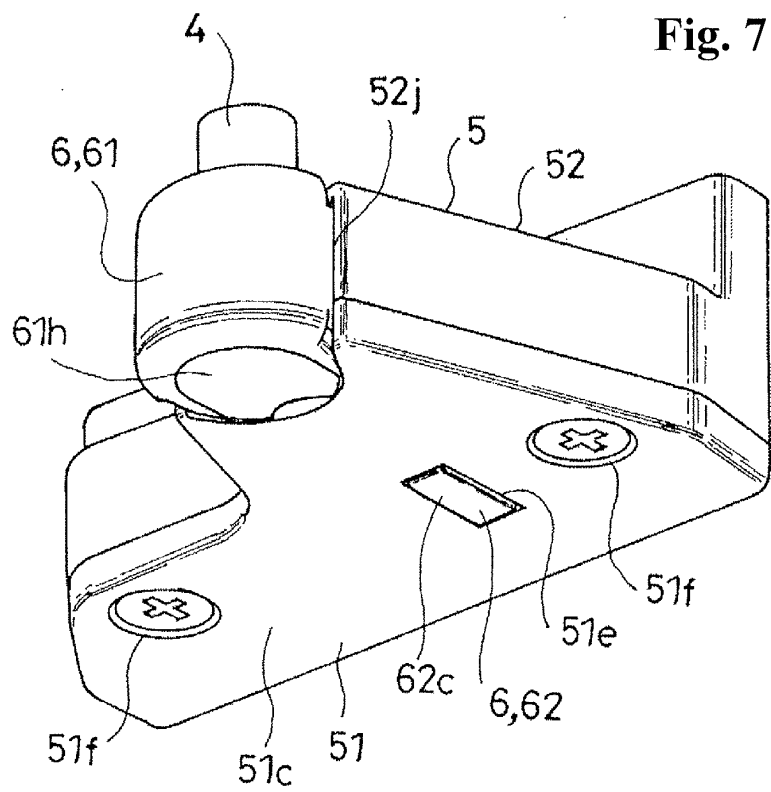
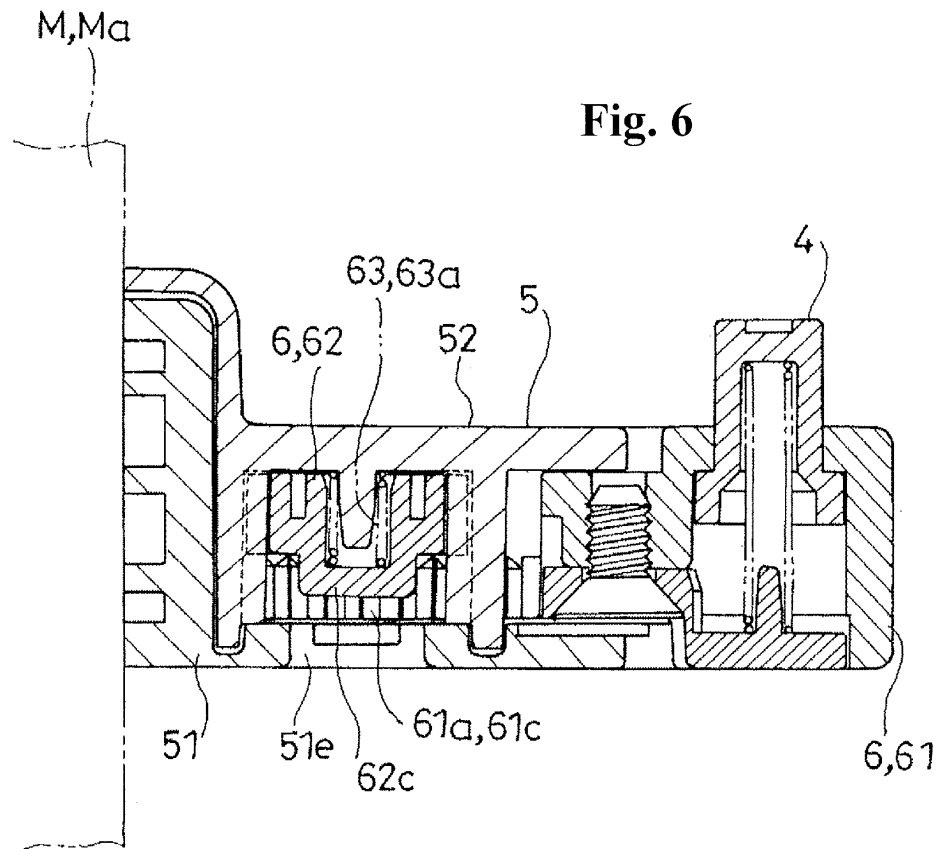


Fig. 4

Fig. 5





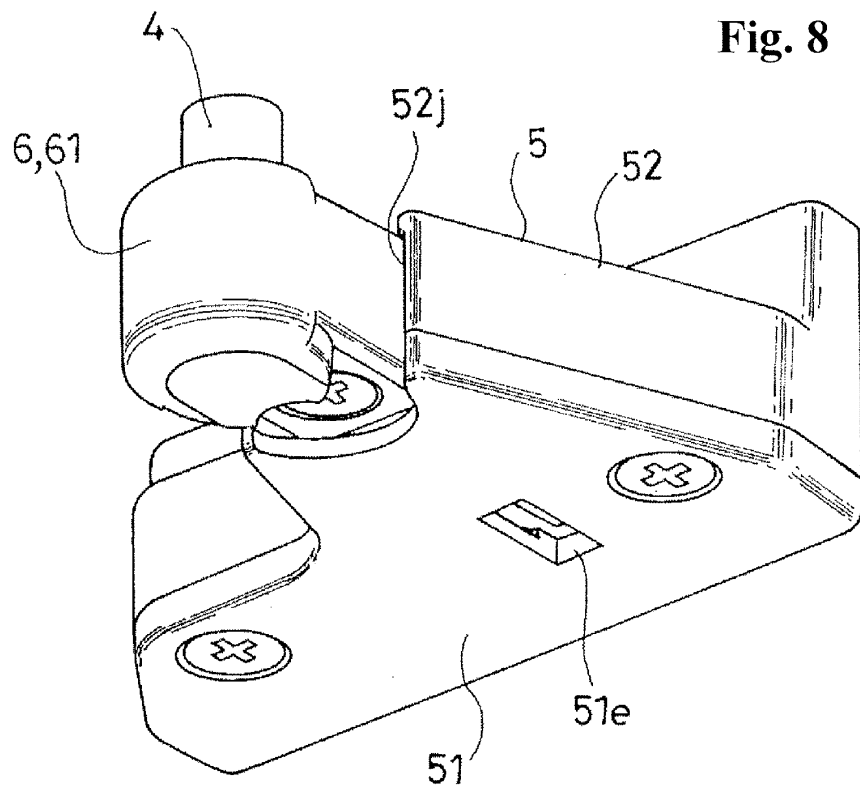
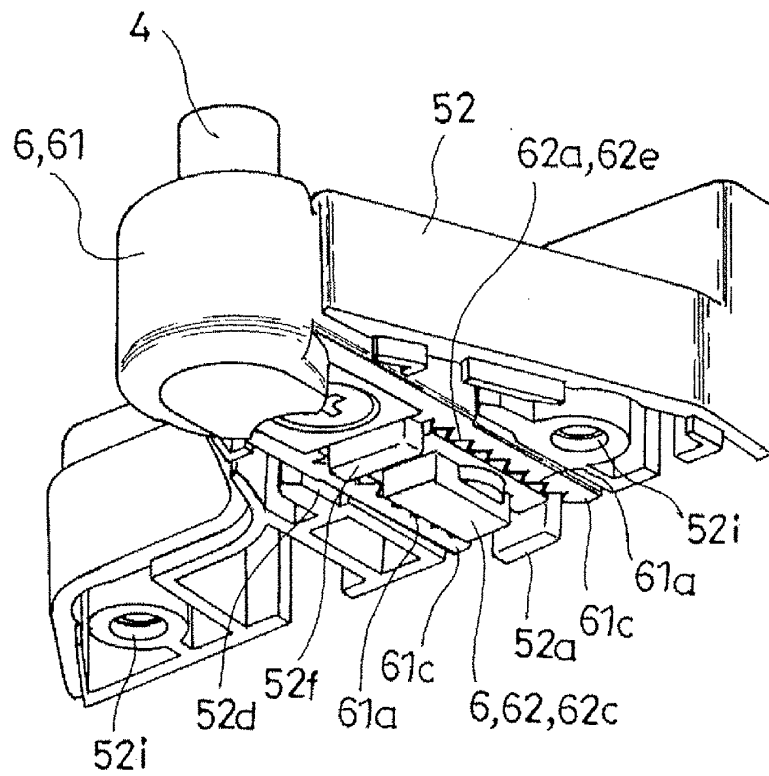


Fig. 9



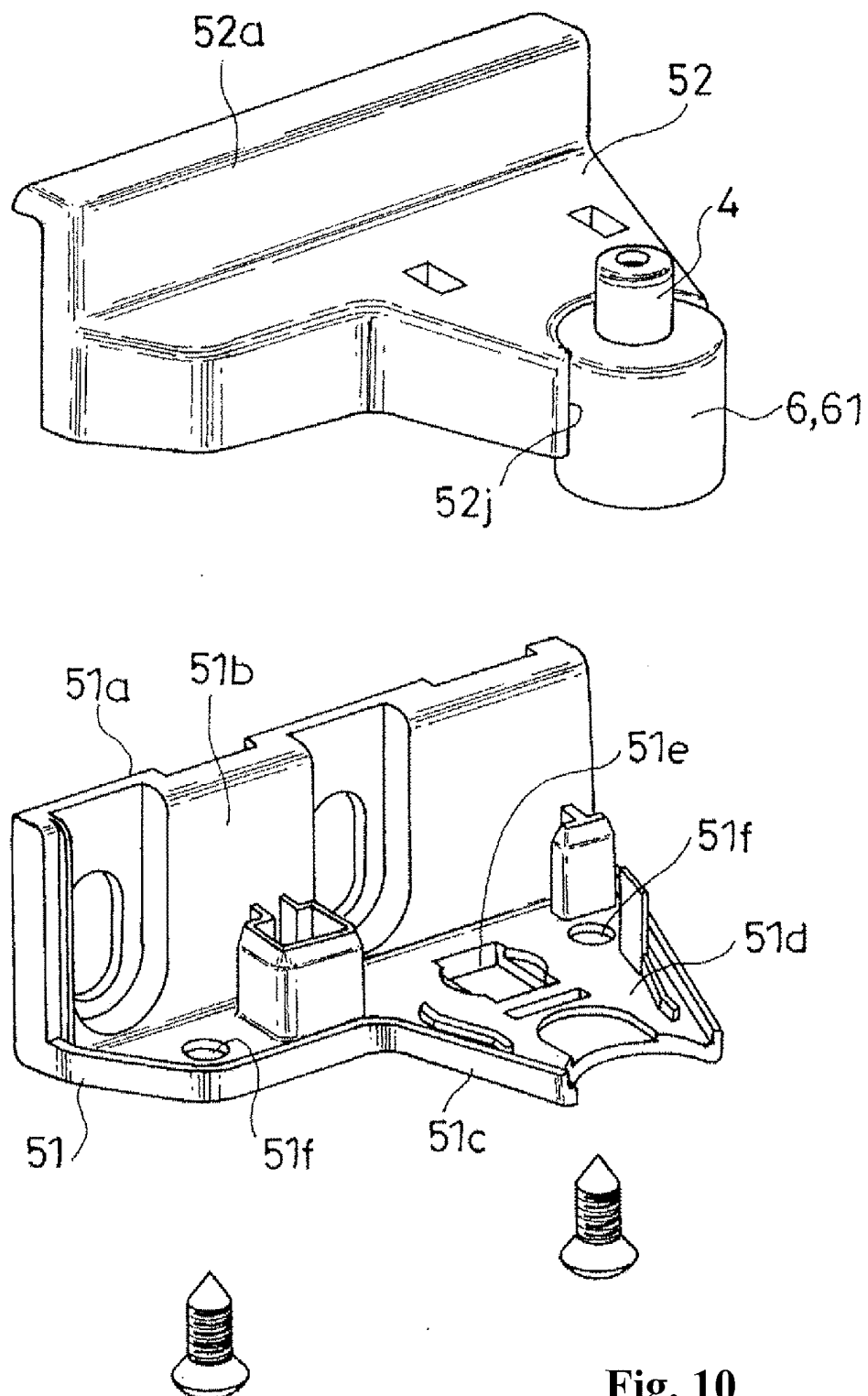


Fig. 10

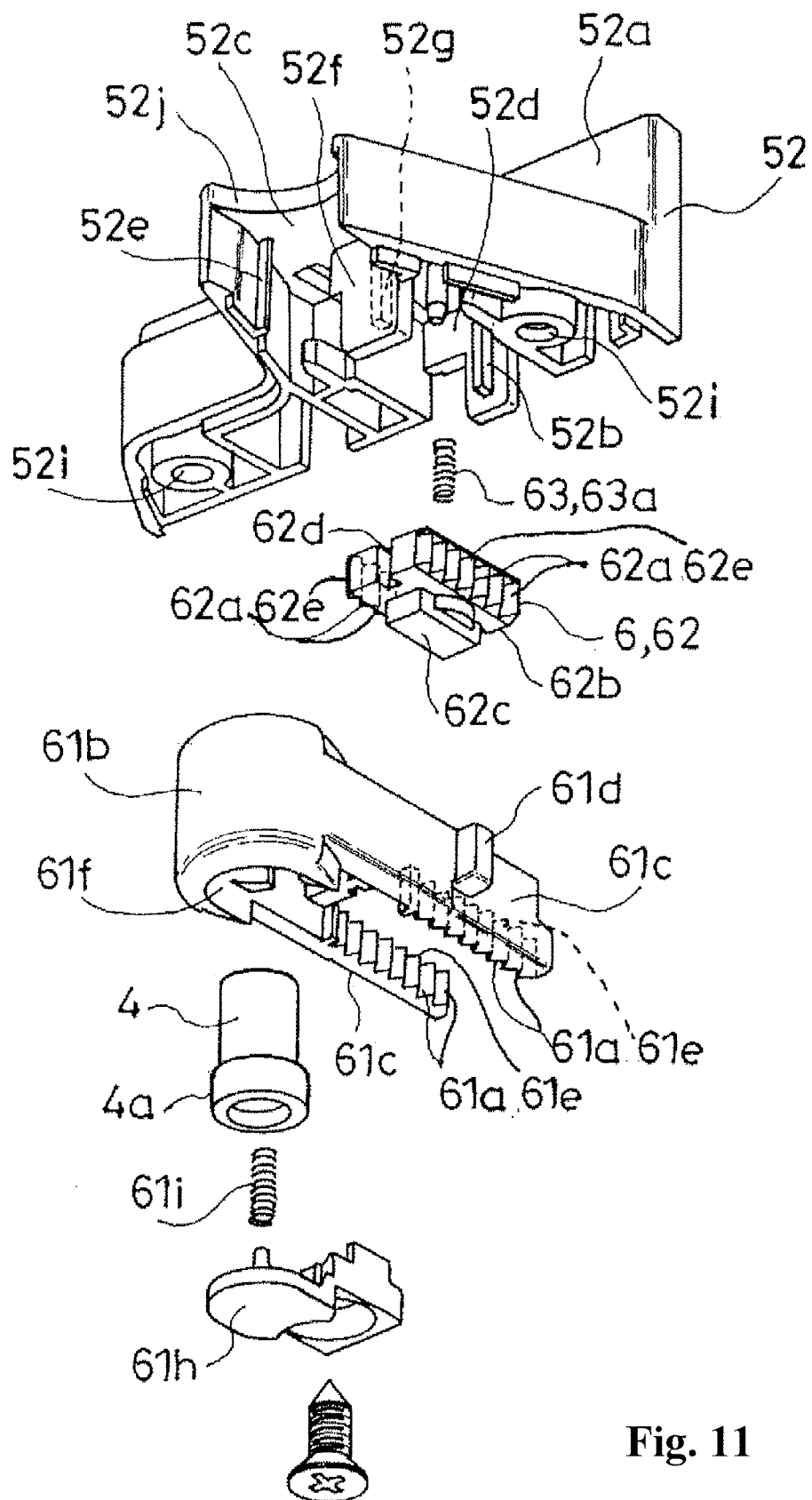


Fig. 11

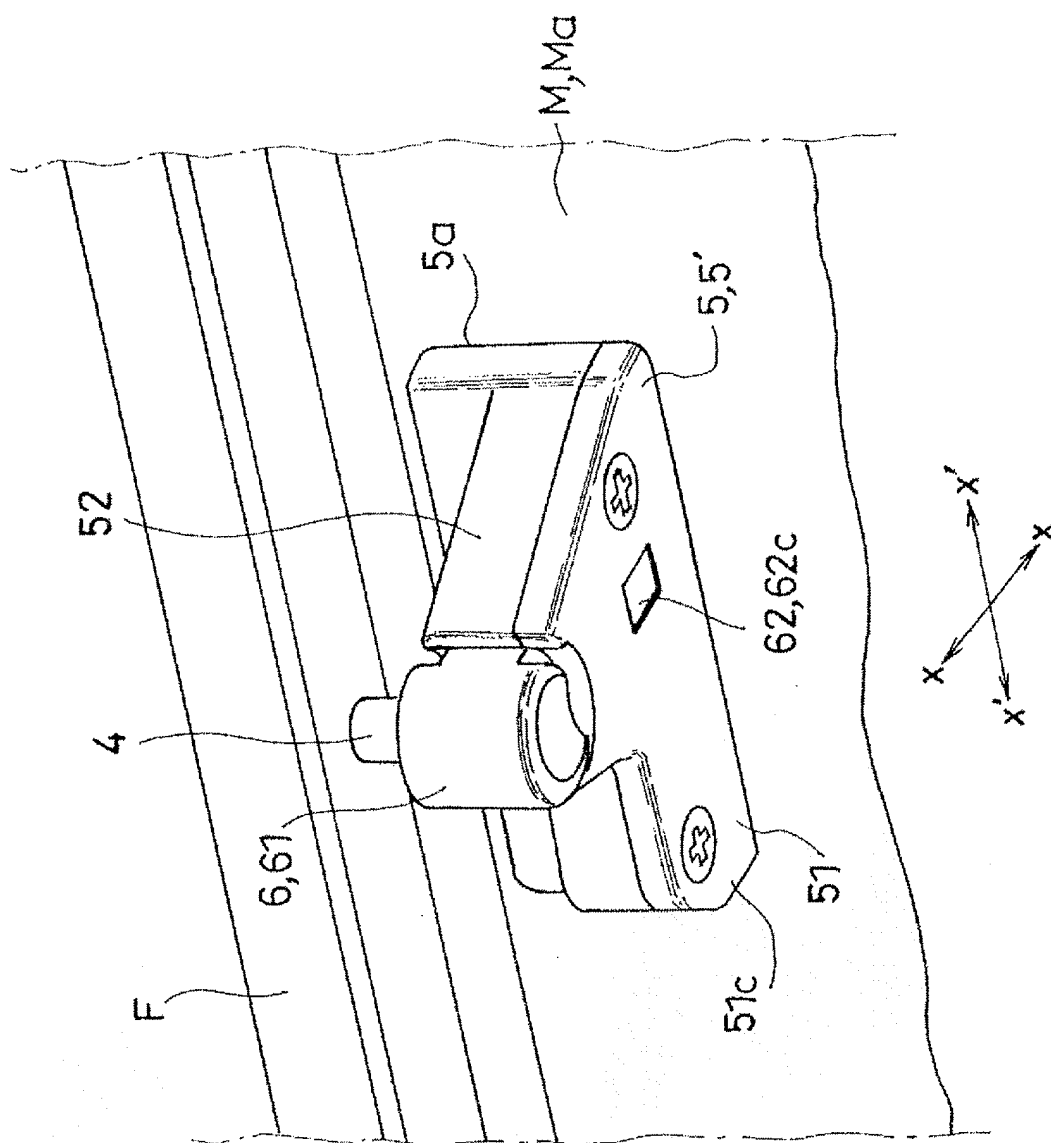


Fig. 12

Fig. 13

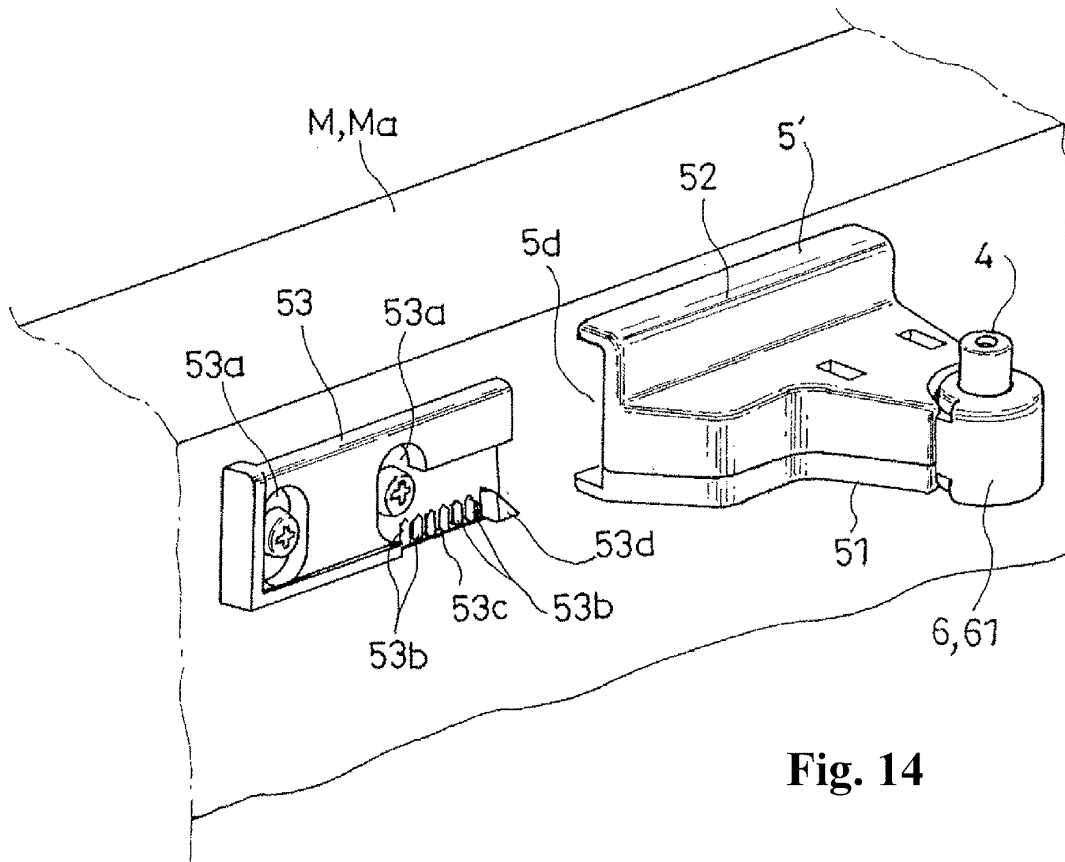
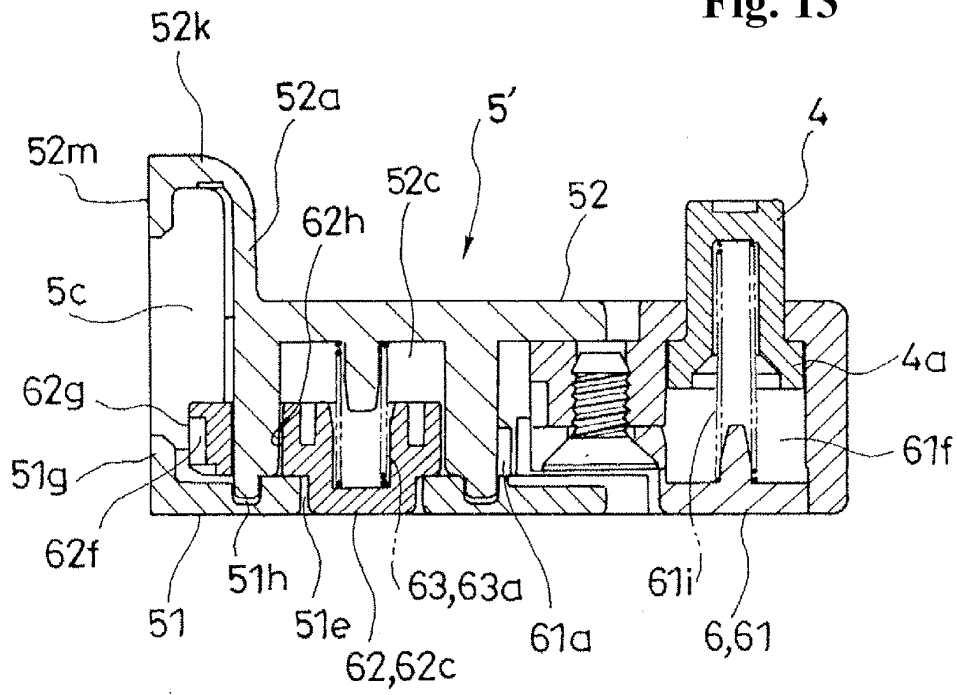


Fig. 14

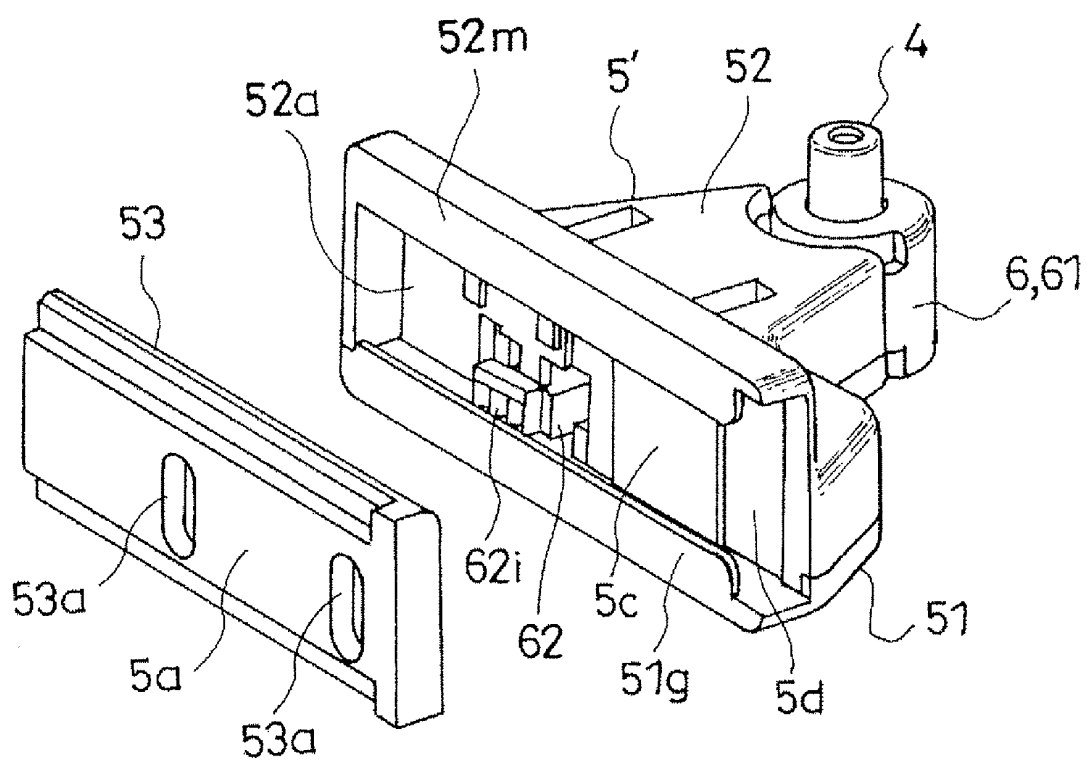


Fig. 15

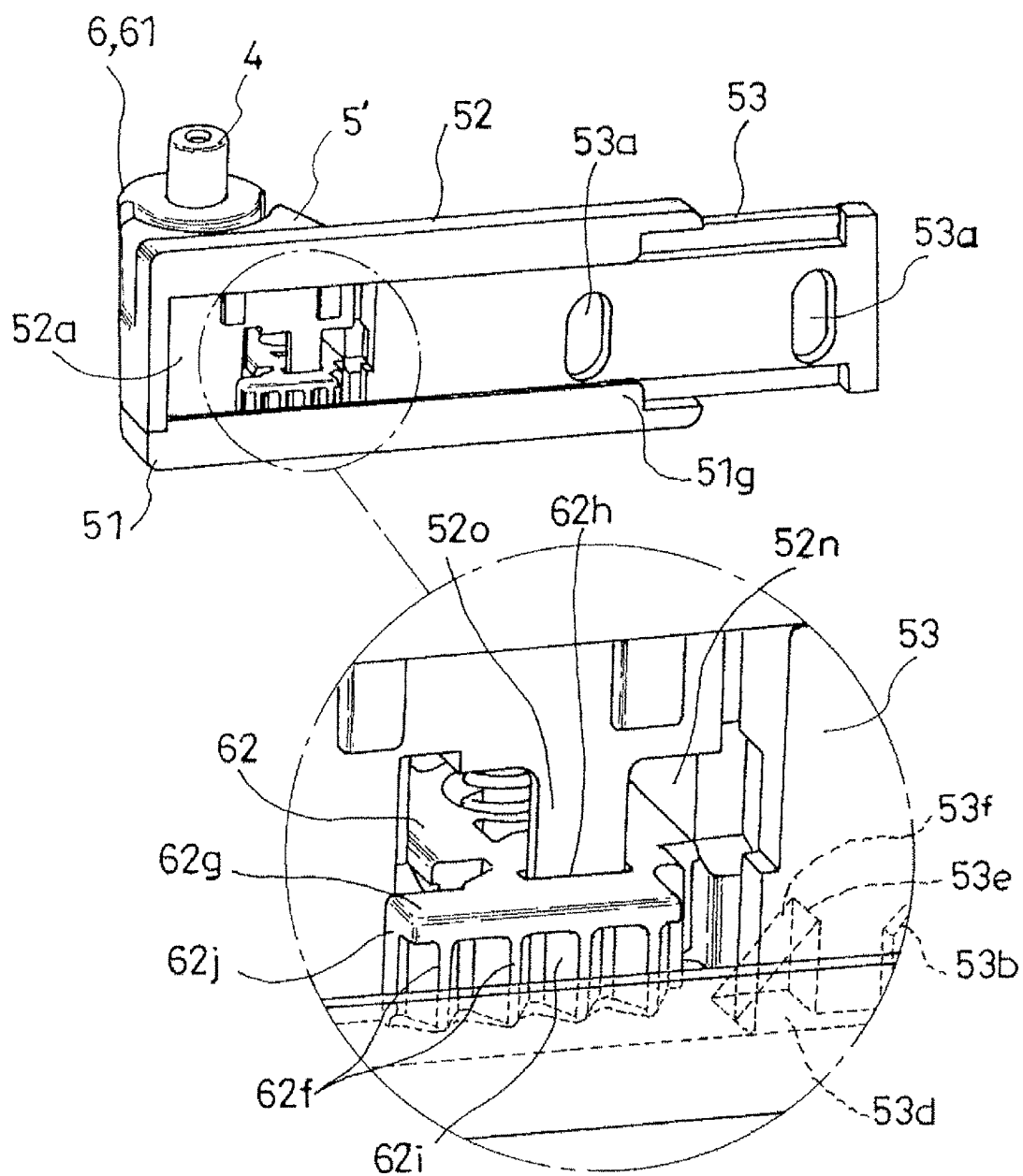


Fig. 16

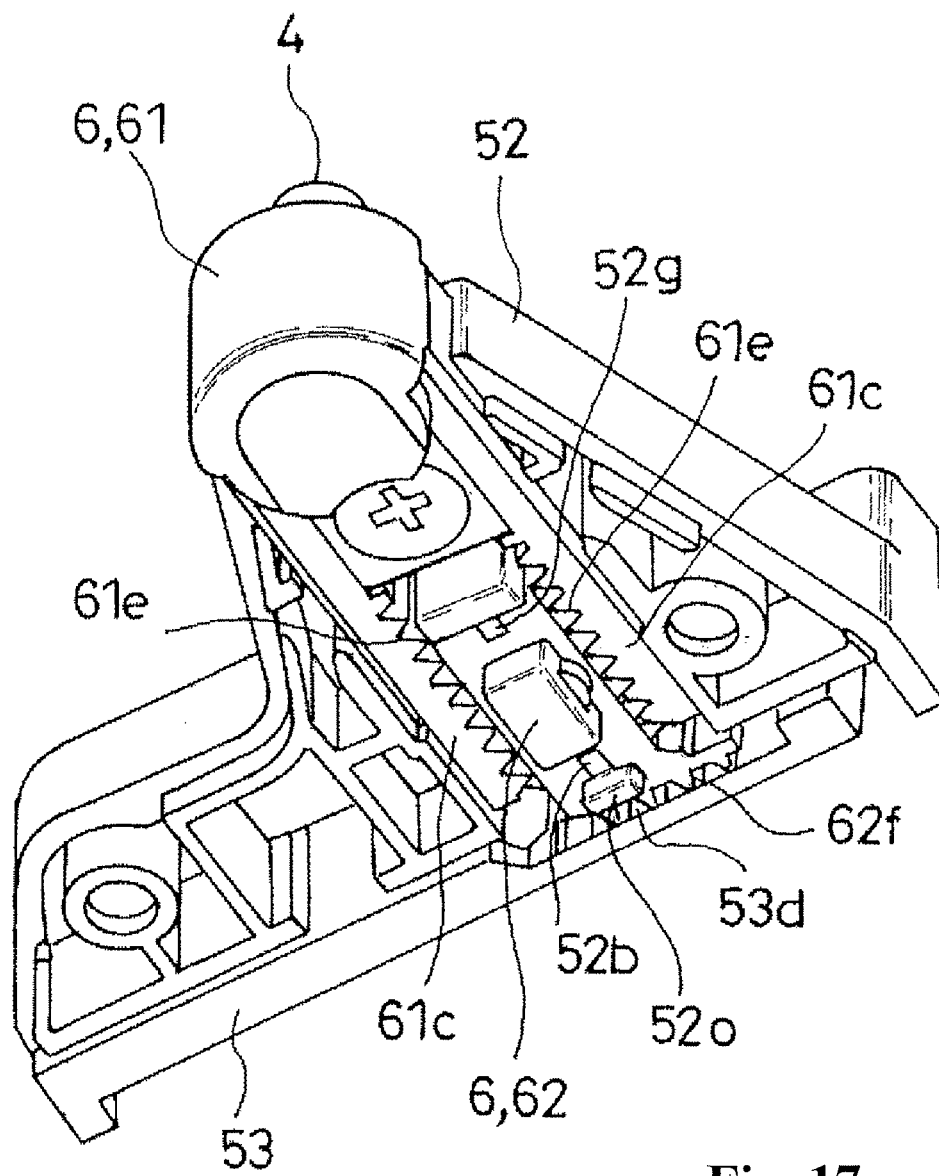


Fig. 17

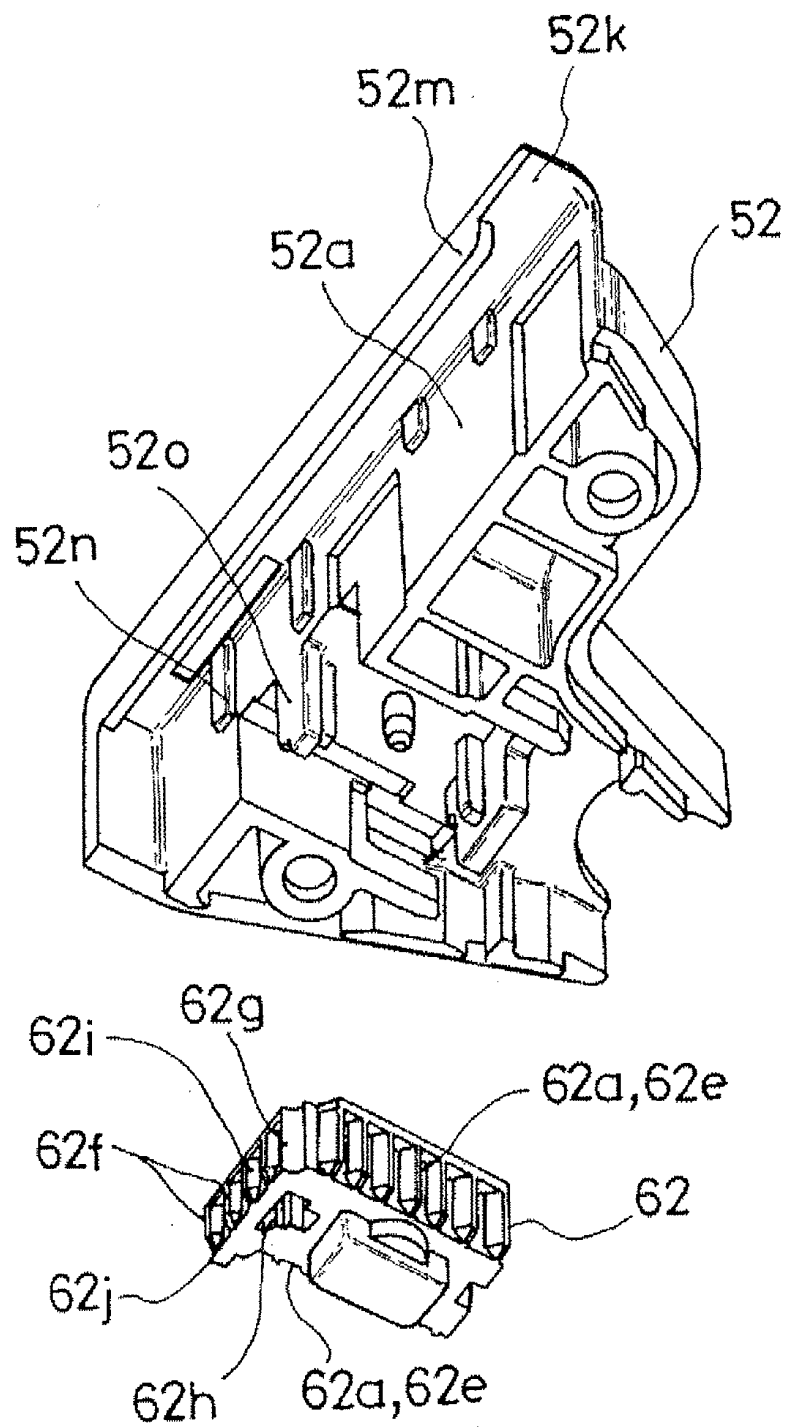
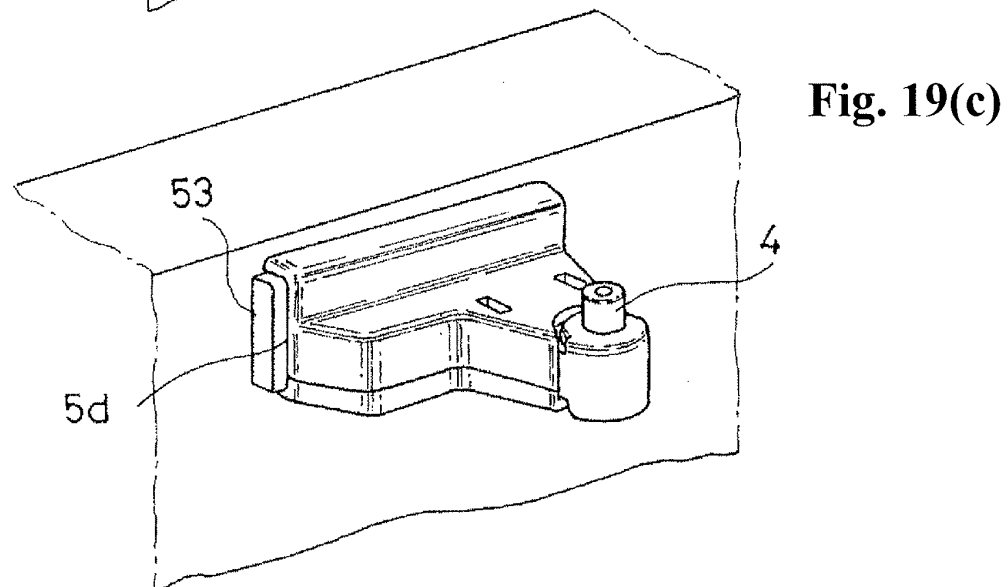
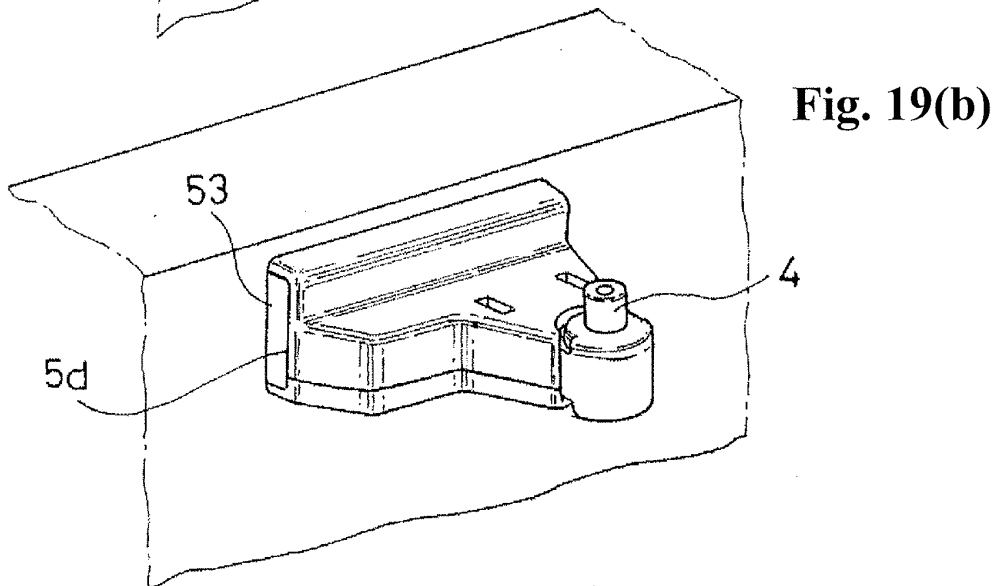
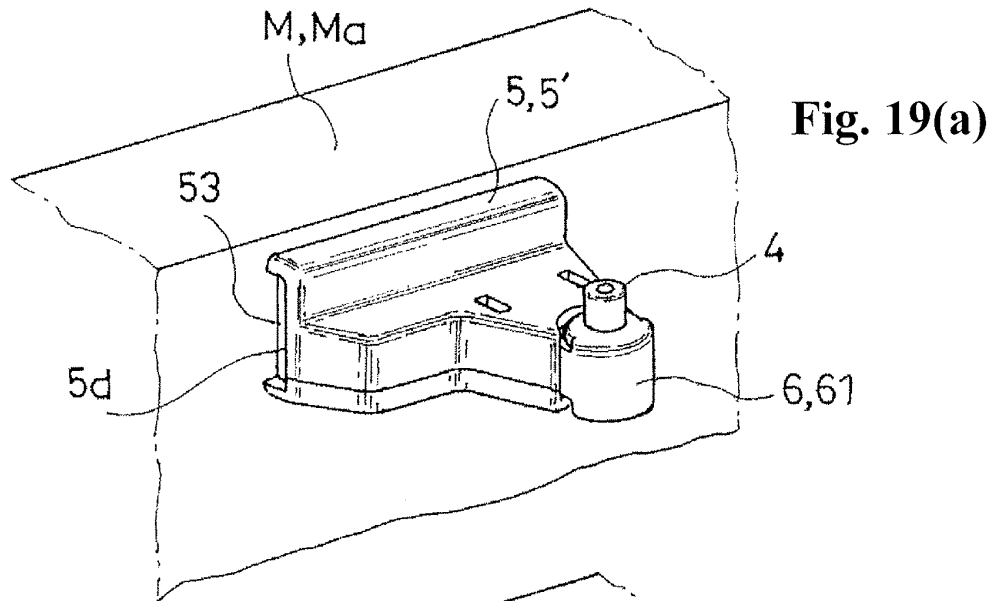


Fig. 18



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/071485

A. CLASSIFICATION OF SUBJECT MATTER

E05F1/10 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E05F1/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2007-177459 A (Nakanishi Metal Works Co., Ltd.), 12 July 2007 (12.07.2007), paragraphs [0014] to [0034]; all drawings (Family: none)	1-4, 7 5, 6, 8
Y A	JP 6-45588 Y2 (Koei Sangyo Kabushiki Kaisha), 24 November 1994 (24.11.1994), column 3, line 28 to column 4, line 40; all drawings (Family: none)	1-4 5-8

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
26 January, 2010 (26.01.10)Date of mailing of the international search report
09 February, 2010 (09.02.10)Name and mailing address of the ISA/
Japanese Patent Office

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Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/071485

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 151201/1978 (Laid-open No. 69566/1980) (Kabushiki Kaisha Kobayashi Seisakusho), 13 May 1980 (13.05.1980), specification, page 3, line 8 to page 12, line 8; all drawings (Family: none)	1, 3, 7 2, 4-6, 8

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2007177459 A [0004]
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