



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.12.2011 Bulletin 2011/49

(51) Int Cl.:
E05F 1/10 (2006.01)

(21) Application number: **10735879.8**

(86) International application number:
PCT/JP2010/051165

(22) Date of filing: **28.01.2010**

(87) International publication number:
WO 2010/087414 (05.08.2010 Gazette 2010/31)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

• **KAI, Takayuki**
Yokohama-shi
Kanagawa 244-8522 (JP)

(30) Priority: **29.01.2009 JP 2009018008**

(74) Representative: **Ehnis, Tobias et al**
Patentanwälte
Dr. Gassner & Partner
Marie-Curie-Strasse 1
91052 Erlangen (DE)

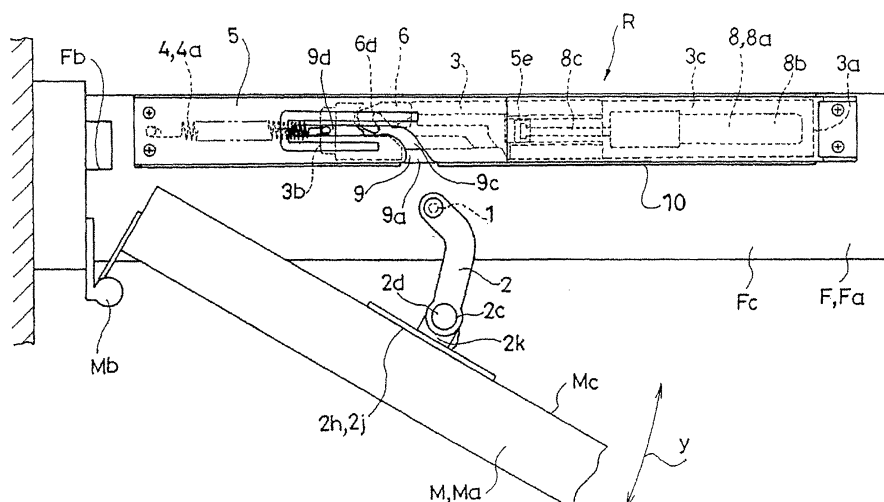
(72) Inventors:
• **TOMIOKA, Kazuyuki**
Yokohama-shi
Kanagawa 244-8522 (JP)

(54) **RECIPROCATION MECHANISM FOR ROTATION BODY**

(57) A reciprocation mechanism for a pivoting body, is provided with an arm body pivotally provided to a door and having a striker provided to the free end side of the arm body, a receiving member provided to a door frame so as to be slidable between a first position and a second position in the direction intersecting the direction of pivoting of the door, and a pressing means for pressing the

receiving member toward the second position. The receiving member is adapted so as to be held at the first position while resisting the above pressing section and, after capturing the striker at the first position in the process of closing the door, to be released from being held at the first position and moved to the second position by the above pressing action.

Fig. 2



Description

FIELD OF THE INVENTION

[0001] This invention relates to an improvement in a reciprocation mechanism which functions to assist the forward movement of a rotating member being pivotally moved to a predetermined position during said forward movement up to the predetermined position.

BACKGROUND ART

[0002] There is a mechanism shown in Patent Document 1, which comprises a striker body installed on a door and a catcher installed on a door frame which captures the striker moving from the front side when the door is operated toward a closing position; the catcher being so provided as to be reciprocatingly rotatable between a standby position and a rotated position and capture the striker at the standby position and reciprocatingly rotate to the rotated position to assist the closing of a door

[0003] However, in Patent Documents 1, because the pivoting of the catcher is indispensable, there are limitations to reduce the depth of the mechanism in the direction of pivoting of the door or, to be more precise, the width of the case supporting the catcher.

[Prior Art Document]

[Patent Document]

[0004] [Patent Document 1] International publication No. 2007/055204

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] The main problem that this invention is designed to solve is to make the mechanism for assisting the forward movement of this kind of a rotating member to be configured as compact as possible.

MEANS TO SOLVE THE PROBLEM

[0006] To solve the problem, the reciprocation mechanism for a rotating member in this invention comprises an arm body pivotally provided to either one of a rotating member or a stationary body pivotally supporting the rotating member and having a striker provided to a free end side of the arm body; a receiving member provided to the other of the rotating member or the stationary body so as to be slidable between a first position and a second position in the direction intersecting the direction of pivoting the rotating member; and urging means for urging the receiving member toward the second position. The receiving member is held at the first position while resisting the above-mentioned urging action and, after capturing

ing the striker at the first position in the process of the forward movement of the rotating member, to be released from being held at the first position and moved to the second position by the above-mentioned urging action.

[0007] Because the arm body is provided pivotably, even if the sliding movement of the receiving member intersects the direction of pivoting of the rotating member, the rotating member can be moved forward in association with the movement of the receiving member by the urging means toward the second position. That is to say, after the striker is captured by the receiving member, by making the arm body pivot depending on the slide movement of the receiving member toward the second position, the rotating member can be moved forward by the receiving member which is provided so as to be slidable as described above. Because the receiving member slides in the direction intersecting the direction of pivoting of the rotating member, the space requirement of the receiving member in the direction of pivoting of the rotating member can be minimized, and typically, the receiving member can appropriately be provided to a door frame without damaging the appearance.

[0008] If such a mechanism is made to be provided with a guide means to guide the striker to the capture section of the receiving member which is in the first position, the striker can be made to be smoothly captured by the capture section in the process of the forward movement of the rotating member.

[0009] According to a preferred embodiment, such mechanism is arranged so that the catcher member of the striker may be made to be pivotally installed in the receiving member between the engagement position where the striker is brought into engagement and the non-engagement position where the striker is not brought into engagement. Also a holding member is arranged such that the catcher member and the supporter for the receiving member may be made to be held at a same time in a state in which the receiving member is in the first position and a state in which the catcher member is in the non-engagement position, that pivoting of the catcher member to the engagement position following the abutment of the striker is allowed, and by this pivoting, the afore-mentioned holding of the receiving member is released.

[0010] Also, in such a mechanism, if an urging means is arranged on the transition axis line of the receiving member next to the receiving member, such arrangement can contribute to the minimalization of the installation space of the receiving member side of the mechanism in the direction of pivoting of the rotating member.

[0011] Also, in such a mechanism, if the free end side of the arm body is made to be bent so that the pivot center side of the rotating member may be situated inside the bent portion, in the backward movement of the rotating member, until the receiving member releases the striker, the striker can be moved as linearly as possible and the receiving member can be returned to the first position smoothly.

[0012] Also, according to a preferred embodiment, the afore-mentioned arm body may comprise a plurality of arm components which are pivotally assembled together.

EFFECT OF THE INVENTION

[0013] For the mechanism according to this invention, having the striker provided to the pivotable arm body, and functioning to assist the forward movement of the rotating member by making the receiving member capturing the striker slide in the direction intersecting the direction of pivoting of the rotating member, it is possible to minimize, in particular, the length or depth of the mechanism in the direction of pivoting of the rotating member as much as possible.

BRIEF DESCRIPTION OF DRAWINGS

[0014]

FIG 1 is a perspective view showing a use state of a reciprocation mechanism according to the first example.

FIG 2 is a bottom view of the reciprocation mechanism according to the first example, wherein receiving member is positioned in a first position.

FIG 3 is a bottom structural view of the essential parts showing the members housed in a main body such as a receiving member while omitting a base plate member, a front plate part and a back plate part of a main body from FIG 2.

FIG 4 is an enlarged view of the essential parts of FIG 3.

FIG 5 is a bottom view showing the state in which a striker is positioned in an oblique part of a guide groove of guide means of the main body.

FIG 6 is a bottom view showing the state in which the striker is positioned in a straight part of a guide groove of the guide means of the main body.

FIG 7 is an enlarged view of the essential parts showing the essential parts of the reciprocation mechanism in the state of FIG 6 in the same way as in FIG 4. FIG 8 is an enlarged view of the essential parts showing the essential parts of the reciprocation mechanism in the same way as in FIG 4, in a state in which the catcher member has been pivoted to the engagement position from its state of FIG 6.

FIG 9 is a bottom view of the reciprocation mechanism according to first example when the receiving member is positioned in a second position.

FIG 10 is a perspective view of the main body housing the receiving member etc. (the receiving member is positioned in a second position.)

FIG 11 is a perspective view showing the members housed in the main body, such as the receiving member while omitting the base plate member, front plate part and back plate part of the main body from FIG 10.

FIG 12 is a perspective view seen from the side of

the top plate member of the main body showing the main body and the channel material separately.

FIG 13 is a perspective view of the striker and the arm body comprising the reciprocation mechanism according to the first example.

FIG 14 is an exploded perspective view of the striker and the arm body of FIG 13.

FIG 15 is a longitudinal or vertical section view of the reciprocation mechanism according to the second example, wherein the receiving member is positioned in a first position.

FIG 16 is an enlarged view of the essential parts of FIG 15.

FIG 17 is a bottom structural view of the essential parts of the portion shown in FIG 16 seen from the lower part.

FIG 18 is an enlarged view of the essential parts showing the condition just after the striker abuts against the receiving member positioned in a first position in the same manner as in FIG 16.

FIG 19 is a longitudinal section view of the reciprocation mechanism according to the second example, wherein the receiving member is positioned in a second position.

FIG 20 is an enlarged view of the essential parts of FIG 19.

FIG 21 is a bottom structural view of the essential parts of the portion shown in FIG 20 seen from the lower part.

FIG 22 is an exploded perspective view of the receiving member constituting the reciprocation mechanism according to the second example.

FIG 23 is an exploded broken away side view, in cross section, of the essential parts of the receiving member.

FIG 24 is a perspective view of the striker and the arm body comprising the reciprocation mechanism according to the second example.

FIG 25 is an exploded perspective view of the striker and the arm body shown in FIG 24.

MODES OF CARRYING OUT THE INVENTION

[0015] Hereinafter, typical examples for carrying out this invention are explained based on FIG 1 to FIG 25.

[0016] It is to be noted that, here, FIG 1 - FIG 14 show the first example of a reciprocation mechanism R which is constructed by the invention. Also, FIG 15 - FIG 25 show the second example of the reciprocation mechanism R which is constructed by the invention..

[0017] The reciprocation mechanism R of rotating member M according to this mode for carrying out the invention functions so as to assist the forward movement of rotating member M which is moved forward to a predetermined position during the forward movement up to the predetermined position

[0018] Such rotating member M is supported by stationary body F so as to be pivotable forwardly and back-

wardly and typically includes a door and a hinged door, but it is not limited to these and may include others only if they are supported by stationary body F so as to be pivotable forwardly and backwardly. The depicted example shows an example in which reciprocation mechanism R is provided to door Ma and door frame Fa.

[0019] In the example, door Ma as rotating member M blocks an opening inside door frame Fa in a closing position (a predetermined position) where one side Mc which becomes the top in the forward movement is knocked against door stop part Fb of door frame Fa as stationary body F. (FIG 9) And, when the door Ma as rotating member M is moved forward toward the aforementioned closing position (FIG 1, FIG 2) from an opening position where it does not block the afore-mentioned opening inside door frame Fa, striker 1 comprising reciprocation mechanism R abuts against receiving member 3 comprising reciprocation mechanism R in the process of such forward movement, and, (FIG 6, FIG 18) it is adapted to receive action of reciprocation mechanism R up to said closing position

[0020] In the example, said striker 1 is installed on the side of door Ma as rotating member M. Thus, in the example, receiving member 3 is provided on the side of door frame Fa as stationary body F. It is to be noted that, separately from the example, even if striker 1 is installed on the side of door frame Fa as stationary body F and receiving member 3 is provided on the side of door Ma as rotating member M, it still can assist the forward movement of such rotating member M in the process of such forward movement.

[0021] In the example, striker 1 is placed at one side Mc which becomes the top in the forward movement of door Ma by arm body 2. More specifically, in the example, striker 1 is provided on the top edge side of door Ma in the door hinge Mb side of door Ma. Such striker 1 is comprised as a form of a shaft body sticking out upwardly from free end 2a of arm body 2. The top edge of striker 1 is located at about the same level as the top edge of door Ma, or a little lower than that, and in its forward movement toward the closing position of door Ma, it is captured by receiving member 3 provided in frame upper part Fc of door frame Fa right before door Ma finishes its closing. Such arm body 2 is located downward from the level of the lower part of the below-mentioned main body 5 which holds receiving member 3 slidable therewithin, and at the base end 2b thereof, is installed in door Ma pivotably.

[0022] On the other hand, receiving member 3 is provided so as to be slidable between a first position and a second position in the direction intersecting the direction of pivoting of rotating member M. Also, it is arranged that such receiving member 3 is pressed toward the second position by urging means 4 when it is in the first position. Also, such receiving member 3 is held at the first position while resisting the above-mentioned urging action, and after capturing striker 1 at the first position in the process of the forward movement of door Ma, holding is released

to be moved to the second position by the above-mentioned urging action. In the example, receiving member 3 is provided in frame upper part Fc of door frame Fa so as to be slidable in the right-and-left direction intersecting the direction of pivoting of door Ma (or, front-back or longitudinal direction). And, in the example, striker 1 abuts against catcher body 6 of receiving member 3 which is in the first position right before door Ma finishes its closing in the forward movement of door Ma. And, when striker 1 abuts against this catcher body 6, in the first example shown in FIG 1 - FIG 14, catcher body 6 which is in the non-engagement position captures the striker 1 by pivoting to the engagement position and, in the second example shown in FIG 15 - FIG 25, catcher body 6 which is in the non-engagement position captures the striker 1 by moving backwardly to the engagement position, while receiving member 3 is released from the above-mentioned holding and moved to the second position together with striker 1 by the above-mentioned urging action. And, door Ma is thereby receives the effect of reciprocation mechanism R up to the closing position (a predetermined position).

[0023] Because arm body 2 is provided pivotably, even if the sliding direction of receiving member 3 intersects the direction of pivoting y of rotating member M, it can make rotating member M move forward in association with the movement of receiving member 3 toward the second position by urging means 4. That is to say, after striker 1 becomes captured by receiving member 3, by making arm body 2 pivot depending on the slide movement of receiving member 3 toward the second position, rotating member M can be moved forward by receiving member 3 which is provided so as to be slidable as described above. Because receiving member 3 slides in the direction intersecting the direction of pivoting y of rotating member M, the installation space of receiving member 3 in the direction of pivoting y of rotating member M can be minimized, and typically, receiving member 3 can appropriately be provided to door frame Fa without damaging the appearance.

[0024] In the example, it is arranged such that the widest distance is formed between striker 1 and one side Mc which becomes the top in the forward movement in door Ma until striker 1 becomes captured by receiving member 3. In the example, this condition is maintained by the undermentioned torsion coil springs 2f, 2q. And, when striker 1 becomes captured by receiving member 3 and receiving member 3 is moved toward the second position, as receiving member 3 gets closer and closer to the second position, arm body 2 is pivoted while resisting the urging action of the above mentioned springs 2f, 2q, to narrow the above mentioned distance between one side Mc and striker 1. More specifically, in the example, after capturing striker 1, receiving member 3 slides in the direction approaching door hinge Mb and arm body 2 is pivoted in the direction to move striker 1 closer to this door hinge Mb.

(Example No. 1)

[0025] In reciprocation mechanism R according to the first example shown in FIG 1 - FIG 14, striker 1 is provided at free end 2a of single arm body 2. Striker 1 is put together vertically movably at free end 2a of arm body 2 and is provided to this arm body 2 so as to be changeable in length depending upon the movement in the downward direction resisting the urging action of compression coil spring 2g which is built in free end 2a of arm body 2, or in other words, the size or projection from free end 2a of arm body 2. Therefore, in the first example, in the event receiving member 3 has been moved to the second position inadvertently or by malfunction in a condition as described below in which door Ma is not being moved forward to the closing position, by moving door Ma forward toward the closing position, and by making striker 1 get over between auxiliary engagement section 6g and movable end 6c of catcher body 6 pivoted to the engagement position, striker 1 can engage the auxiliary engagement section 6g.

[0026] Also, in the first example, arm body 2 is pivotally provided to door Ma by means of mounting bracket 2h which is comprised of horizontal plate section 2i and vertical plate section 2j and provided so as to locate vertical plate section 2j adjacent to one side Mc of door Ma by fixing horizontal plate section 2i on the upper end surface of door Ma. In the bottom edge of vertical plate section 2j of mounting bracket 2h, ear section 2k sticking out sideways outside this vertical plate section 2j is formed, and by shaft component 2d which passes through bore 2c formed in base end 2b of arm body 2 and is fixed in this ear section 2k, arm body 2 is pivoted around this shaft component 2d. (FIG 13, FIG 14)

[0027] In the first example, one end of spring of torsion coil spring 2f wound around shaft component 2d is stopped by this shaft component and the other end of spring is stopped by arm body 2, and at the back or in a posterior direction of bore 2c, positioning section 2e which abuts against vertical plate section 2j of mounting bracket 2h by the urging action of the spring 2f is formed. Also, by this spring 2f and positioning section 2e, the reference posture (posture of FIG 2) of arm body 2 wherein the widest distance is formed between striker 1 and one side Mc which becomes the top in the forward movement in door Ma is maintained.

[0028] Also, in the first example, the free end 2a side of arm body 2 is bent so that the pivot center side of rotating member M or door hinge Mb side of door Ma may be situated inside the bent portion. That is to say, arm body 2 is configured to be straight halfway from base end 2b and it is curved to free end 2a side. In the reference posture, free end 2a is located closer to door hinge Mb than to base end 2b. When door Ma as rotating member M is reciprocated or operated so as to be opened from the closing position (the position of FIG 9, i.e. the predetermined position), by the movement of striker 1 associated therewith, receiving member 3 slides to the first po-

sition while resisting the urging action of urging means 4, to release striker 1 and to be held again there. But, if the free end 2a side of arm body 2 is curved in this way, until receiving member 3 releases striker 1, striker 1 can be moved as linearly as possible and receiving member 3 can be returned to the first position smoothly.

[0029] In the first example, receiving member 3 is slidably supported by main body 5 and is attached to door frame Fa as stationary body F through this main body 5.

[0030] Also, catcher body 6 of striker 1 is pivotally installed in such receiving member 3 between the engagement position where the striker is brought into engagement and the non-engagement position where the striker is not brought into engagement. Also, holding member 7 is provided to this catcher body 6 and main body 5 to permit at the same time a state in which receiving member 3 is in the first position and a state in which catcher body 6 is in the non-engagement position, and pivoting of catcher body 6 to the engagement position is made upon the abutment of striker 1, and by this pivoting, the afore-mentioned holding of receiving member 3 is released.

[0031] Until catcher body 6 abuts against striker 1, such receiving member 3, firstly, waits in main body 5 while being held at the first position by holding member 7 while resisting the urging action of tension coil spring 4a as urging means 4 as described later, (FIG 2, FIG 3) and secondly, captures striker 1 together with catcher body 6 which is pivoted to the engagement position when catcher body 6 abuts against striker 1, and is forcibly moved, upon releasing the holding, to the second position or a position near door hinge Mb, in the example, by the urging action of the above mentioned tension coil spring 4a. (FIG 9) Thereby, in the first example, when door Ma as rotating member M is operated to be moved forward from the position in which striker 1 is being abuttedly captured by catcher body 6 in receiving member 3, the forward movement of door Ma is assisted by receiving member 3 operated as described above up to the closing position as the predetermined position. Also, in the first example, with the braking force of below described braking means 8 being acted upon, the forward movement of such door Ma assisted as above is made to be a slow one and that door Ma does not make a loud sound nor move back in the opening direction by the reaction force generated when door Ma abuts against door stop part Fb.

[0032] When door Ma as rotating member M moved forward to the predetermined position in this way is moved backward while resisting the urging action of tension coil spring 4a, or while accumulating this tension coil spring 4a, receiving member 3 catching striker 1 by catcher body 6 is moved to the first position within main body 5, and when it reaches the first position, it becomes held again by main body 5 by means of holding member 7 and catcher body 6 is pivoted to the non-engagement position and releases striker 1. And, the movement to a desired position of door Ma is allowed by means of this release.

[0033] Specifically, main body 5 as the supporter for receiving member 3 is provided to frame upper part Fc of door frame Fa, forming part of door stop part Fb. That is to say, main body 5 is configured to form a form of a slim case in the horizontal direction and is provided with front plate section 5a located at the side becoming door stop part Fb, back plate section 5b opposed to this front plate section 5a, top plate section 5c and base plate section 5d. Also, both the right and left ends of such main body 5 are closed. In the depicted example, this main body 5 is attached to frame upper part Fc by holding such main body 5 within channel material 10 which forms a channel-shaped or squarely U-shaped cross section, by covering the front plate section 5a, back plate section 5b and top plate section 5c with this channel material 10 and by making both the right and left ends of such main body 5 fix to frame upper part Fc of door frame Fa through this channel material 10.

[0034] Having its overall length shorter than that of main body 5 and width to fit in between front plate section 5a and back plate section 5b of main body 5 without leaving too much of a gap therebetween, receiving member 3 is slidably put in the horizontal direction within main body 5. And, in the first position, right edge 3a in FIG 2 opposite to the door hinge Mb side in receiving member 3 and the right edge inside surface of main body 5 are close to each other and the widest distance is formed between left edge 3b of receiving member 3 and a left edge inside surface of main body 5 (FIG 2).

[0035] In the depicted example, receiving member 3 assumes the distance between the position at about the middle thereof in the lengthwise direction and right edge 3a to be built-in part 3c of braking means 8 and is provided with catcher body 6 which is pivotally provided between the position from about the middle thereof in the lengthwise direction to left edge 3b. And, tension coil spring 4a as urging means 4 is disposed between left edge 3b of such receiving member 3 and the left edge of main body 5. That is say, in the depicted example, along the transition axis line x (FIG 3, FIG 11) of receiving member 3, urging means 4 is placed to be adjacent to receiving member 3 so that the installation space of the mechanism on the side of receiving member 3 in the direction of pivoting y of rotating member M is minimized.

[0036] In the depicted example, braking means 8 is comprised of piston damper 8a which includes cylinder 8b and a piston and piston rod 8c which are not shown, and is configured to apply a braking force to the movement or relative movement of said piston. And, in the depicted example, such piston damper 8a is disposed between main body 5 and receiving member 3 by incorporating cylinder 8b in built-in part 3c of receiving member 3 to be fixed therein while making the side of piston rod 8c protrude to the left, and by fixing the edge of such protrusion of piston rod 8c in stationary portion 5e formed in the position at about the middle of main body 5 in the lengthwise direction. And, when receiving member 3 is in the first position, piston rod 8c is protruded most from

inside of cylinder 8b. (FIG 2) Thereby, when receiving member 3 slides by means of the urging action of urging means 4 from the first position toward the second position, piston rod 8c is pushed in cylinder 8b and this sliding movement of receiving member 3 and then the forward movement of door Ma to the closing position are acted by the above described braking force.

[0037] Catcher body 6 is pivotally provided to receiving member 3 by means of vertical axis 6a. In the depicted example, such catcher body 6 is put in receiving member 3 by making vertical axis 6a put into bore 3d disposed in receiving member 3 in the bottom of receiving member 3. Catcher body 6 is provided with catching concave part 6d for catching striker 1, which is located between base end 6b provided with this vertical axis 6a and movable end 6c, is left open in the front plate section 5a side of main body 5 and becoming dented in the backward direction, and is open in both the top surface and the under surface of catcher body 6. And, in the depicted example, when receiving member 3 is in the first position, the right and left side walls 6e, 6e of the catching concave part 6d intersect a moving axis line x of receiving member 3 to make an acute angle in the right edge 3a side of receiving member 3, and (FIG 3, FIG 4, FIG 7 or non-engagement position), guided by the undermentioned guide means 9, striker 1 abuts against side wall 6e on the left side of catching concave part 6d of catcher body 6 in this non-engagement position in the process to make door Ma move forward to the closing position. And, when striker 1 abuts in this way, catcher body 6 is pivoted in a direction to make the right and left side walls 6e, 6e of catching concave part 6d perpendicular to the moving axis line x of receiving member 3, and (FIG 8 or engagement position) striker 1 enters into the inside 6f of catching concave part 6d and the holding by holding member 7 is released to start the sliding movement of receiving member 3 toward the second position.

[0038] In the depicted example, guide means 9 to guide such striker 1 to catcher body 6 in receiving member 3 in the first position is formed in front plate section 5a and base plate section 5d of main body 5. In the depicted example, such guide means 9 includes introduction opening 9a cut out through front plate section 5a of main body 5 and guide groove 9b which is formed in base plate section 5d. Cut out opening 10a corresponding to this introduction opening 9a is formed in the above mentioned channel material 10. Guide groove 9b is provided with oblique part 9c which, communicating with introduction opening 9a, extends obliquely up to the position at about the middle of main body 5 in the width direction, and straight section 9d which, continuing this oblique part 9c in a position at the middle of main body 5 in the width direction, extends straight toward left edge side of main body 5. Oblique part 9c inclines to approach the left edge of main body 5 as it get closer to the side communicating with straight part 9d. In the depicted example, when receiving member 3 is in the first position, catcher body 6 in the non-engagement position is disposed in the com-

munication point between straight part 9d and oblique part 9c in the guide means 9 while facing the inlet of catching concave part 6d to introduction opening 9a. (FIG 4) Thereby, in the process to make door Ma move forward to the closing position, by guiding striker 1 by means of oblique part 9c of guide means 9, the striker 1 is made to get into catching concave part 6d of catcher body 6. And, when striker 1 enters into catching concave part 6d of catcher body 6, catcher body 6 is pivoted to the engagement position, and because the sliding movement of receiving member 3 toward the second position is started with this, striker 1 is moved to the door hinge Mb side along straight part 9d of guide means 9 while making arm body 2 pivot as mentioned above through catcher body 6 and door Ma is thereby moved to the closing position. It is to be noted that, in the first example, front wall 3e protruding downward is formed in the lower part of receiving member 3 and catcher body 6 is provided therebehind, and cut out opening 3f which, functioning as guide means 9, leading striker 1 to catching concave part 6d of catcher body 6 in the non-engagement position is formed in the front wall 3e. When catcher body 6 is pivoted to the engagement position, front wall 3e which is located more to the left than the cut out opening 3f is located before the inlet of catching concave part 6d, and in the process of the movement of receiving member 3 toward the second position, the engagement state between catcher body 6 and striker 1 is not released even without guide means 9 of main body 5.

[0039] The aforementioned holding member 7 in the first example is comprised of sliding contact section 7a formed between catching concave part 6d and movable end 6c of catcher body 6 and cam groove 7b for this sliding contact section 7a formed in top plate section 5c of main body 5.

[0040] Sliding contact section 7a is configured to form a protrusion projecting from the top surface of catcher body 6. In receiving member 3, there is formed aperture hole 3g making this sliding contact section 7a project from the top surface of receiving member 3.

[0041] Cam groove has a groove width to receive sliding contact section 7a to hold and guide sliding contact section 7a, and is provided with length side groove section 7c which extends straight along the direction of the movement of receiving member 3 and width side groove section 7d which forms corner 7f with right edge of the length side groove section 7c and extends backward. As width side groove section 7d moves backward from corner 7f, it extends obliquely to approach the left or the urging action direction of urging means 4.

[0042] Thereby, in the depicted example, when catcher body 6 has sliding contact section 7a entering into width side groove section 7d of cam groove 7b, catcher body 6 is placed in the non-engagement position by locating sliding contact section 7a in rear end 7e of the width side groove section 7d by means of the urging action of urging means 4 and then, sliding contact section 7a is caught on the width side groove section 7d by means

of the urging action of urging means 4 and receiving member 3 is held in the first position. When door Ma is moved forward toward the closing position from this condition while being guided by guide means 9, striker 1 abuts against side wall 6e (FIG 7) on the left side of catching concave part 6d as described above, but because the side wall 6e is in the side of vertical axis 6a rather than in the side of sliding contact section 7a and is located in front thereof, catcher body 6 is pivoted to the engagement position in a direction to make sliding contact section 7a slip away from width side groove section 7d. When sliding contact section 7a is located in corner 7f by means of this pivoting by means of the urging action of urging means 4, receiving member 3 slides to the second position and door Ma is moved forward to the closing position. When door Ma in the closing position is moved backward, receiving member 3 is moved to the first position by means of catcher body 6 catching striker 1. Because striker 1 pushes side wall 6e of the right side of catching concave part 6d at that time, when sliding contact section 7a is located in corner 7f of the cam groove, catcher body 6 is pivoted to the non-engagement position in a direction to make sliding contact section 7a enter into width side groove section 7d, receiving member 3 is placed in the first position again, and striker 1 is released from receiving member 3.

[0043] It is to be noted that, in the first example, upwardly concave auxiliary engagement section 6g is formed between catching concave part 6d and movable end 6c in the lower part of catcher body 6, and that when receiving member 3 has been moved to the second position by malfunction or inadvertently though door Ma has not been made to be pivoted to the closing position, in case door Ma is operated to be moved forward toward the closing position, striker 1 guided by guide means 9 gets over between auxiliary engagement section 6g and movable end 6c of catcher body 6 in the engagement position while moving itself downward, to enter into auxiliary engagement section 6g. Thereby, should such a misoperation happen, the return to the anticipated condition wherein receiving member 3 is in the first position can be made.

Second Example

[0044] In reciprocation mechanism R according to the second example shown in FIG 15 - FIG 25, arm body 2 comprises a plurality of rod-shaped arm components 2m, 2n which are pivotably put together with each other. One arm component 2m is attached to one side Mc of door Ma between its both ends. The other arm component 2n is pivotably installed in one end of arm component 2m by means of vertical axis 2o. Nose member 2p comprising striker 1 is screwed in the other arm component 2n and striker 1 is provided in free end 2a of arm body 2.

[0045] In the second example, one end of the spring of torsion coil spring 2q wound around by vertical axis 2o is held at the side of one arm component 2m, and, the

other end of the spring is held at the side of the other arm component 2n. And, by means of this spring 2q, the reference posture of arm body 2 wherein the widest distance is formed between striker 1 and one side Mc which becomes the top in the forward movement in door Ma is maintained. (FIG 24)

[0046] Also, in the second example, receiving member 3 is supported slidably by main body 5, and is attached to door frame Fa as stationary body F by means of the main body 5.

[0047] Also, catcher body 6 of striker 1 is movably installed in such receiving member 3 between the engagement position where the striker engages and the non-engagement position where the striker does not engage. At the same time, receiving member 3 and main body 5 are made to be held at the same time in a state in which receiving member 3 is in the first position and a state in which catcher body 6 is in the non-engagement position. And movement of catcher body 6 to the engagement position following the abutment of striker 1 is allowed, while holding member 7 to release the afore-mentioned holding of receiving member 3 is provided by this movement.

[0048] In the depicted example, main body 5 is configured to form a slim case open in the under surface thereof. Also, introduction opening 5f of striker 1 which communicates with the below described lower chamber 5h is formed in one end of the main body 5. Typically, while locating the other end thereof in the side of door hinge Mb and making its lengthwise direction extend along the frame upper part Fc, the main body 5 is installed in frame upper part Fc of door frame Fa at its upper part.

[0049] In the second example, until receiving member 3 abuts against striker 1, receiving member 3 firstly waits in main body 5 or in the introduction opening 5f side thereof, while being held at the first position by holding member 7 and resisting the urging action of tension coil spring 4b as urging means 4 as described later, and (FIG 15) secondly, when receiving member 3 abuts, it releases this holding and captures striker 1 instead, to forcibly move to the second position by means of the urging action of the tension coil spring 4b in a direction to move away from introduction opening 5f in main body 5. (FIG 19) Thereby, in the depicted example, when door Ma as rotating member M is operated to be moved forward, from the position in which striker 1 abuts against receiving member 3, the forward movement of door Ma is assisted by receiving member 3 operated as described above up to the closing position as the predetermined position. Also, in the second example, with the braking force of below described braking means 8 being acted upon, the forward movement of such door Ma assisted as above is made to be a slow one and door Ma does not make a loud sound nor move back in the opening direction by the reaction force generated when door Ma abuts against door stop part Fb.

[0050] When door Ma as rotating member M moved forward to the predetermined position in this way is moved backward, while resisting the urging action of ten-

sion coil spring 4a, or while accumulating the force in this tension coil spring 4a, receiving member 3 catching striker 1 by catcher body 6 is moved to the first position within main body 5, and when it reaches the first position, it becomes held again by means of holding member 7 and catcher body 6 is pivoted to the non-engagement position to release striker 1. And, the backward movement to a desired position of door Ma is allowed by means of this release.

[0051] Specifically, main body 5 is divided into upper chamber 5g and lower chamber 5h. The lower chamber 5h is opened downward over the lengthwise direction of main body 5. The receiving member 3 is moved in this lower chamber 5h. This lower chamber 5h is provided with a pair of wall sections 5i, 5i along the lengthwise direction of main body 5 and the movement of receiving member 3 is guided by this wall section 5i. Also, upper chamber 5g is communicated with lower chamber 5h through slit 5m over the lengthwise direction of main body 5.

[0052] Receiving member 3 is provided with base 3h, catcher body 6 which is slidably put together with this base 3h in the lengthwise direction of main body 5, stopper 7 which is slidably put together with this base 3h in the up-and-down direction and spring 3k which presses catcher body 6 constantly in a direction protruding out from base 3h toward the side of introduction opening 5f. Also, stopper 7 and catcher body 6 are connected with each other by means of pin 3j passing through the vertical guide groove 3i formed in base 3h which passes through cam groove 6m formed in main portion 6h of catcher body 6, and in a condition where catcher body 6 has finished advancing in the side of introduction opening 5f by the urging action of the spring 3k, stopper 7 projects upward from the upper part of base 3h and on the other hand, when catcher body 6 is moved backward resisting the urging action of spring 3k, stopper 7 is drawn within base 3h.

[0053] Also, in the front of catcher body 6, there is provided one clasp piece 6n to catch striker 1 on each side thereof respectively. Either one of such pair of clasp piece 6n, 6n, makes rear end 6p join together and project forward by means of thin-walled hinge section 6k in the contacting corner between front face 6i and either one of side face 6j of main portion 6h of catcher body 6 and is provided with protrusion 6q which projects inwardly between this rear end 6p and forward end 6o. Also, the other one of such pair of clasp piece 6n, 6n, makes rear end join together and protrude forward by means of thin-walled resilient hinge section 6k in the contacting corner between front face 6i and the other side face of main portion 6h of catcher body 6 and is provided with protrusion 6q which projects inwardly between this rear end and forward end. And, in the depicted example, such pair of clasp piece 6n, 6n, is placed so as to widen (or open) the pitch relative to the other clasp piece 6n by the elasticity of above resilient hinge section 6k as it approaches its forward end 6o in the above first position

and to hold "back part 6r" opposite to above protrusion 6q within aperture hole 5j formed in wall section 5i in the introduction opening 5f side of lower chamber 5h of main body 5. (FIG 17) Also, in this first position, a distance is formed to pass striker 1 between protrusions 6q of a pair of clasp piece 6n, 6n. (FIG 17) Also, in this first position, stopper 7g enters into concave part 7h formed in sky section 5k of lower chamber 5h. (FIG 16) Receiving member 3 is held at the first position by means of the stopper's entry into concave part 7h. That is to say, in the second example, the stopper 7g and the concave part 7h function as holding member 7.

[0054] In the depicted example, urging means 4 is comprised of tension coil spring 4b put in the upper chamber 5g of main body 5. In the depicted example, through slit 5m formed in upper section 5k of lower chamber 5h, one end of the spring of such spring 4b is held in a part of the rear end of base 3h of receiving member 3 entering into the upper chamber 5g, and the other end of the spring of such spring 4b is held in the rear end side of the upper chamber 5g of main body 5. The spring 4b is expanded most when receiving member 3 is in the first position. (FIG 15)

[0055] In the depicted example, braking means 8 is comprised of piston damper 8a which includes cylinder 8b and not-shown piston and piston rod 8c, and is configured to apply a braking force to the movement or relative movement of said piston. In the depicted example, such piston damper 8a is held between receiving member 3 in lower chamber 5h of main body 5 and the rear end of this lower chamber 5h so that the protrusion edge of piston rod 8c is fixed to base 3h of receiving member 3 and the movement of cylinder 8b is prevented. And, when receiving member 3 is in the first position, piston rod 8c is pushed out most from inside of cylinder 8b. (FIG 15)

[0056] Also, in the second example, in the front of introduction opening 5f of main body 5, there is provided guide means 9 to guide striker 1 to catcher body 6 of receiving member 3 in the first position. In the depicted example, this guide means 9 is configured to form curvature-shaped guide face 9f in block body 9e which has one side 9g linked integrally in the formed one end of introduction opening 5f of main body 5. The one side 9g of block body 9e is linked to main body 5 at a side in which introduction opening 5f in main body 5 is sandwiched. Block body 9e is configured to gradually increase thickness in the front-back direction as it moves toward the other side 9h opposed to one side 9g, and thereby, the side face which is between one side 9g and the other side 9h of block body 9e and facing one side Mc of door Ma becomes the afore-mentioned curvature-shaped guide face 9f.

[0057] Thereby, in the second example, when door Ma is moved forward toward the closing position, right before it is completely closed, striker 1 abuts against this curvature-shaped guide face 9f and is guided into main body 5 from introduction opening 5f of main body 5 while mak-

ing arm body 2 pivot. Striker 1 guided into main body 5 in this way and passing between protrusions 6q of a pair of clasp piece 6n, 6n of catcher body 6 of receiving member 3 in the first position, abuts against front face 6i of main portion 6h of said catcher body 6. (FIG 18) Catcher body 6 hit by striker 1 is moved backward resisting the urging action of said spring 4b and, when this backward movement occurs, back part 6r of a pair of clasp piece 6n, 6n is made to slip away from said aperture hole 5j of main body 5 and, by means of wall section 5i of main body 5, it is placed in a closed condition (clapsed condition) wherein striker 1 is prevented from slipping away from between protrusions 6q to the side of introduction opening 5f and striker 1 becomes captured by catcher body 6. Also, when catcher body 6 is moved backward in this way, stopper 7g is drawn within base 3h and said holding of receiving member 3 is released. (FIG 18) Thereby, the movement of receiving member 3 toward the second position is made by the urging action of said spring 4b, and because striker 1 is captured by this receiving member 3, door Ma is moved forward to the closing position. (FIG 19 - FIG 21) Stopper 7g drawn as described above makes the upper end thereof slide-contacts with upper section 5k of lower chamber 5h of main body 5. When door Ma moves back from this condition, receiving member 3 is moved within main body 5 in the opposite direction when door Ma is moved forward, and when it reaches said first position, stopper 7g enters concave part 7h again to allow advance movement of catcher body 6 by said spring 3k and, by this advance, back part 6r of clasp piece 6n enters into said aperture hole 5j again to make the pair of clasp piece 6n, 6n becomes the opening state (non-holding condition) and striker 1 is released. (FIG 17)

The specification, claims, drawings and abstract of Japanese Patent Application No. 2009-018008 filed on January 29, 2009 are incorporated herein by reference as disclosure of the specification of this invention.

Claims

1. A reciprocation mechanism for a rotating member, comprising:

an arm body pivotally provided at either one of a rotating member or a stationary body pivotally supporting the rotating member and having a striker at a free end side of the arm body;
a receiving member provided at the other of the rotating member or the stationary body so as to be slidable between a first position and a second position in a direction intersecting a direction of pivoting of the rotating member; and
urging means for urging the receiving member toward the second position,
wherein the receiving member is held at the first position while resisting an urging force and, after

capturing the striker at the first position in a process of a forward movement of the rotating member, holding is released to be moved to the second position by the urging force.

5

2. The reciprocation mechanism for a rotating member according to claim 1, further comprising guide means to guide the striker to a capture section of the receiving member in the first position.

10

3. The reciprocation mechanism for a rotating member according to claim 1 or 2, wherein a catcher body of the striker is pivotally installed in the receiving member between an engagement position where the striker is brought into engagement and a non-engagement position where the striker is not brought into engagement, and

15

the catcher member and a supporter for the receiving member are held at a same time in a state in which the receiving member is in the first position and a state in which the catcher member is in the non-engagement position, the catcher member is pivoted to the engagement position following the abutment of the striker is allowed, and a holding member to release said holding of the receiving member by means of this pivoting is provided.

20

25

4. The reciprocation mechanism for a rotating member according to any one of claims 1 through 3, wherein the urging means is arranged on a transition axis line of the receiving member adjacent to the receiving member.

30

5. The reciprocation mechanism for a rotating member according to any one of claims 1 through 4, wherein the free end side of the arm body is bent so that a pivot center side of the rotating member is situated inside a bent portion.

35

6. The reciprocation mechanism for a rotating member according to any one of claims 1 through 5, wherein the arm body comprises a plurality of arm components pivotally assembled together.

40

45

50

55

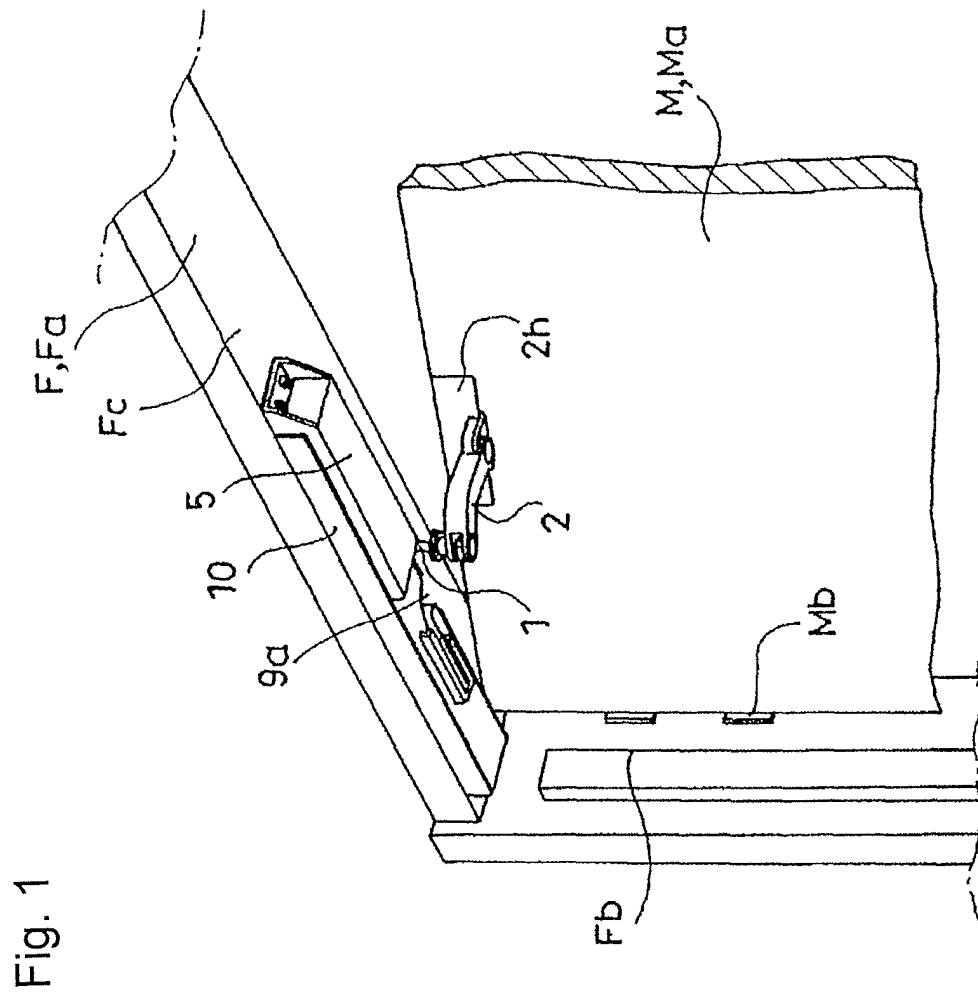


Fig. 2

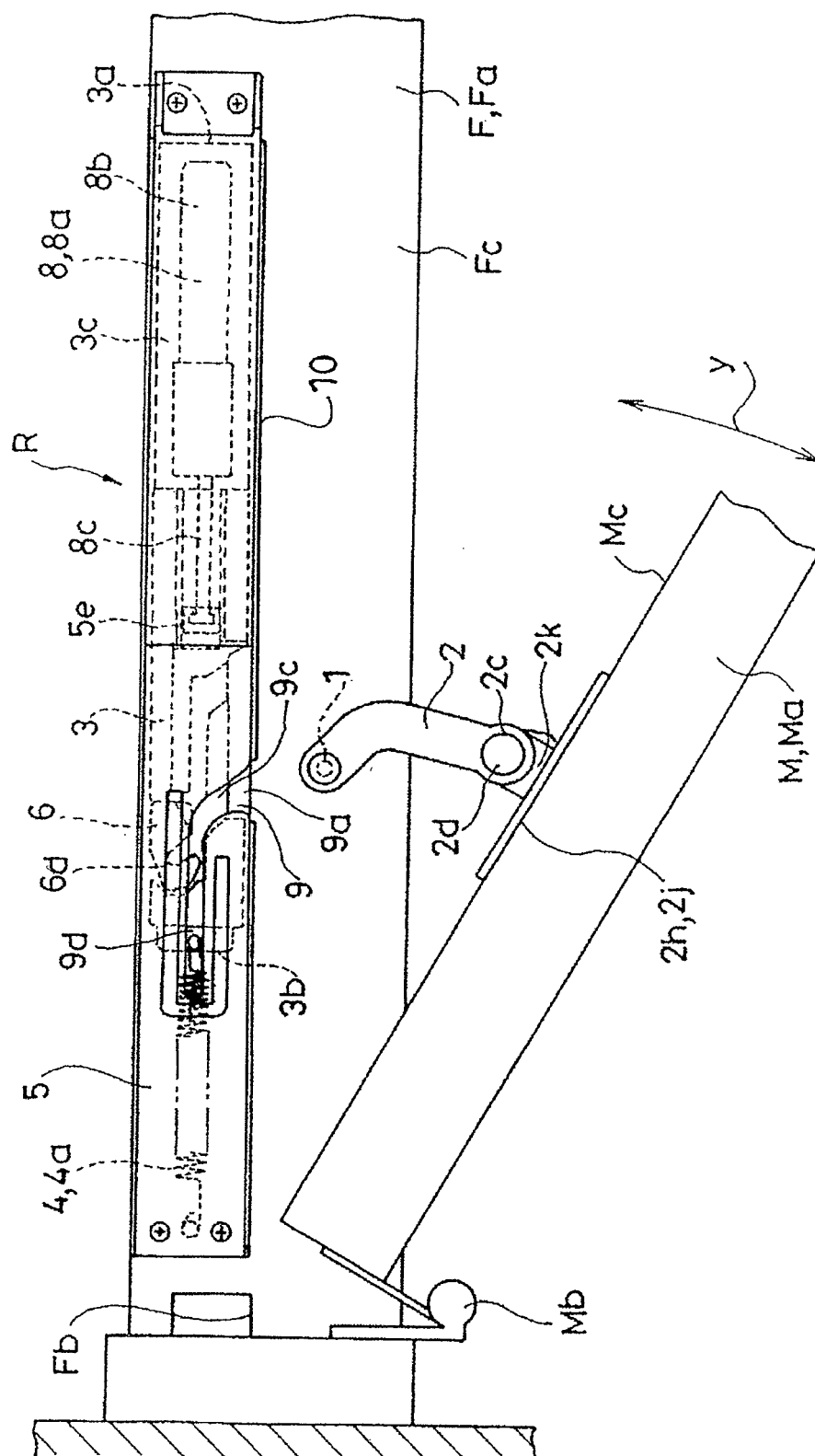


Fig. 3

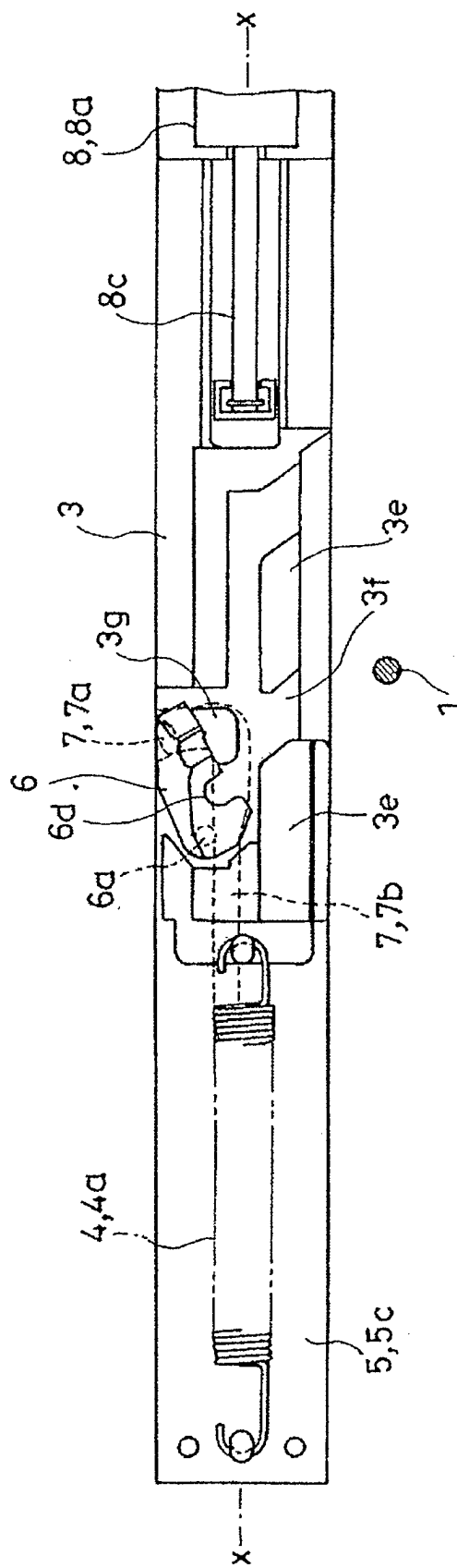


Fig. 4

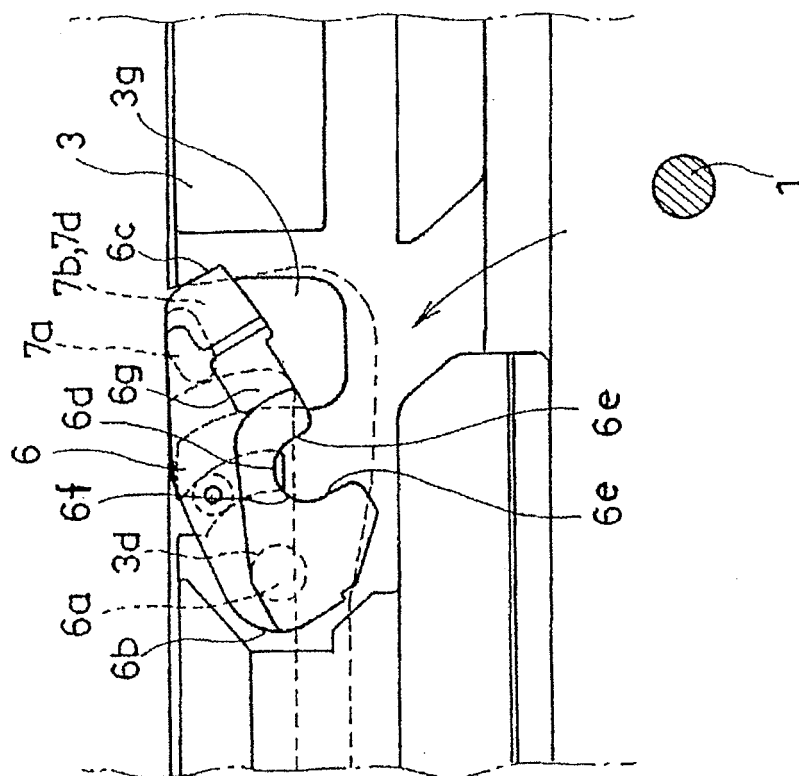


Fig. 5

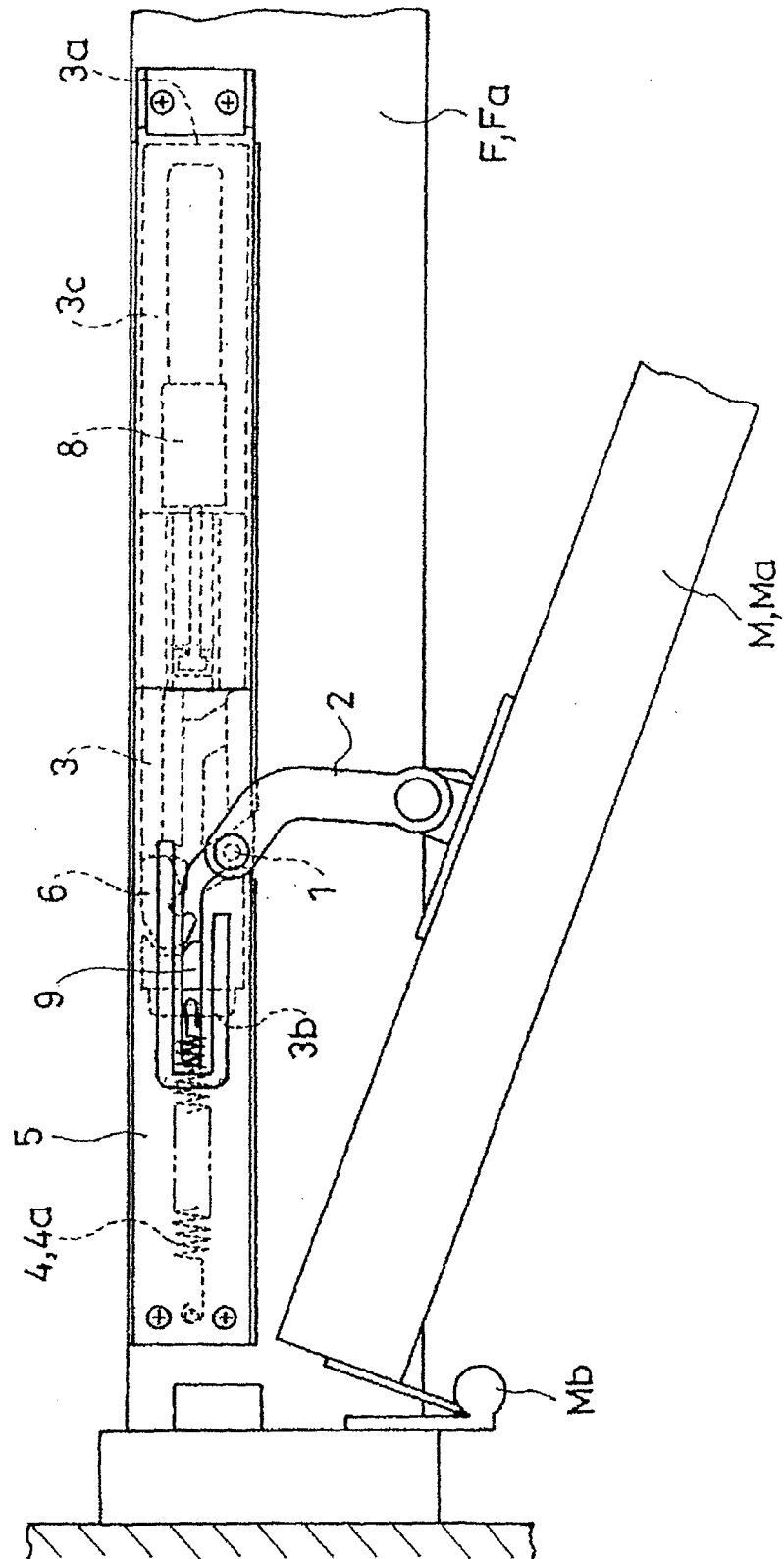


Fig. 6

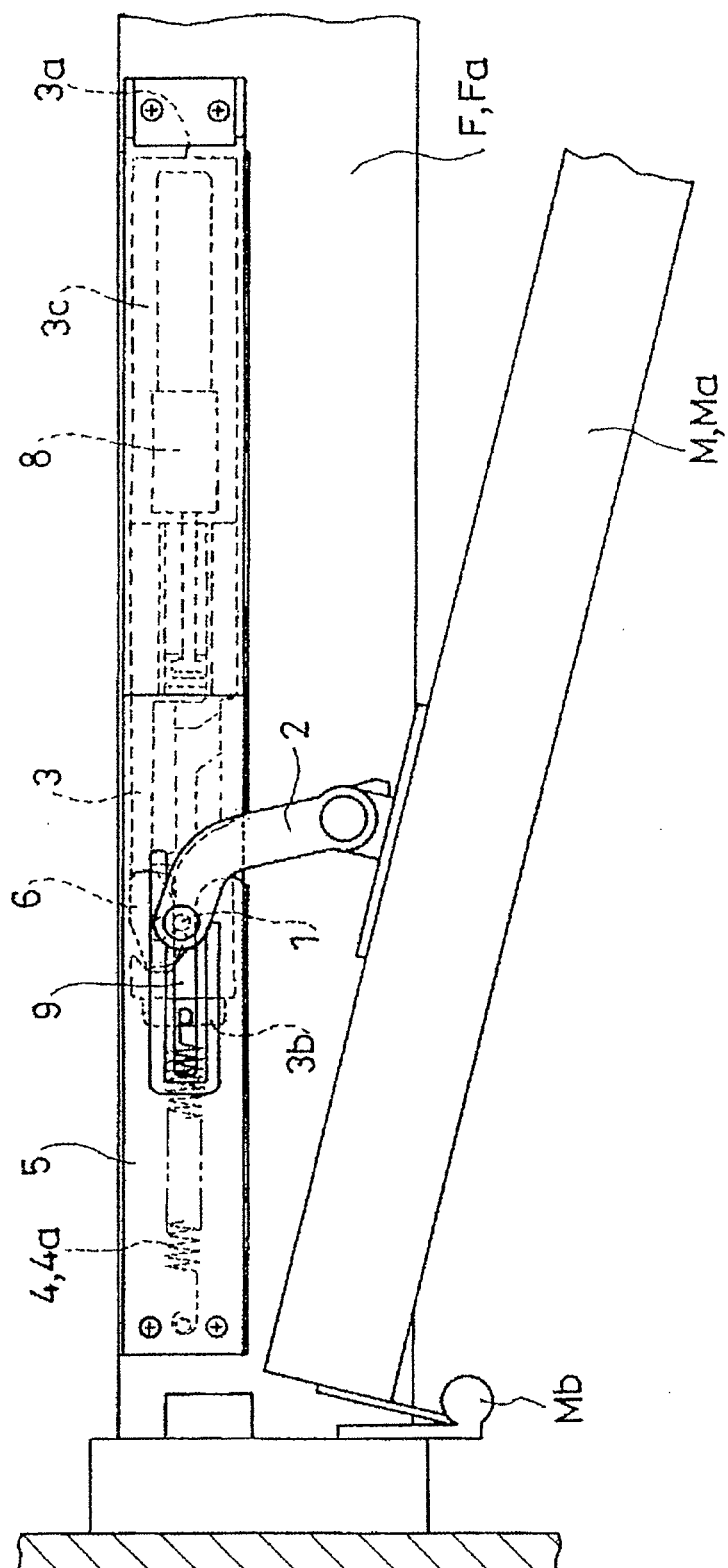


Fig. 7

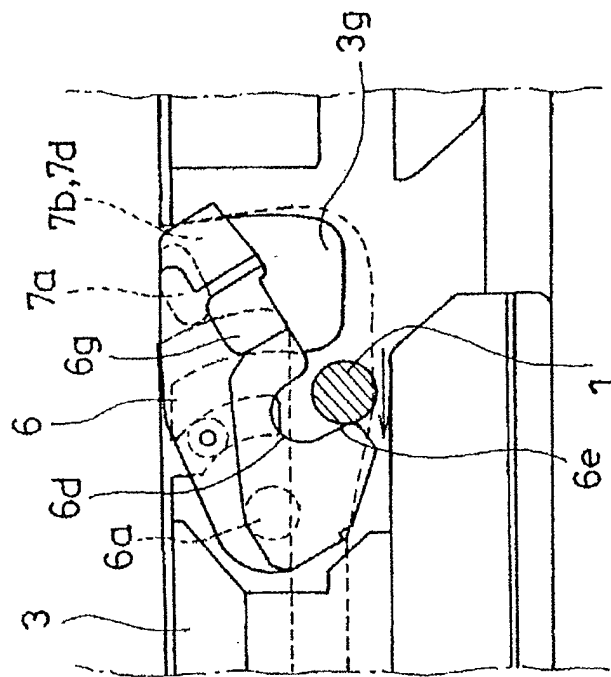


Fig. 8

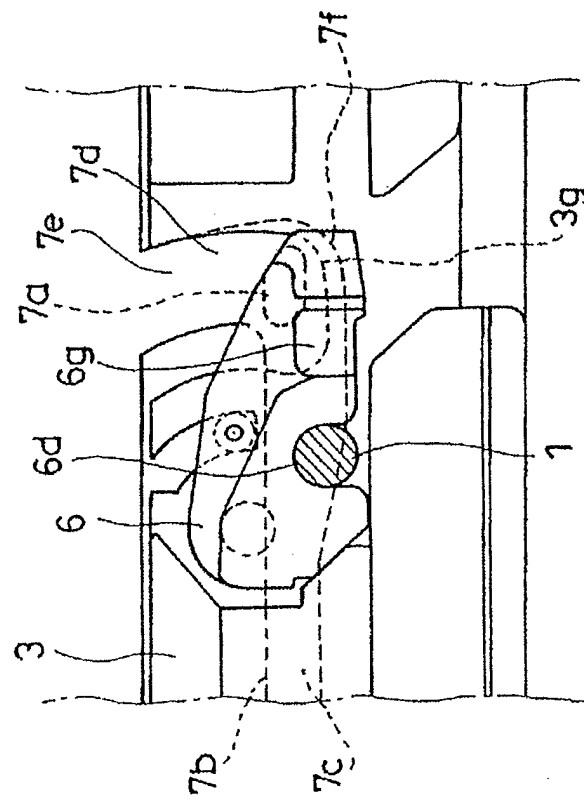


Fig. 9

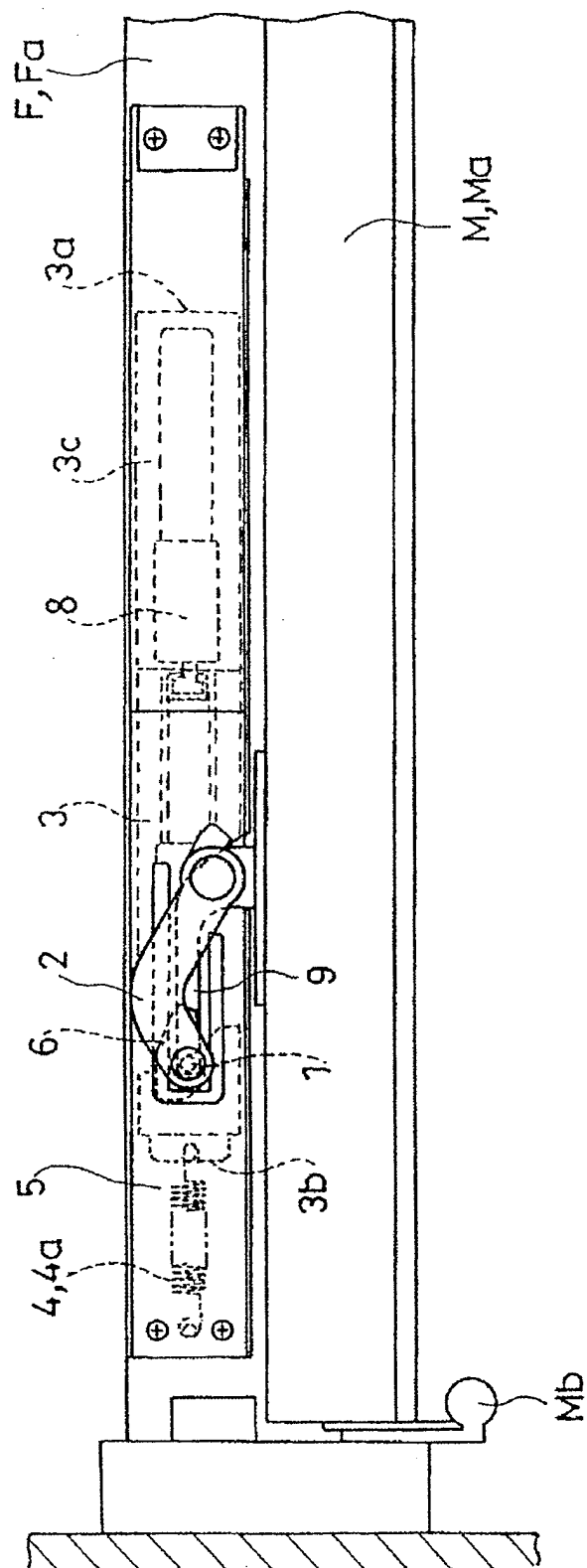


Fig. 10

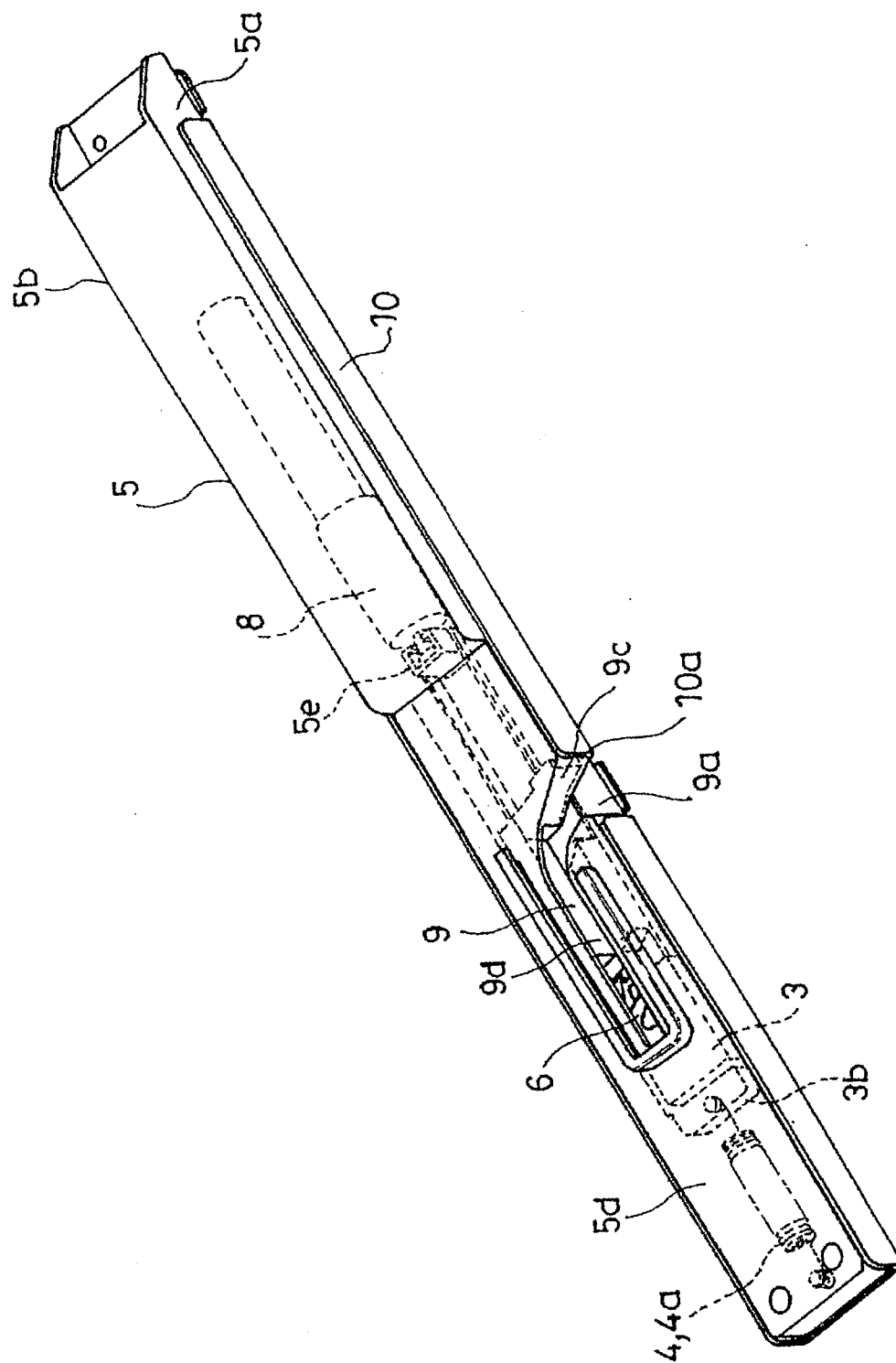


Fig. 11

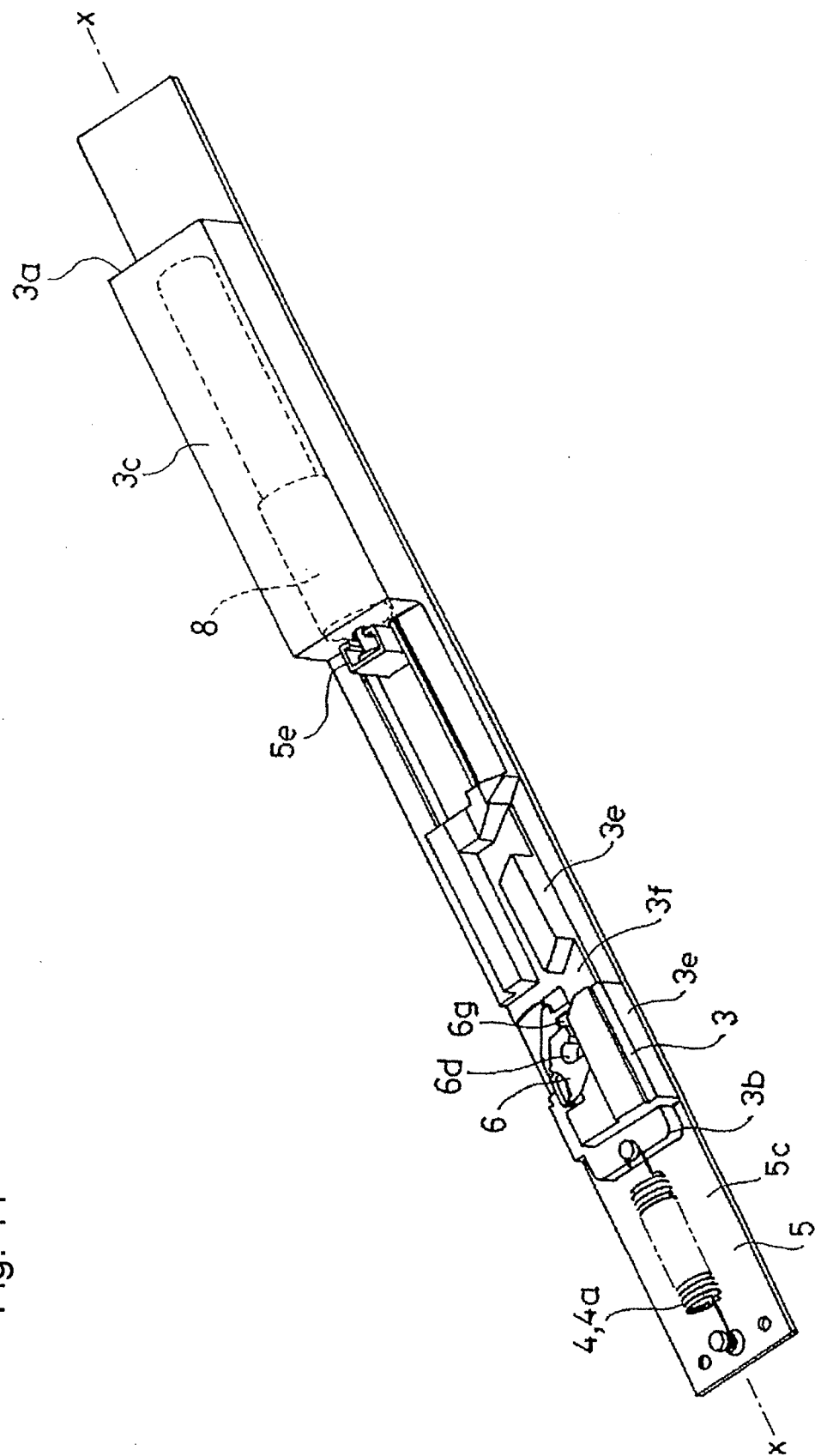


Fig. 12

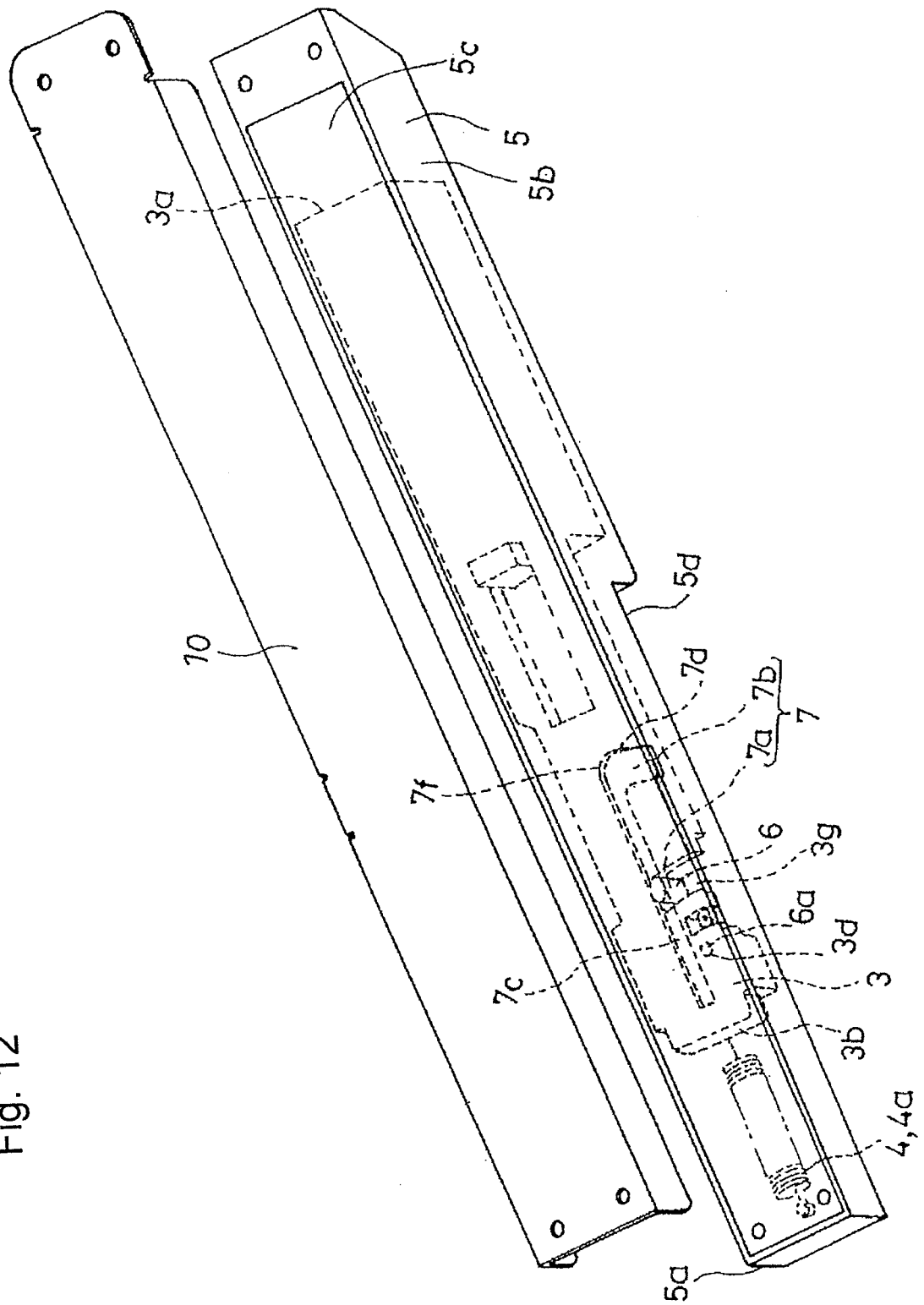
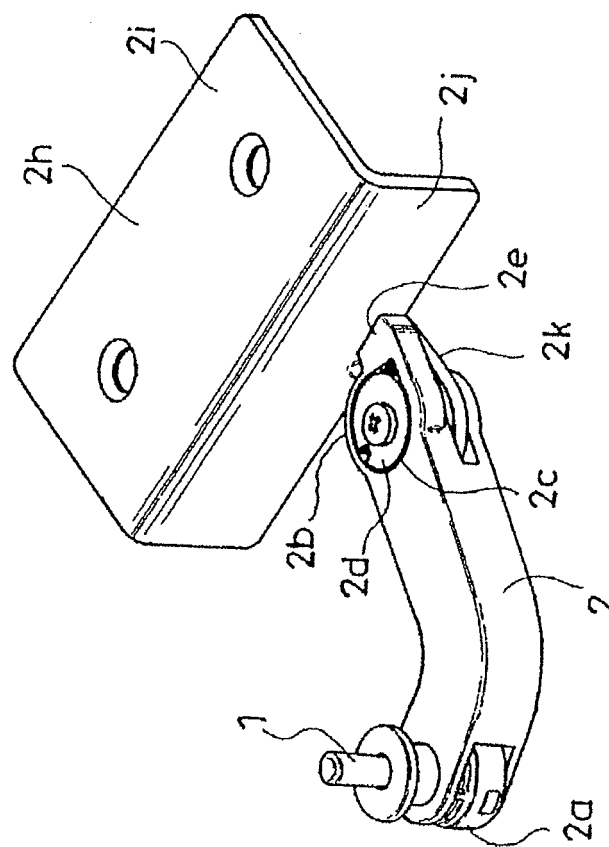


Fig. 13



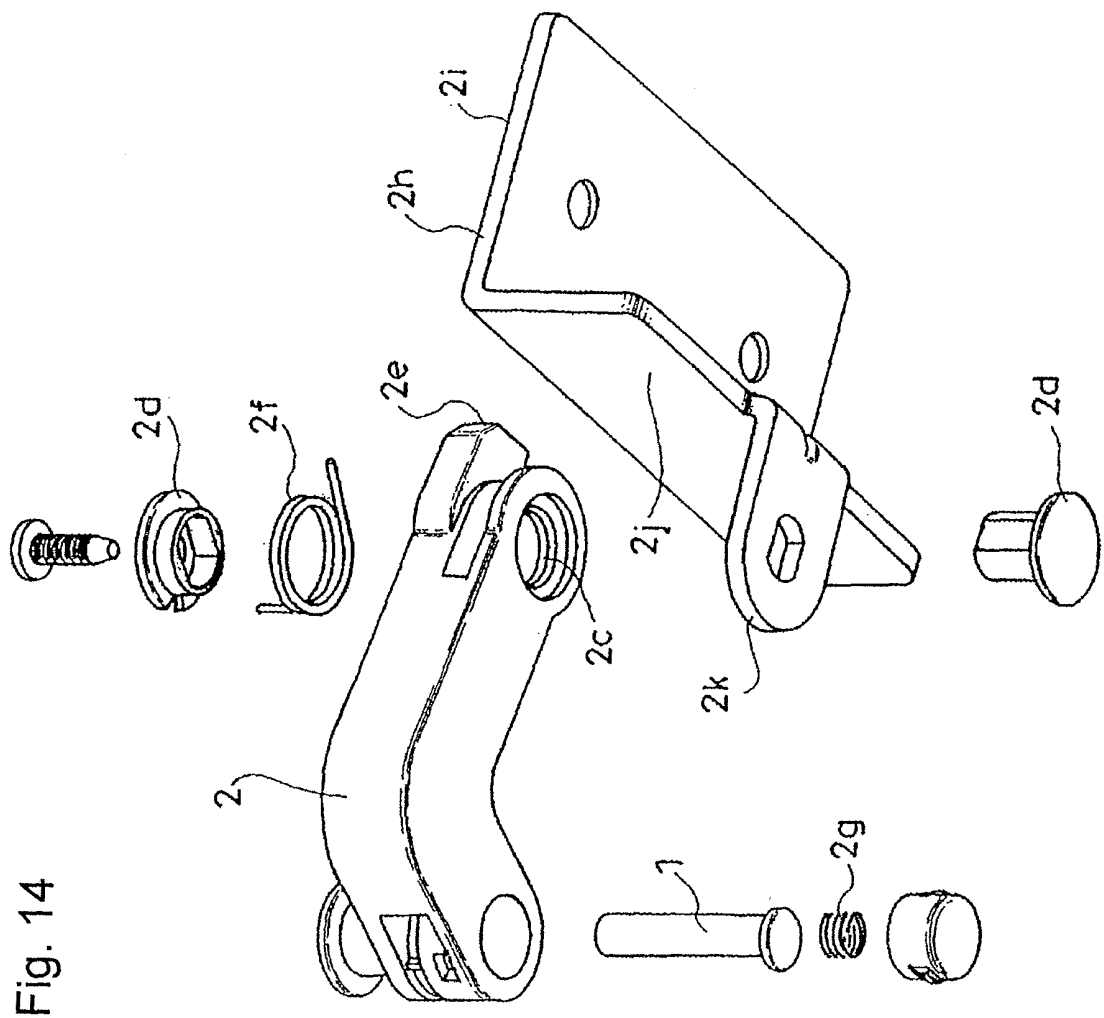


Fig. 14

Fig. 15

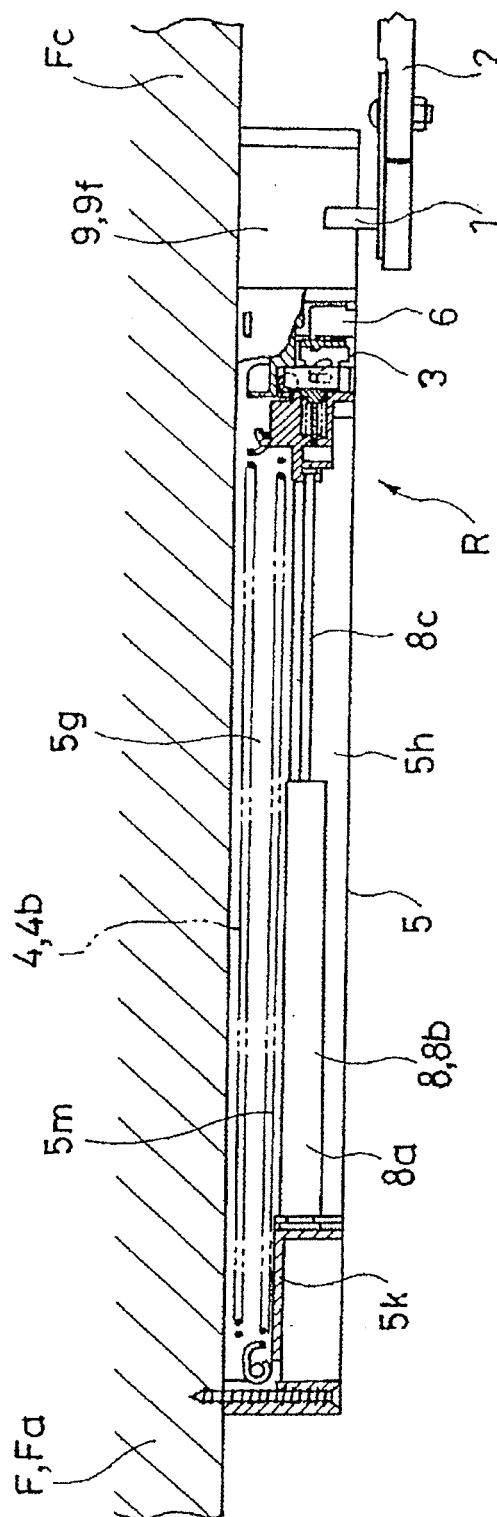
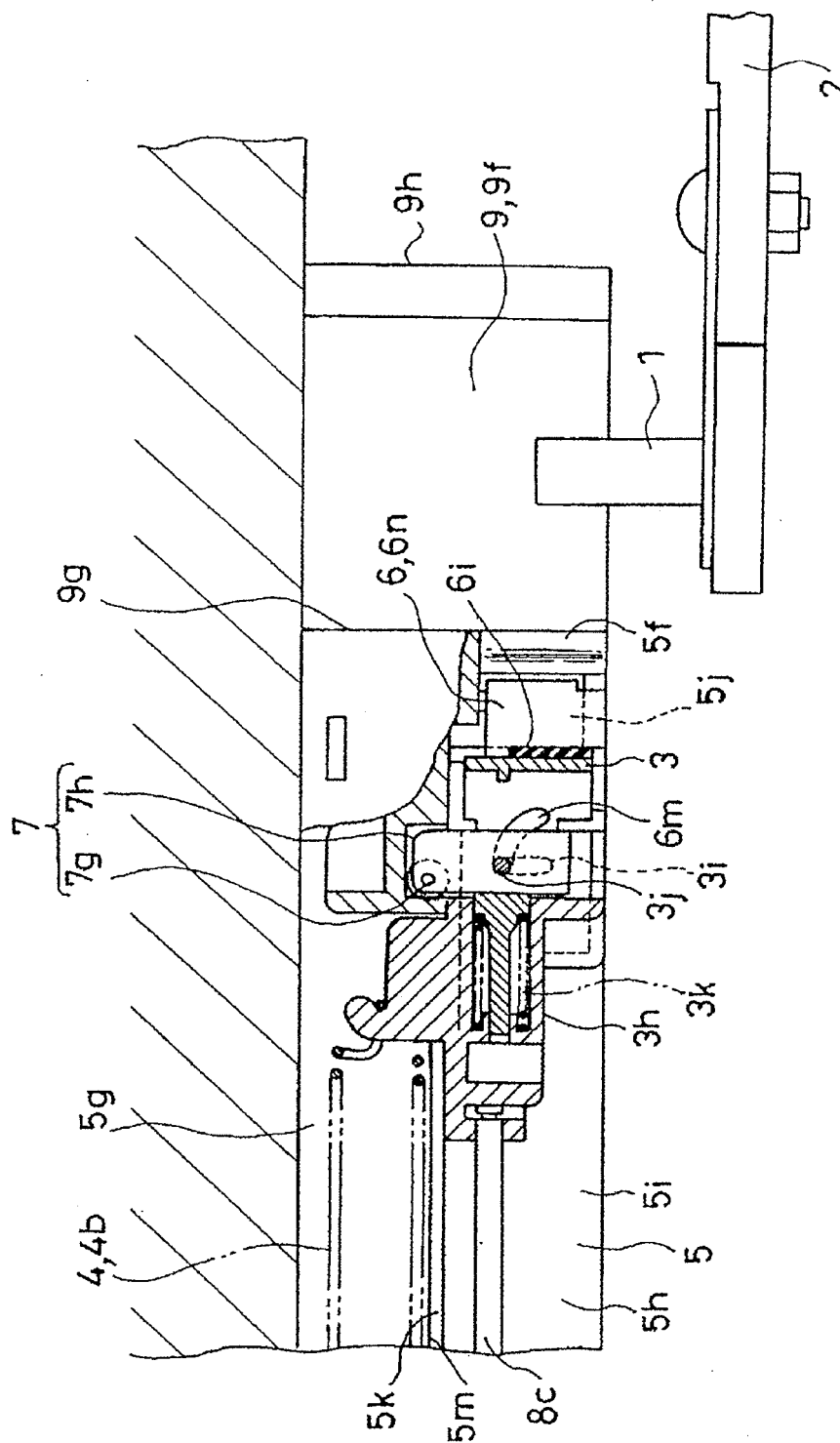


Fig. 16



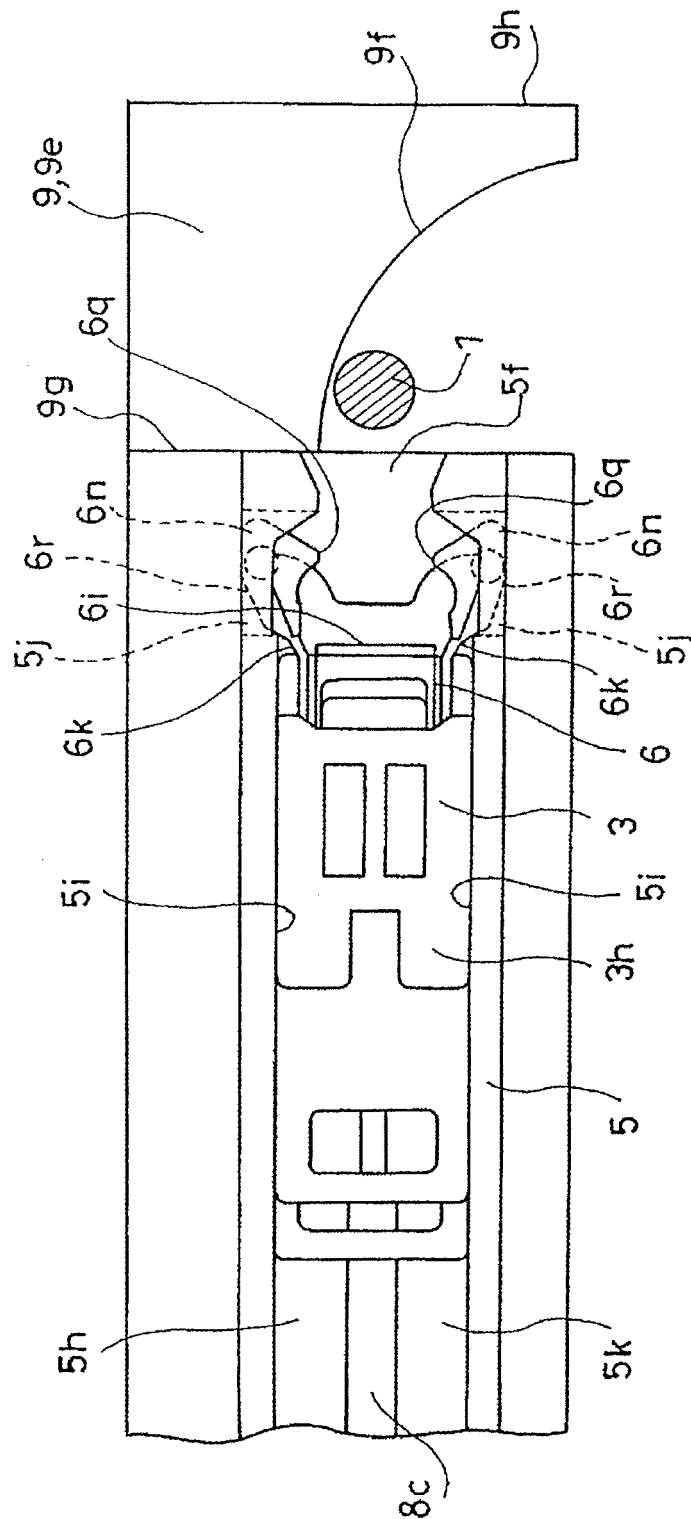


Fig. 17

Fig. 18

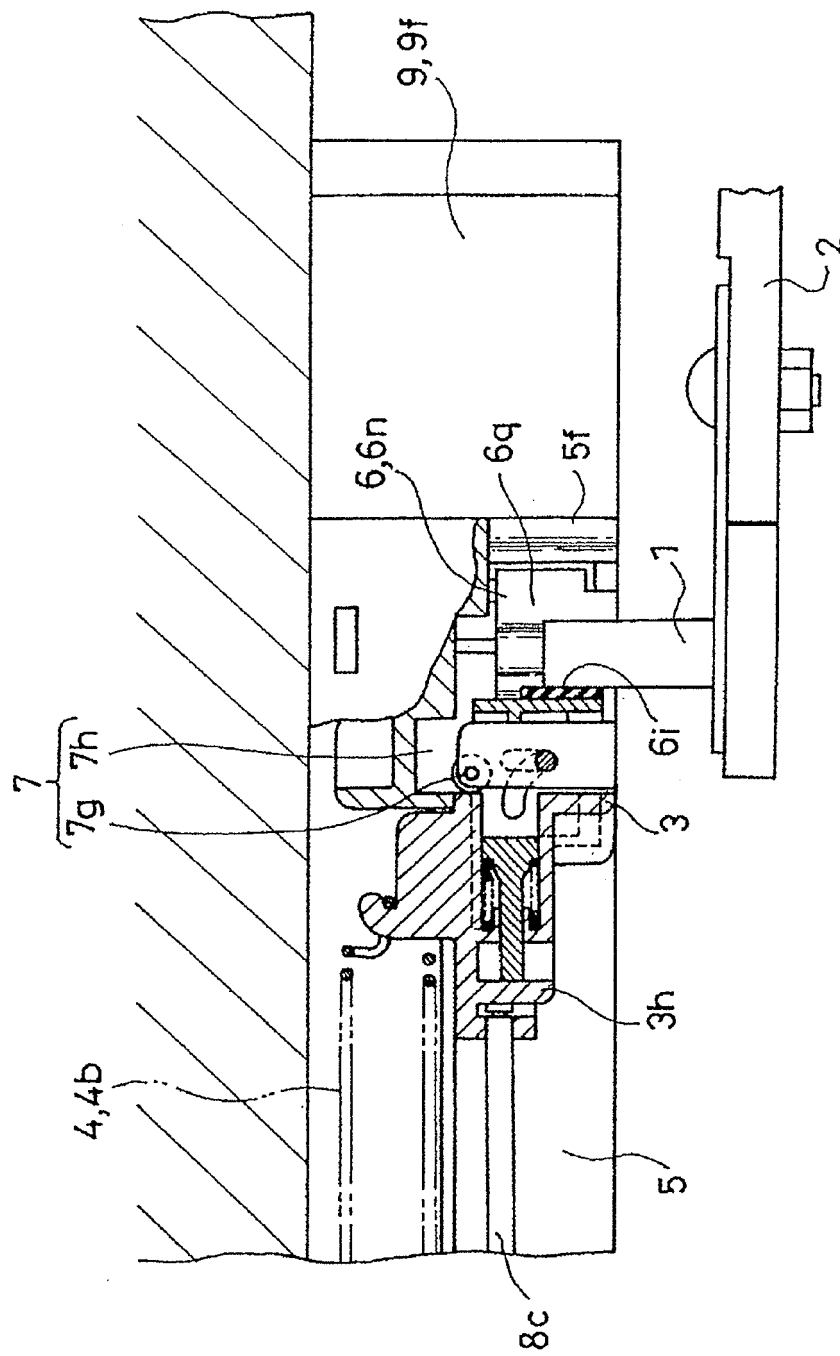


Fig. 19

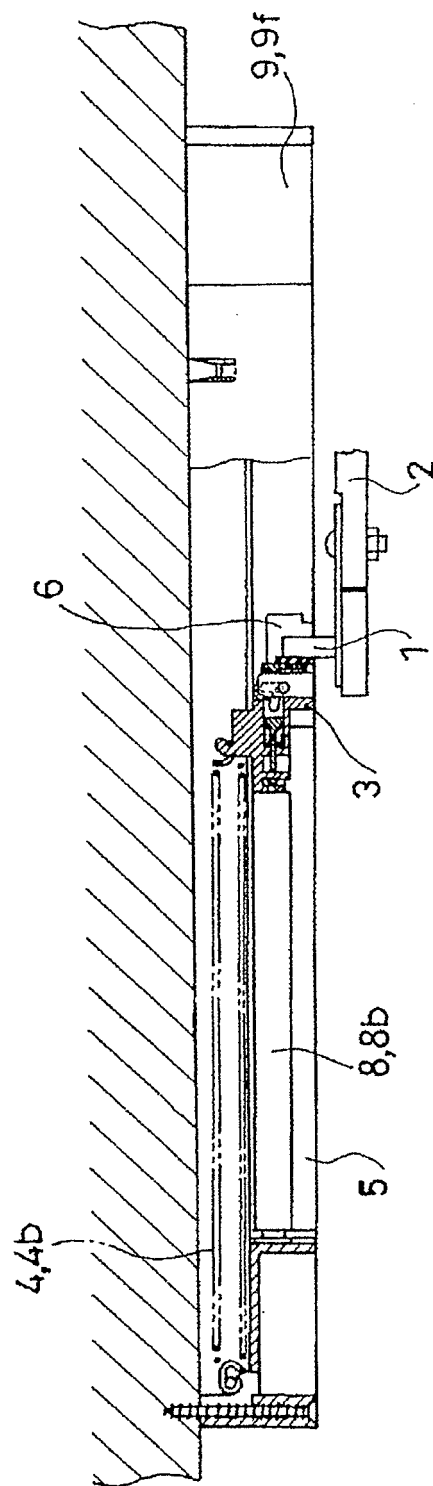


Fig. 20

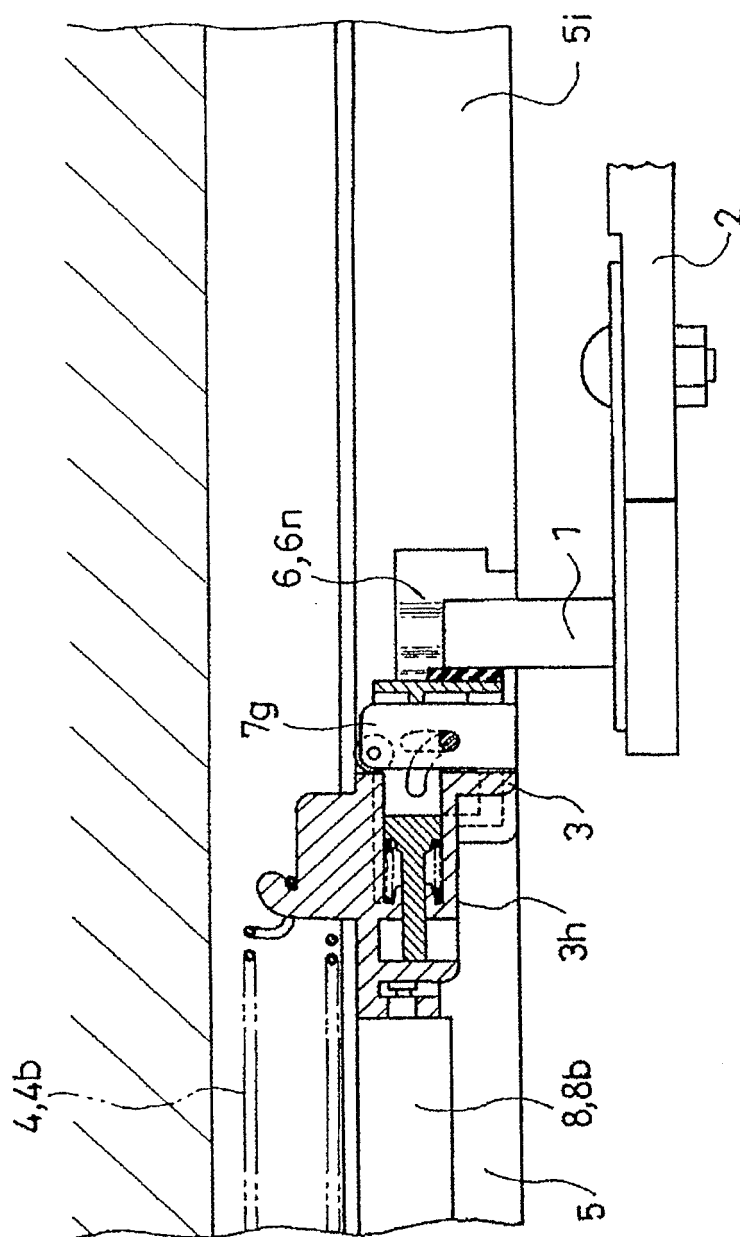


Fig. 21

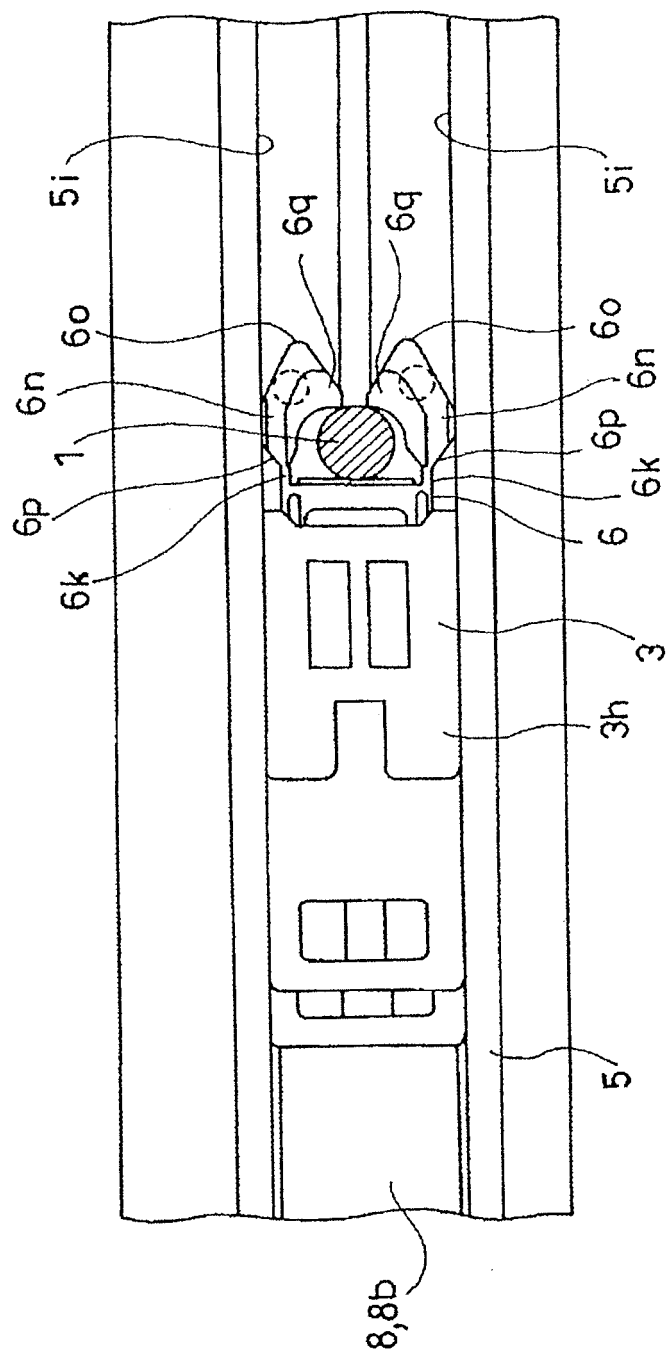


Fig. 22

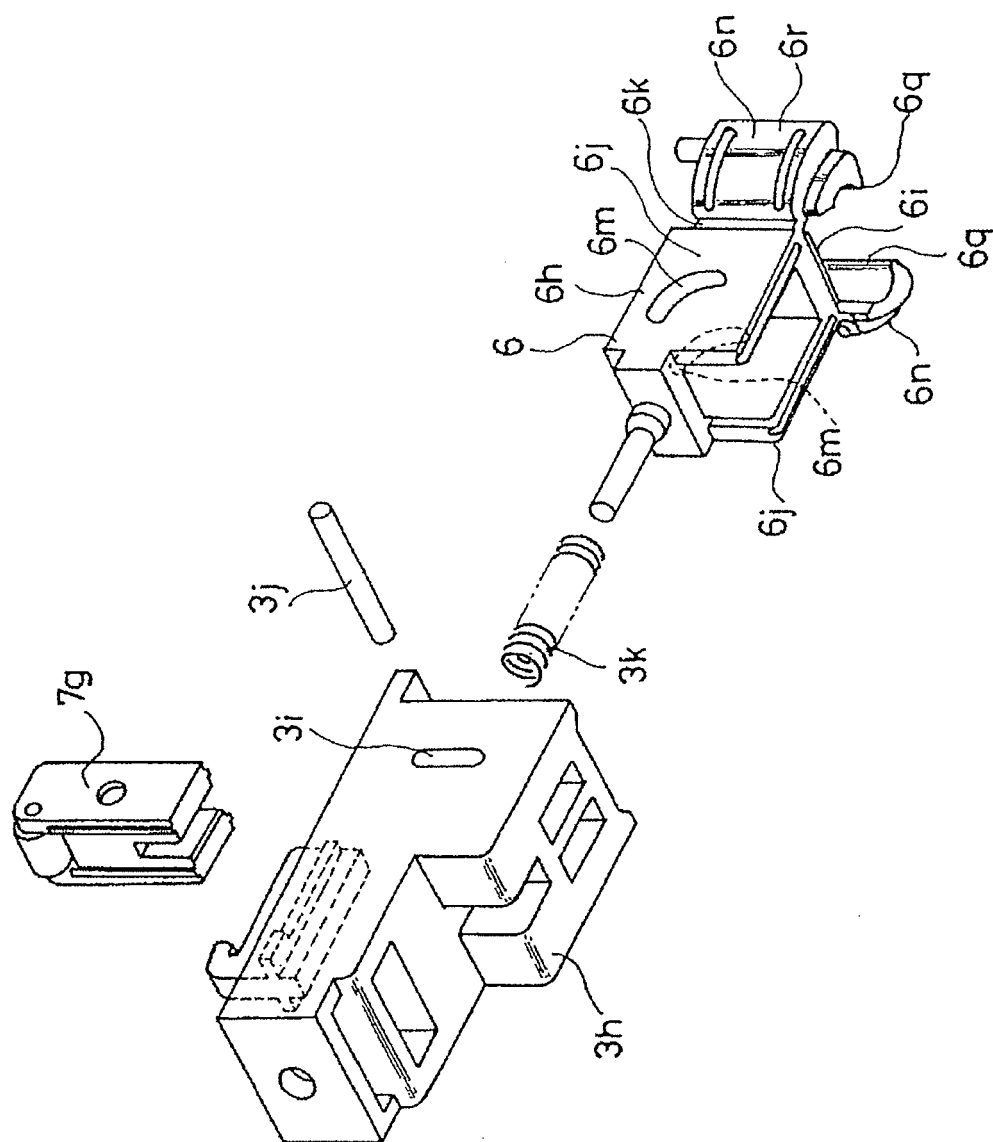


Fig. 23

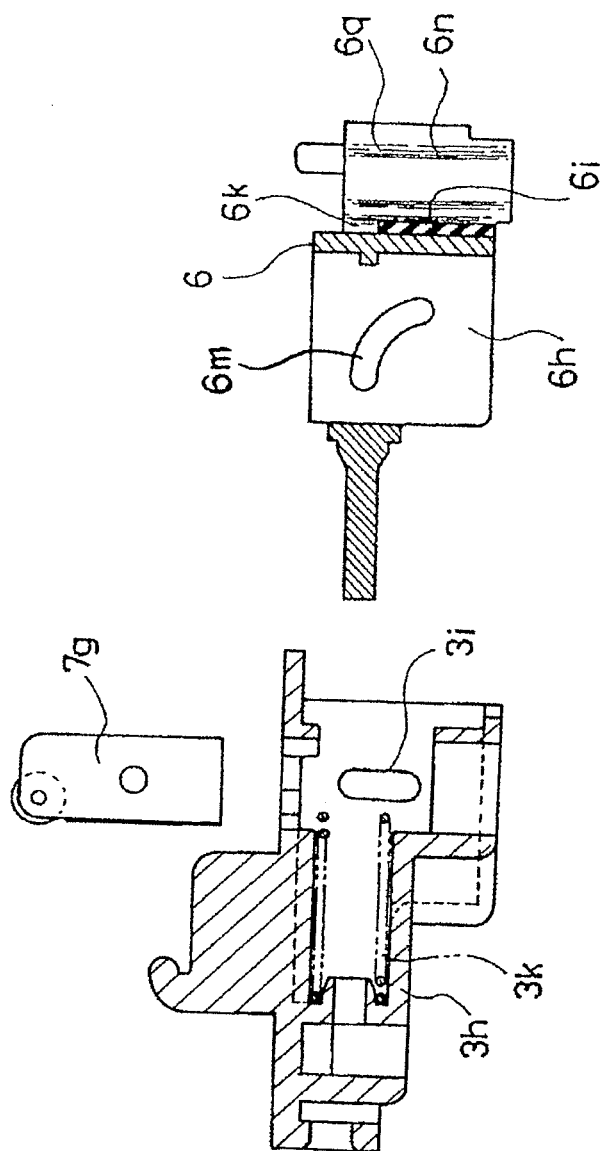


Fig. 24

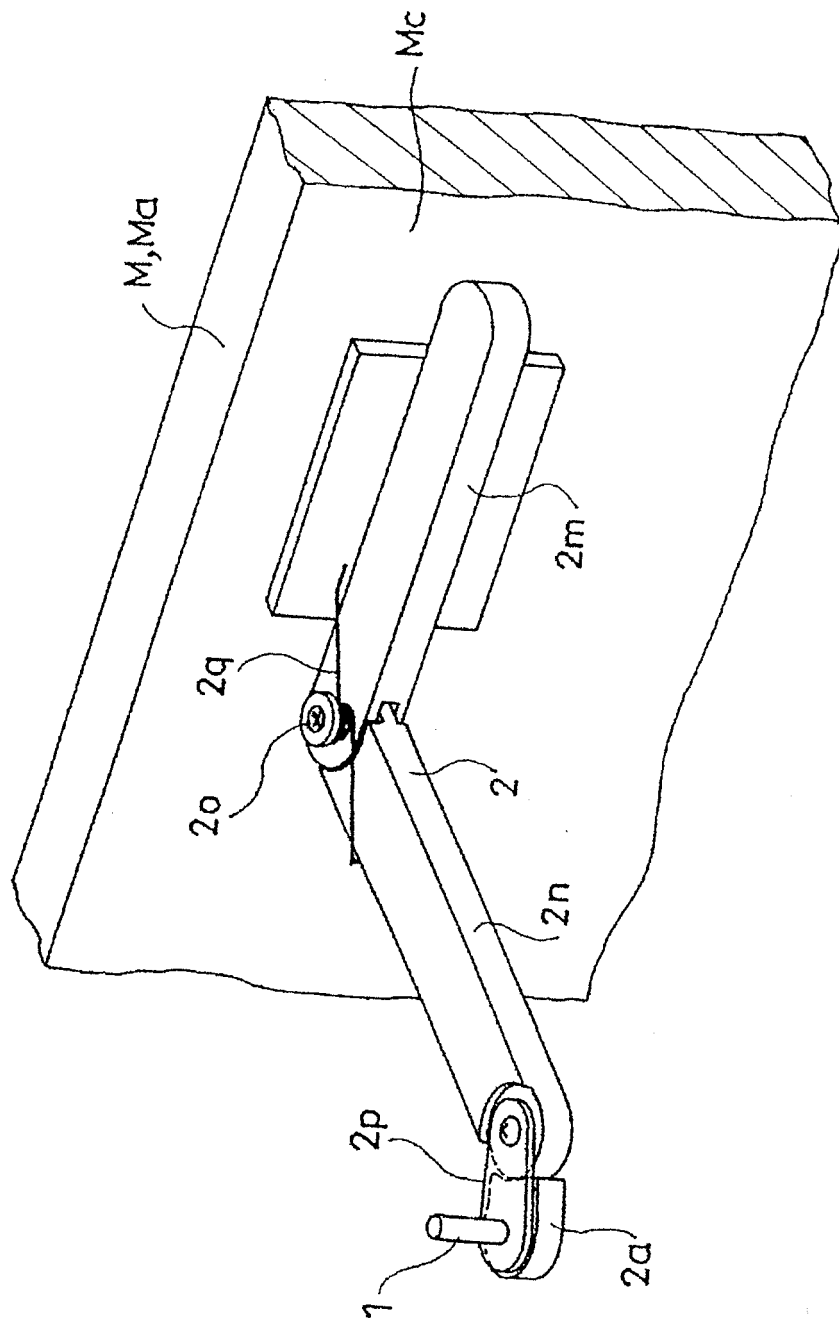
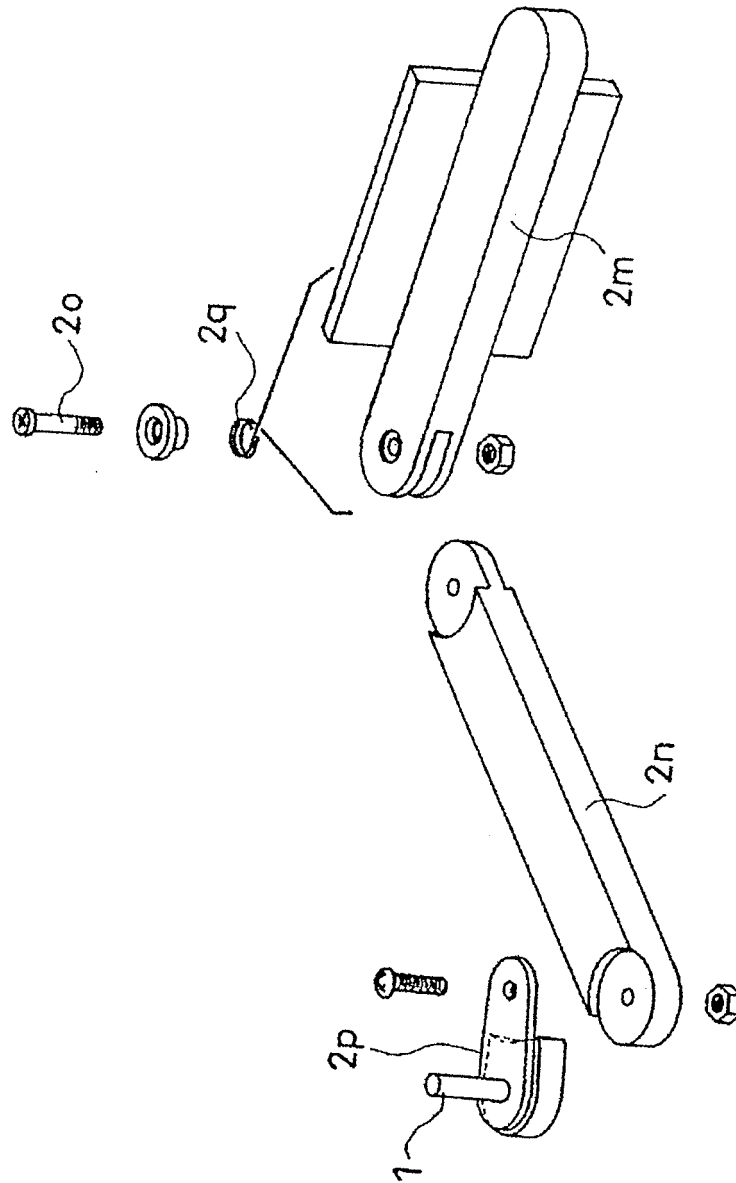


Fig. 25



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/051165

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.
X Y A	JP 2001-245738 A (Julivs Blum Gesellschaft M.B.H), 11 September 2001 (11.09.2001), paragraphs [0010] to [0035]; all drawings & US 2001/0008037 A1 & EP 1120065 A2 & WO 2001/050916 A1 & DE 201021255 U & AT 410504 B & BR 100070 A & AU 2651901 A & ES 2210172 T & CN 1305763 A	1, 3-5 2-5 6
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)	2-5 6

☐ 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

"T" 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
18 February, 2010 (18.02.10)Date of mailing of the international search report
02 March, 2010 (02.03.10)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2007055204 A [0004]
- JP 2009018008 A [0057]