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(54) **FORWARD MOVEMENT MECHANISM OF MOVABLE BODY**

(57) Provided are a receiving member that is movably held inside a main body provided on a movable body, and is linked to a damping device for applying a damping force to forward movement of the movable body to a prescribed position and to an assisting device for moving the movable body forward up to the prescribed position, and a received member that is provided on a stationary body, is caught on the receiving member in the course

of forward movement of the movable body, and is relatively moved inside the main body. The receiving member has a contact part that contacts with the received member, and a holding part in front of the contact part, that moves in the event of collision of the received member on the contact part and holds the received member from front to back inside together with the contact part to accomplish the catching.

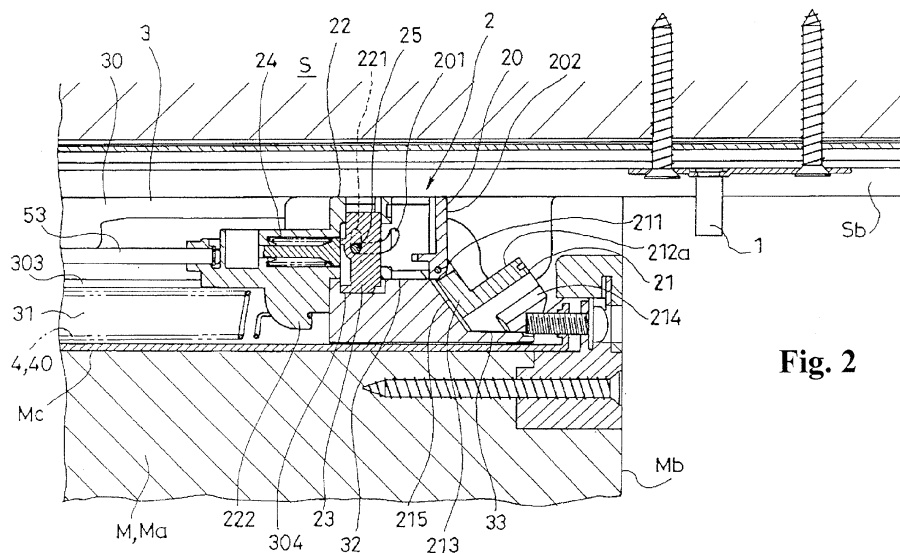


Fig. 2

Description

Technical Field

[0001] This invention relates to an improvement of a forward-moving mechanism that functions to apply a damping force to a movable body to be moved forward toward a prescribed position from midcourse of the forward movement up to the prescribed position, to assist that forward movement, or to perform both such application of damping force and such assisting.

Background Technology

[0002] There is an apparatus in which a slider provided on the side of a sliding door is rotated at a prescribed movement position of the sliding door, and is latched onto a receiving member fixed on a rail, to assist sliding movement of the sliding door with an assisting force accumulated in a drive mechanism connected to the slider (see Patent Document 1). However, in the apparatus in Patent Document 1, the entire slider rotates.

Prior Art Documents

Patent Documents

[0003]

Patent Document 1: Japanese Patent No. 4402133

Summary of the Invention

Problem to Be Solved by the Invention

[0004] A main problem to be solved by this invention is to make such mechanism for assisting forward movement of a movable body as compact as possible.

Means for Solving the Problem

[0005] In order to solve the aforementioned problem, in this invention, a mechanism for moving a movable forward is provided with:

a receiving member that is movably held inside a main body provided either on a movable body or on a stationary body supporting the movable body to be capable of reciprocating movement, and is linked to a damping device for applying a damping force to forward movement of the movable body to a prescribed position, to an assisting device for moving the movable body forward up to the prescribed position, or to both the damping device and the assisting device; and
a received member that is provided on the other of the movable body and the stationary body, is caught on the receiving member in the course of forward

movement of the movable body, and is moved or relatively moved inside the main body.

The receiving member has a contact part that contacts with the received member; and a holding part in front of the contact part, that moves in the event of collision of the received member on the contact part and holds the received member from front to back in between with the contact part to accomplish the catching.

[0006] According to such configuration, because the catching of the received member is accomplished by the movement of the holding part serving as one part of the receiving member, the space for assuring the movement of the receiving member can be reduced compared with the case when the catching is accomplished by moving the entire receiving member, as a result of which the required dimensions of the forward-moving mechanism in the direction of this movement can be made as small as possible. Also, because the received member is caught while being held from front to back between the contact part and the holding part, there is no impediment to the catching even if the distance between the contact part and the holding part is secured wider. Accordingly, even if a shift in a fixed range from a prescribed position occurs to the position of placement of the received member and of the receiving member in the direction of movement of the movable body, this shift can be prevented from influencing the operation of the forward-moving mechanism. Also, even if a shift from an expected position occurs to the position of placement of the received member and of the receiving member in a direction orthogonal to the direction of movement of the movable body, as long as the range is such that the received member can be held between the contact part and the holding part, this shift can be prevented from influencing the operation of the forward-moving mechanism.

[0007] One preferred aspect is such that the holding part is combined with a shaft on the side of the contact part to be capable of rotation between a holding position in which the received member is held in between with the contact part and a non-holding position in which this is not done. Also, in this case, one preferred aspect is such that a sliding-contact part that is slid in contact with a guide part on the main body so as to maintain a posture of the holding part in the holding position is provided in front of the position where the holding part is assembled to rotate on the contact part. Also, in this case, one preferred aspect is such that the receiving member is held inside the main body to be capable of sliding movement between an advanced position and a retracted position for accomplishing catching or releasing of the received member; and a receiving space for receiving the holding part of the receiving member in the advanced position is provided in front of the front end of the guide part on the main body.

[0008] An auxiliary catching part, that is elastically deformed to accept the received member by moving the

movable body forward up to the prescribed position when the receiving member moves to the retracted position in a state not having caught the received member (malfunctioning state), and is coupled to the received member by elastic return in a position at the end of this acceptance, may be provided on a front side part on the holding part opposite a rear side part facing the contact part.

Effect of the Invention

[0009] According to this invention, a mechanism for assisting forward movement of the movable body can be made as compact as possible.

Brief Description of the Drawings

[0010]

FIG. 1 is a front structural view cutting open main parts above a sliding door, illustrating an example of use of a forward-moving mechanism according to one example of the present invention;

FIG. 2 is a front structural view enlarging the main parts in FIG. 1;

FIG. 3 is a plan structural view viewed from above the sliding door in FIG. 2, illustrating the configuration on the side of the receiving member constituting the forward-moving mechanism;

FIG. 4 is a front structural view illustrating the main parts in FIG. 1, not cutting open the main body constituting the receiving member constituting the forward-moving mechanism;

FIG. 5 is a perspective view of the main parts on the side of the receiving member constituting the forward-moving mechanism;

FIG. 6 is a front structural view cutting open the main parts above a sliding door, illustrating an example of use of the forward-moving mechanism according to the embodiment, wherein the sliding door is in the position at the end of forward movement;

FIG. 7 is a front structural view enlarging the main parts in FIG. 6;

FIG. 8 is an exploded perspective view of the receiving member constituting the forward-moving mechanism; and

FIG. 9 is an exploded perspective view of the receiving member constituting the forward-moving mechanism, and illustrates the constituent components in a state having inverted the top, bottom, left, and right in FIG. 8.

Embodiment of the Invention

[0011] A typical embodiment of this invention is described below based on FIGS. 1 to 9. A mechanism for moving a movable body M forward according to the embodiment functions to apply a damping force to a movable body M to be moved forward toward a prescribed position

from midcourse of the forward movement up to the prescribed position, to assist that forward movement, or to perform both such application of damping force and such assisting.

[0012] Such movable body M is supported to be capable of reciprocating movement on a stationary body S. Examples include sliding doors, hanging doors, folding doors, and the like, but the movable body is not limited to these provided that it is supported to be capable of reciprocating movement on the stationary body S. In the illustrated example, an example is illustrated in which the forward-moving mechanism is used for a sliding door Ma. The sliding door Ma as movable body M is combined on the stationary body S, with an upper end part of the sliding door Ma being held in a rail part Sb provided on the stationary body S provided with an entrance/exit Sa to be opened and closed by the sliding door Ma, so as to perform forward movement and return movement along the rail part Sb.

[0013] In the illustrated example, the sliding door Ma as movable body M closes the entrance/exit Sa at a prescribed position where a front end being at the head during forward movement is struck against a doorstop part Sc of the entrance/exit Sa (FIG. 6). Also, when the sliding door Ma as movable body M is operated to move forward toward the prescribed position from a state not closing the entrance/exit Sa (FIG. 1), a received member 1 constituting the forward-moving mechanism contacts with a contact part 20 of a receiving member 2 constituting the forward-moving mechanism in the course of this forward movement, so that the sliding door is subject to the operation of the forward-moving mechanism up to the prescribed position. In the illustrated example, the received member 1 is provided on the rail part Sb on the side toward the doorstop part Sc at a distance from the doorstop part Sc.

[0014] In the illustrated example, such received member 1 is configured as a shaft-form body suspended inside the trench-form rail part Sb with an upper end being fixed to the trench bottom of the rail part Sb. Meanwhile, the receiving member 2 is provided inside a main body 3 held in a recess Mc formed on the sliding door Ma as movable body M, facing downward from an upper end face of the sliding door Ma. Such recess Mc has a trench form continuing along the direction of movement of the sliding door Ma (the left-right direction in FIG. 1), and is opened forward at a front end Mb of the sliding door Ma. In the illustrated example, at midcourse of the forward movement of the sliding door Ma, the received member 1 enters inside the recess Mc, that is, inside the main body 3, from the side of the front end Mb of the sliding door Ma, so as to be brought into contact with the receiving member 2 inside the main body 3. Also, the sliding door Ma is subject to the operation of the forward-moving mechanism up to the prescribed position by this contact.

[0015] In the illustrated example, the receiving member 2 is held to be movable along the direction of movement of the sliding door Ma inside the main body 3, and

is forced by impelling force of a spring 40 constituting an assisting device 4 to perform movement toward the direction away from the front end Mb of the sliding door Ma. Also, damping force of an impelling device 5 is applied to movement of the receiving member 2 in the direction away from the front end Mb of the sliding door Ma.

[0016] In the illustrated example, the receiving member 2 first is held and stands by against the impelling force of the spring 40 at the side of the front end Mb of the sliding door Ma inside the main body 3 (FIG. 1 / the position of the receiving member 2 at this time is hereinafter referred to as "advanced position") until being brought into contact with the received member 1; and second, upon being brought into contact with the received member 1, the hold is released and the receiving member catches the received member 1 and is relatively moved forcibly by the impelling force of the spring 40 in the direction away from the front end Mb of the sliding door Ma up to a prescribed retracted position (FIG. 6). By this, in the illustrated example, when the sliding door Ma as movable body M is operated to move forward, from the position where the received member 1 contacts with the receiving member 2, the sliding door Ma moves freely up to the prescribed position where the front end Mb strikes the doorstep part Sc, with the forward movement being assisted by the receiving member 2 being moved in the aforementioned manner. Also, the free running of the sliding door Ma is slowed by the action of the damping force of the damping device 5 so that the sliding door Ma does not make a loud noise or return toward the opening direction by a return force when colliding with the doorstep part Sc.

[0017] When the sliding door Ma as movable body M, thus having been moved forward up to the prescribed position, is operated to move returning, the receiving member 2 having caught the received member 1 is relatively moved to the side of the front end Mb of the sliding door Ma inside the main body 3 against the impelling force of the spring 40, that is, while accumulating force in the spring 40, and is again held on the main body 3 and releases the received member 1 upon reaching the advanced position. Also, return movement up to a desired position of the sliding door Ma is allowed by this release.

[0018] Aside from the illustrated example, even when the received member 1 is attached on the side of the sliding door Ma as movable body M and the main body 3 containing the receiving member 2 inside is provided on the side of the stationary body S, the forward movement of such movable body M can be assisted from mid-course. Also, such forward-moving mechanism in the illustrated example acts on the sliding door Ma as movable body M when closing the sliding door Ma, but the forward-moving mechanism can also be used for acting on the sliding door Ma when opening the sliding door Ma.

[0019] Specifically, the main body 3 has a long and slender case form having a width and length sufficient to be housed inside the recess Mc. The main body 3 is

divided into an upper chamber 30 and a lower chamber 31. The upper chamber 30 is opened upward across the length direction of the main body 3, and is opened forward at the front end positioned on the side of the front end Mb of the sliding door Ma. The receiving member 2 moves between the advanced position and the retracted position inside the upper chamber 30. The upper chamber 30 is provided with a pair of wall parts 301 and 301 along the length direction of the main body 3 and a bottom part 302 serving as a partition with the lower chamber 31. A slit 303 spanning the length direction of the main body 3 is formed on the bottom part 302, and the upper chamber 30 is connected through to the lower chamber 31 via this slit 303.

[0020] The receiving member 2 has a contact part 20 for contacting with the received member 1, and a holding part 21 in front of the contact part 20, that moves in the event of collision of the received member 1 on the contact part 20 and holds the received member 1 from front to back in between with the contact part 20 to accomplish the catching.

[0021] Also, the receiving member 2 is provided with a base 22 for supporting the contact part 20 to be capable of sliding movement in the front-back direction, a stopper 23 combined on the base 22 to be capable of sliding movement in the up-down direction, and a spring 24 for regularly impelling the contact part 20 in the direction of projecting from the base 22 to the side of the front end Mb of the sliding door Ma, that is, forward. The base 22 has a box form open on the front end to accept inside from in front the contact part 20, which is configured long in the front-back direction, from the rear end side of the contact part. The stopper 23 is held to be capable of moving up and down inside the contact part 20 inside the base 22, and the lower end thereof projects from the lower part of the base 22.

[0022] Also, the stopper 23 and the contact part 23 are linked by a pin 25 passing through vertical guide slots 221 formed on side parts in the front-back direction of the base 22 and passing through cam slots 201 extending in the front-back direction formed on the contact part 20. Rear ends 201a of the cam slots 201 are on the same level as lower ends 221a of the guide slots 221, while front ends 201b of the cam slots 201 are on the same level as upper ends 221b of the guide slots 221. In the state in which the contact part 20 is fully advanced by the impelling force of the spring 24, the pin 25 is positioned at the rear ends 201a of the cam slots 201 and is positioned at the lower ends 221a of the guide slots 221, and the stopper 23 projects downward from the lower part of the base 22. On the other hand, when the contact part 20 is retracted against the impelling force of the spring 24, the pin 25 is guided in the cam slots 201 and is moved to the upper ends 221b of the guide slots 221, whereby the stopper 23 is drawn inside the base 22.

[0023] In this example, the holding part 21 is combined with a shaft 211 on the contact part 20 to be capable of rotation between a holding position in which the received

member 1 is held in between with the contact part 20 (FIG. 7) and a non-holding position in which this is not done (FIG. 8).

[0024] The holding part 21 is provided with a main part 212 orienting a rear face 212a toward a front end 202 of the contact part 20 in the holding position, a pair of arm parts 213 and 213 projecting to the rear from the lower part of the main part 212, and an auxiliary catching part 214, to be described, formed on the side of a front face 212b of the main part 212. An interval is formed between the pair of arm parts 213 and 213, and the holding part 21 is combined with the contact part 20 in the aforementioned manner, with the lower part of the front end 202 of the contact part 20 being received between the pair of arm parts 213 and 213, and the shaft 211 being passed through shaft holes 203 and 213a provided on the arm parts 213 and the lower part of the front end 202.

[0025] In the advanced position of the receiving member 2, the holding part 21 is in a posture in which the side of the lower part thereof is inserted into a receiving space 33, to be described, formed on the main body 3, so that an interval allowing the received member 1 to pass is formed above the holding part 21 (FIG. 2 / the state in which the holding part 21 is in the non-holding position). Also, in the advanced position of the receiving member 2, the lower end side of the stopper 23 projecting in the aforementioned manner enters into a recessed part 304 formed on the bottom part 302 of the upper chamber 30 (FIG. 2). The receiving member 2 is held in the advanced position by the entry of the stopper 23 into the recessed part 304.

[0026] The assisting device 4, in the illustrated example, is configured with a tension coil spring 40 held inside the lower chamber 31 of the main body 3. In the illustrated example, a front end 401 of such spring 40 is fixed to one part 222 of the base 22 of the receiving member having entered inside the lower chamber 31 through the slit 303 formed on the bottom part 302 of the upper chamber 30, and a rear end 402 of the spring 40 is fixed to the rear end side of the lower chamber 31 of the main body 3, so that the spring 40 is most stretched when the receiving member 2 is in the advanced position (FIG. 1).

[0027] The damping device 5, in the illustrated example, are configured with a piston damper 50 provided with a cylinder 51, a piston 52, and a piston rod 53, so that damping force is applied to movement or relative movement of the piston 52. In the illustrated example, such piston damper 50 is held between the receiving member 2 in the upper chamber 30 of the main body 3 and the rear end of the upper chamber 30 with the side of the piston rod 53 on the front side, the projecting end of the piston rod 53 being fixed to the base 22 of the receiving member 2, and the cylinder 51 being fixed to the side of the main body 3. Also, the piston rod 53 is most projected from the inside of the cylinder 51 when the receiving member 2 is in the advanced position (FIG. 1).

[0028] When the sliding door Ma as movable body M is moved forward, the received member 1 enters inside

the main body 3 from the front end Mb of the sliding door Ma, and the receiving member 2 in the state being in the advanced position passes above the holding part in the non-holding position and collides with the front end 202 of the contact part 20. The receiving member having collided with the received member 1 retracts against the impelling force of the spring 24, the holding part 21 is rotated toward the holding position upon this retraction, and the received member 1 is held between the contact part 20 and the holding part 21 and is caught by the receiving member 2. Also, when the contact part 20 thus retracts, the stopper 23 is drawn inside the base 22 and the hold of the receiving member 2 is released. By this, relative movement of the receiving member 2 in the direction away from the front end Mb of the sliding door Ma is accomplished by the impelling force of the spring 40, and because the received member 1 provided on the stationary body S is caught by the receiving member 2, the sliding door Ma is moved forward running freely up to the position where the front end Mb collides with the doorstop part Sc (FIGS. 1 to 6). When the sliding door Ma is moved returning from this state, the receiving member 2 is relatively moved inside the main body 3 in the reverse direction to that during forward movement of the sliding door Ma, and upon reaching the advanced position, entry of the stopper 23 into the recessed part 304 and advance of the contact part 20 by the spring 24 are allowed, the holding part 21 is pressed by the received member 1 and is rotated to the non-holding position, and release of the received member 1 is accomplished.

[0029] In the mechanism for moving a movable body M forward according to this example, because the catching of the received member 1 is accomplished by the movement of the holding part 21 serving as one part of the receiving member 2, the space for assuring the movement of the receiving member 2 can be reduced compared with the case when the catching is accomplished by moving the entire receiving member 2, as a result of which the required dimensions of the forward-moving mechanism in the direction of this movement (up-down direction in the illustrated example) can be made as small as possible. Also, because the received member 1 is caught while being held from front to back between the contact part 20 and the holding part 21, there is no impediment to the catching even if the distance between the contact part 20 and the holding part 21 is secured wider. Accordingly, even if a shift in a fixed range from a prescribed position occurs to the positions of placements of the received member 1 and the receiving member 2 in the direction of movement of the movable body M, this shift can be prevented from influencing the operation of the forward-moving mechanism. Also, even if a shift from an expected position occurs to the positions of placements of the received member 1 and the receiving member 2 in a direction orthogonal to the direction of movement of the movable body M, as long as the range is such that the received member 1 can be held between the contact part 20 and the holding part 21, this shift can be

prevented from influencing the operation of the forward-moving mechanism.

[0030] In this example, a sliding-contact part 215 that is slid in contact with a guide part 32 on the main body 3 so as to maintain the posture 21 of the holding part in the holding position is provided in front of the position where the holding part 21 is assembled to rotate on the contact part 20. Also, a receiving space 33 for receiving the holding part 21 of the receiving member 2 in the advanced position is provided in front of the front end of the guide part 32 on the main body 3.

[0031] In the illustrated example, the bottom part 302 of the upper chamber 30 ends at the position where the front end 202 of the contact part 20 of the receiving member 2 in the advanced position is positioned, which is in front of the recessed part 304 (FIG. 2). By this, the receiving space 33 is formed between the end position of such bottom part 302 and the front end of the main body 3.

[0032] Also, a projecting part 212c to be guided on the upper end of the wall part 301 of the upper chamber 30 of the main body 3 is formed on the upper part of the main part 212 of the holding part 21. The wall part 201 of the upper chamber 30 of the main body 3 is cut out downward in a position directly above the receiving space 33, and the projecting part 212c is positioned in the cutout place 305 in the state in which the holding part 21 is in the non-holding position (FIGS. 4 and 5).

[0033] When the receiving member 2 is relatively moved as previously mentioned from the advanced position toward the retracted position, the projecting part 212 slips out from the cutout place 305 and is brought into sliding contact on the upper end of the wall part 301 of the upper chamber 30 of the main body 3, and the lower part of the arm part 213 of the holding part 21 is brought into sliding contact with the bottom part 302 of the upper chamber 30, the holding part 21 is rotated so that the arm part 213 is made to follow the bottom part 302 and the rear face 212a of the main part 212 is oriented toward the front end 202 of the contact part 20, and that posture is held. That is, in the illustrated example, the upper edge of the wall part 301 of the upper chamber 30 and the bottom part 302 function as the guide part 32, and the projecting part 212c of the holding part 21 and the lower part of the arm part 213 function as the sliding-contact part 215. Such guide part 32 may be either the upper edge of the wall part 301 of the upper chamber 30 or the bottom part 302, and in that case, the sliding-contact part 215 also may be either the projecting part 212c of the holding part 21 or the lower part of the arm part 213 corresponding thereto.

[0034] When the movable body M having been moved forward up to the prescribed position is returned and the receiving member 2 is in the advanced position, entry of the stopper 23 into the recessed part 203 and advance of the contact part 20 by the spring 24 are allowed, and the holding part 21 is pressed by the received member 1, again enters into the receiving space 33, and is rotated to the non-holding position, and release of the received

member 1 is accomplished.

[0035] Also, in this example, an auxiliary catching part 214, that is elastically deformed to accept the received member 1 by moving the movable body M forward up to the prescribed position when the receiving member 2 moves to the retracted position in a state not having caught the received member 1 (malfunctioning state), and is coupled to the received member by elastic return in a position at the end of this acceptance, is provided on a front side part on the holding part 21 opposite a rear side part facing the contact part 20, that is, opposite the side of the rear face 212a of the main part 212, that is, on the side of the front face 212b of the main part 212.

[0036] In the illustrated example, such auxiliary catching part 214 is configured with a pair of elastic pieces 214a and 214a that project forward from the holding part 21. An interval is formed in a direction orthogonal to the direction of movement of the movable body M between such pair of elastic pieces 214a, 214a, and extended parts 214b are formed respectively on inner face parts of the pair of elastic pieces 214a and 214b leaving an interval for receiving the received member 1 in between with the front face 212b of the main part 212. Also, the interval between the extended parts 214b on the pair of elastic pieces 214a and 214a is made somewhat smaller than the thickness of the received member 1. By this, in this example, when a malfunctioning state occurs, the movable body M can be moved forward up to the prescribed position, whereby introduction of the received member 1 further back from the extended parts 214b of the pair of elastic pieces 214a and 214a is allowed by bending outward of the pair of elastic pieces 214a and 214a, the received member 1 is caught by the auxiliary catching part 214 by this introduction, and the receiving member 2 can be returned to the advanced position by moving the movable body M to return thereafter. In the illustrated example, the wall part 301 of the upper chamber 30 of the main body 3 is cut out at the place where the elastic piece 214a of the receiving member 2 in the retracted position is positioned, and bending outward of the auxiliary catching part 214 is made possible by the cutout place 306.

The entire contents of the specification, claims, drawings, and abstract of Japanese Patent Application No. 2011-006972 filed on January 17, 2011 are incorporated by reference herein as a disclosure of the specification of the present invention.

Claims

1. A mechanism for moving a movable body forward, comprising:

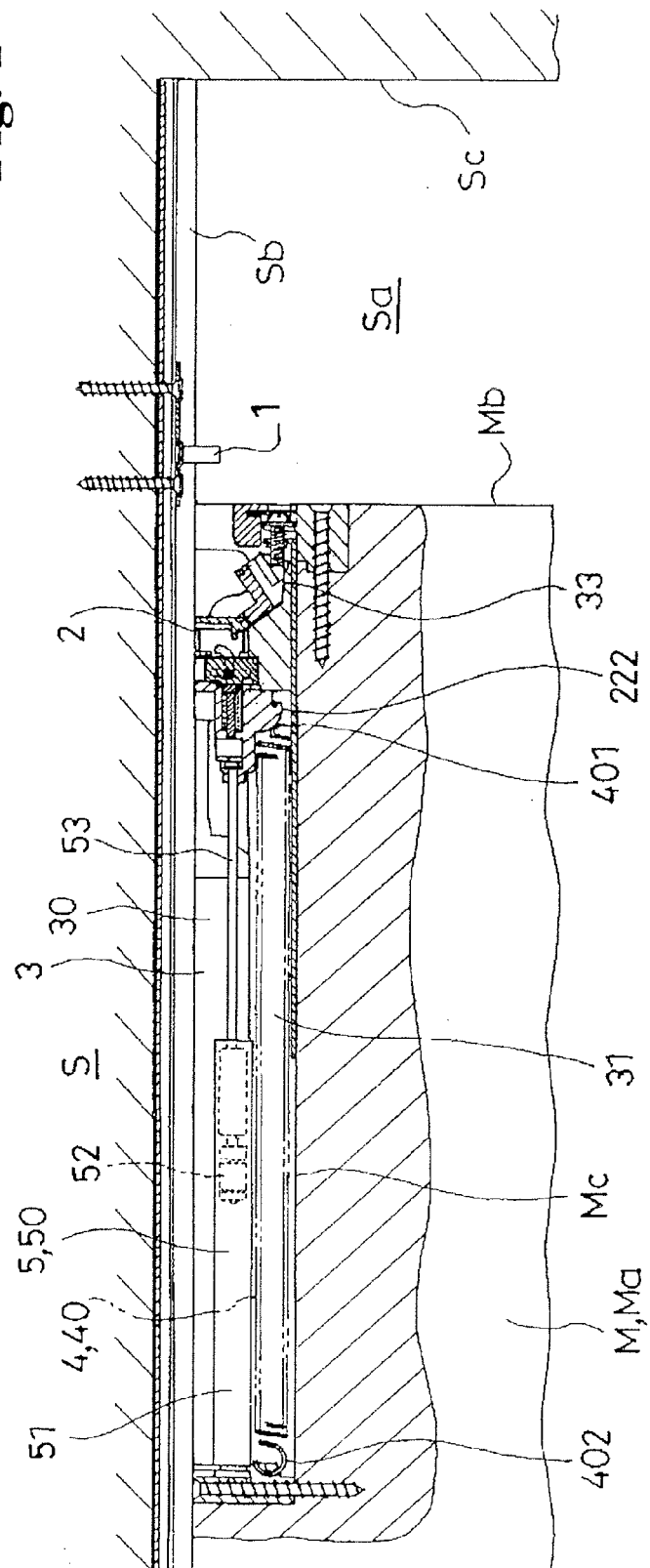
a receiving member that is movably held inside a main body provided either on a movable body or on a stationary body supporting the movable body to be capable of reciprocating movement,

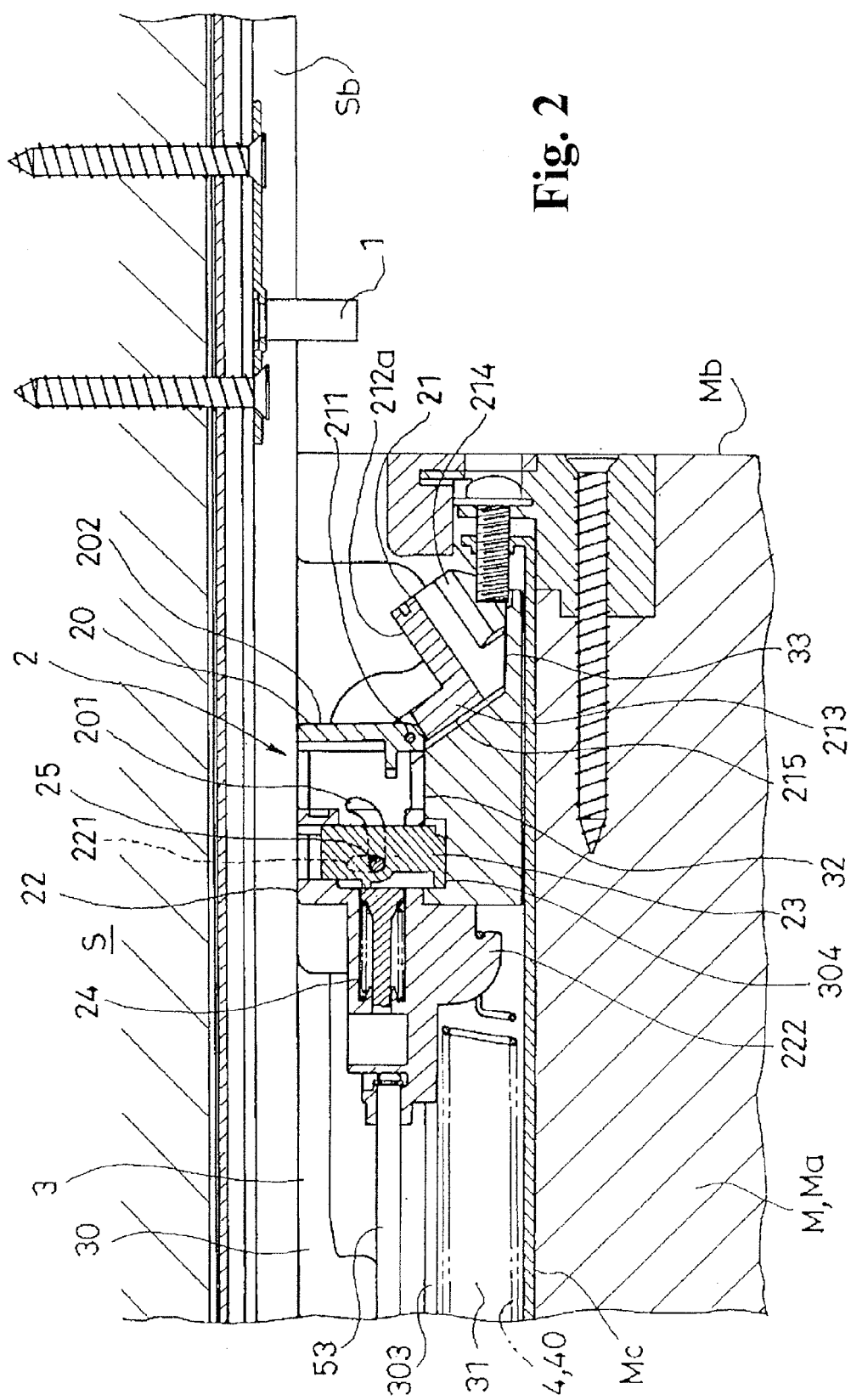
and is linked to damping device for applying a damping force to forward movement of the movable body to a prescribed position, to an assisting device for moving the movable body forward up to the prescribed position, or to both the damping device and the assisting device; and a received member that is provided on the other of the movable body and the stationary body, is caught on the receiving member in the course of forward movement of the movable body, and is moved or relatively moved inside the main body, wherein the receiving member includes a contact part that contacts with the received member, and a holding part in front of the contact part, that moves in the event of collision of the received member on the contact part and holds the received member from front to back in between with the contact part to accomplish catching.

tion in a state not having caught the received member, and is coupled to the received member by elastic return in a position at the end of this acceptance, is provided on a front side part on the holding part opposite a rear side part facing the contact part.

2. The mechanism for moving a movable body forward according to claim 1, wherein the holding part is combined with a shaft on a side of the contact part to be capable of rotation between a holding position in which the received member is held in between with the contact part and a non-holding position in which this is not done.
3. The mechanism for moving a movable body forward according to claim 2, wherein a sliding-contact part that slides in contact with a guide part on the main body so as to maintain a posture of the holding part in the holding position is provided in front of a position where the holding part is assembled to rotate on the contact part.
4. The mechanism for moving a movable body forward according to claim 3, wherein the receiving member is held inside the main body to be capable of sliding movement between an advanced position and a retracted position for accomplishing catching or releasing of the received member; and a receiving space for receiving the holding part of the receiving member in the advanced position is provided in front of the front end of the guide part on the main body.
5. The mechanism for moving a movable body forward according to claim 3, wherein the receiving member is held inside the main body to be capable of sliding movement between an advanced position and a retracted position for accomplishing catching or releasing of the received member; and an auxiliary catching part, that is elastically deformed to accept the received member by moving the movable body forward up to the prescribed position when the receiving member moves to the retracted position

Fig. 1





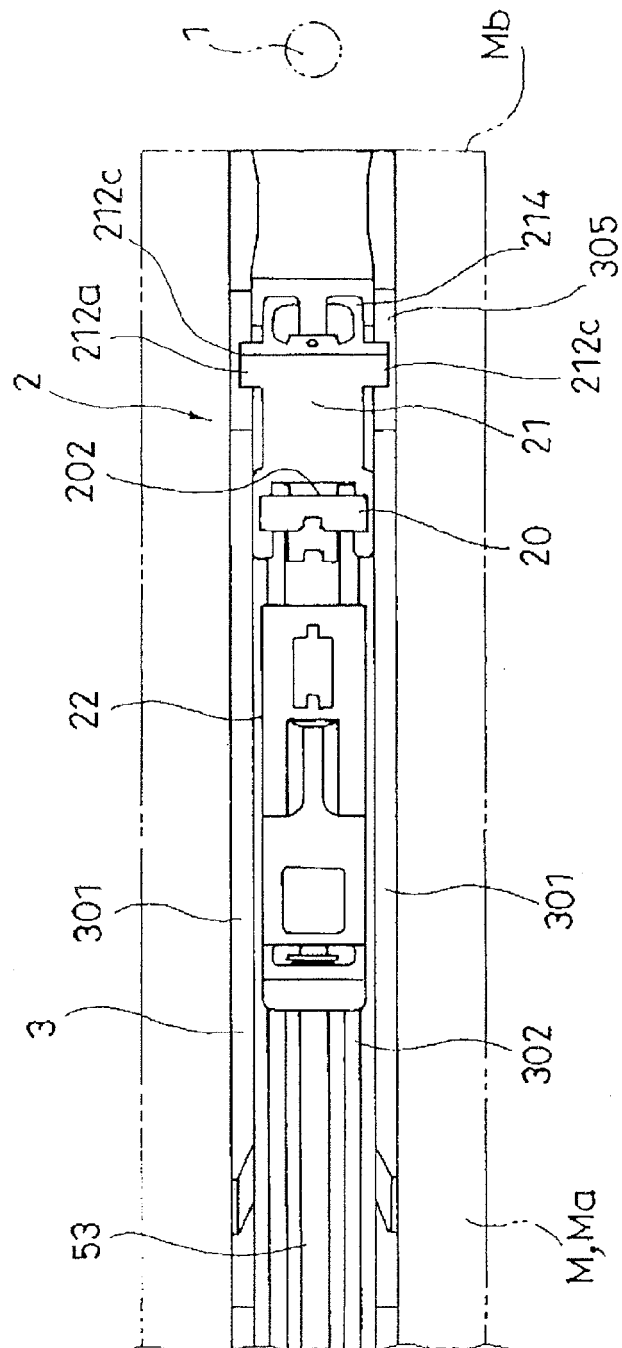


Fig. 3

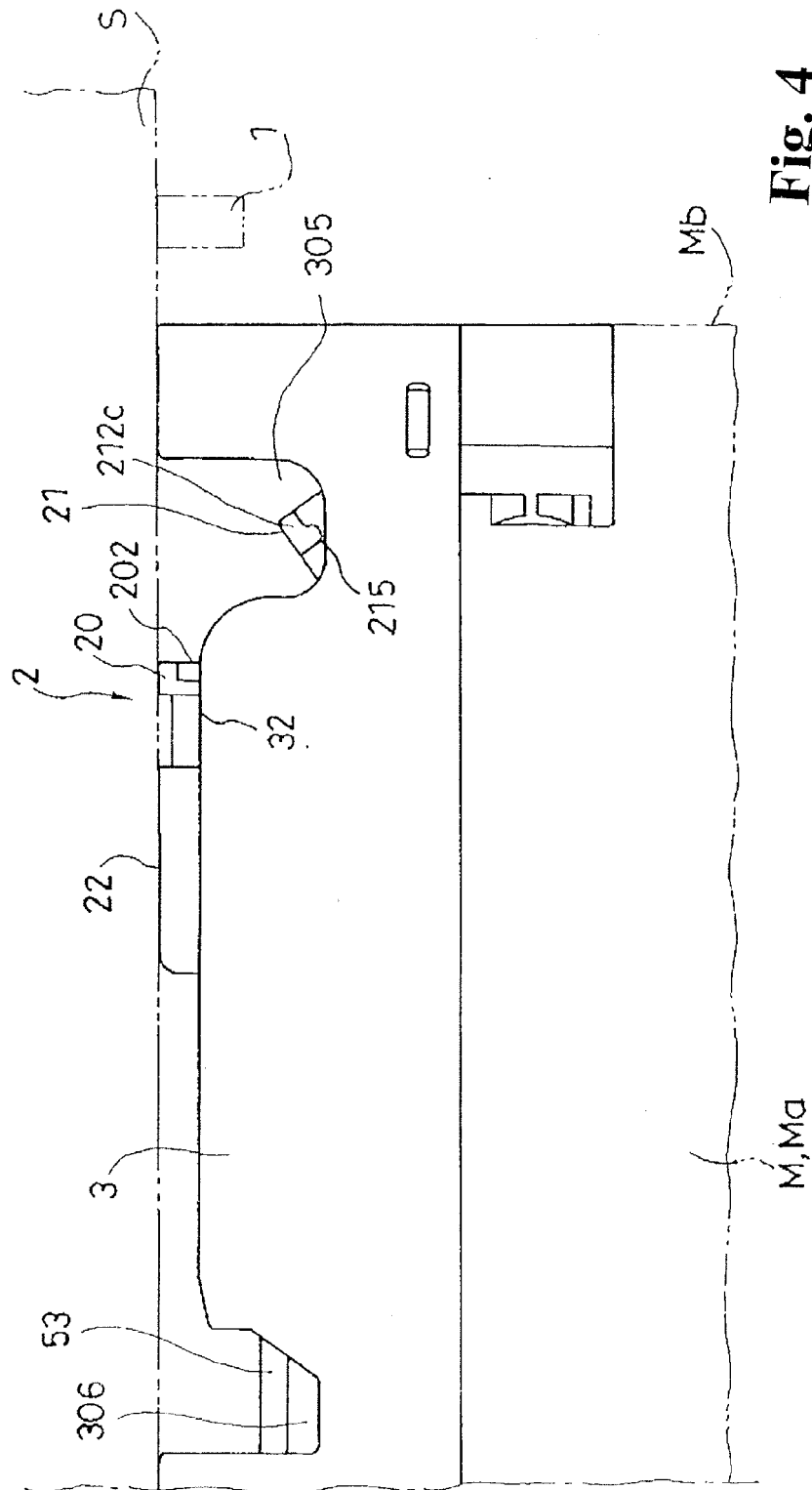


Fig. 4

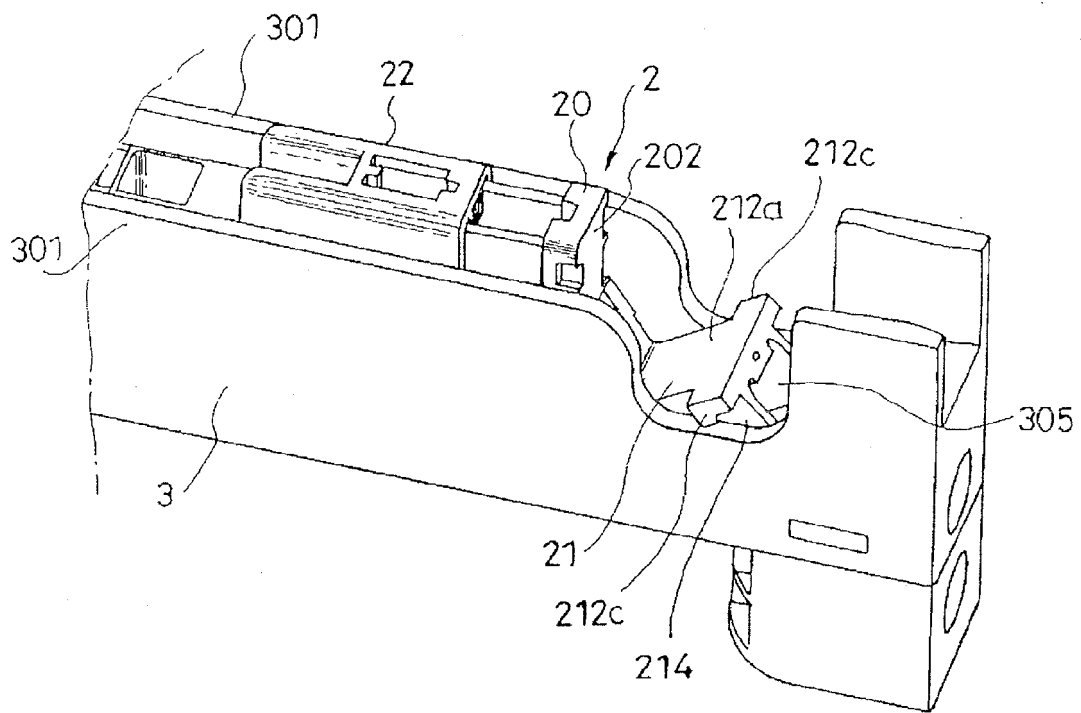


Fig. 5

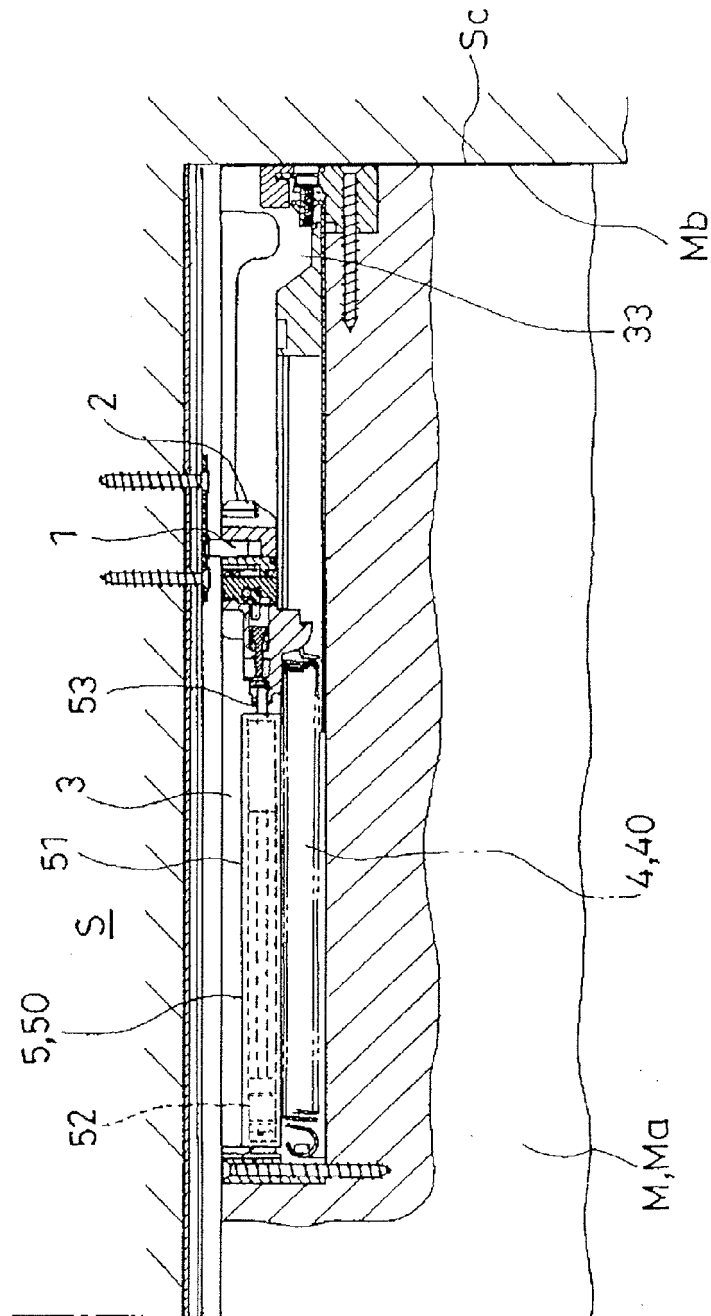


Fig. 6

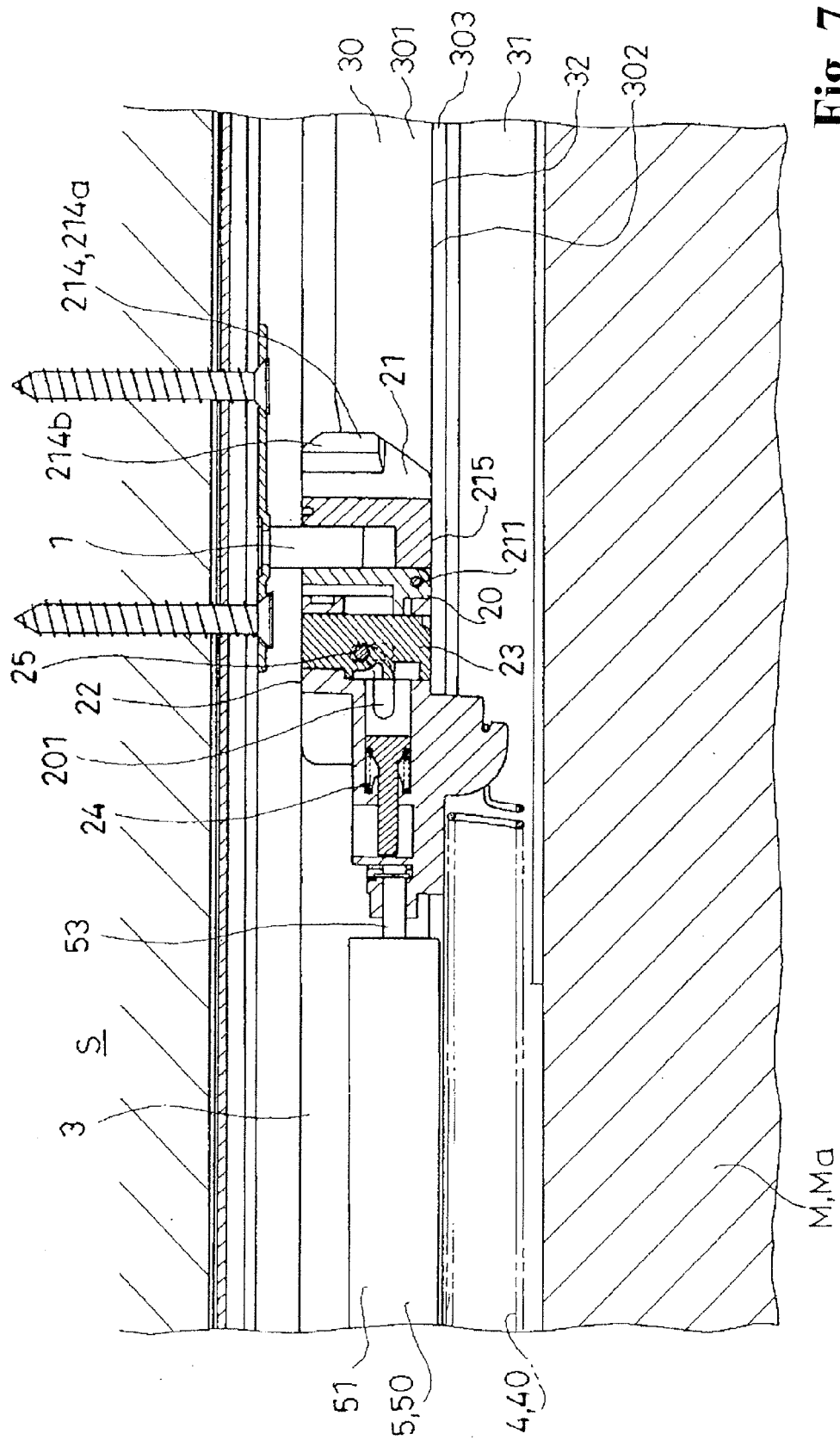


Fig. 7

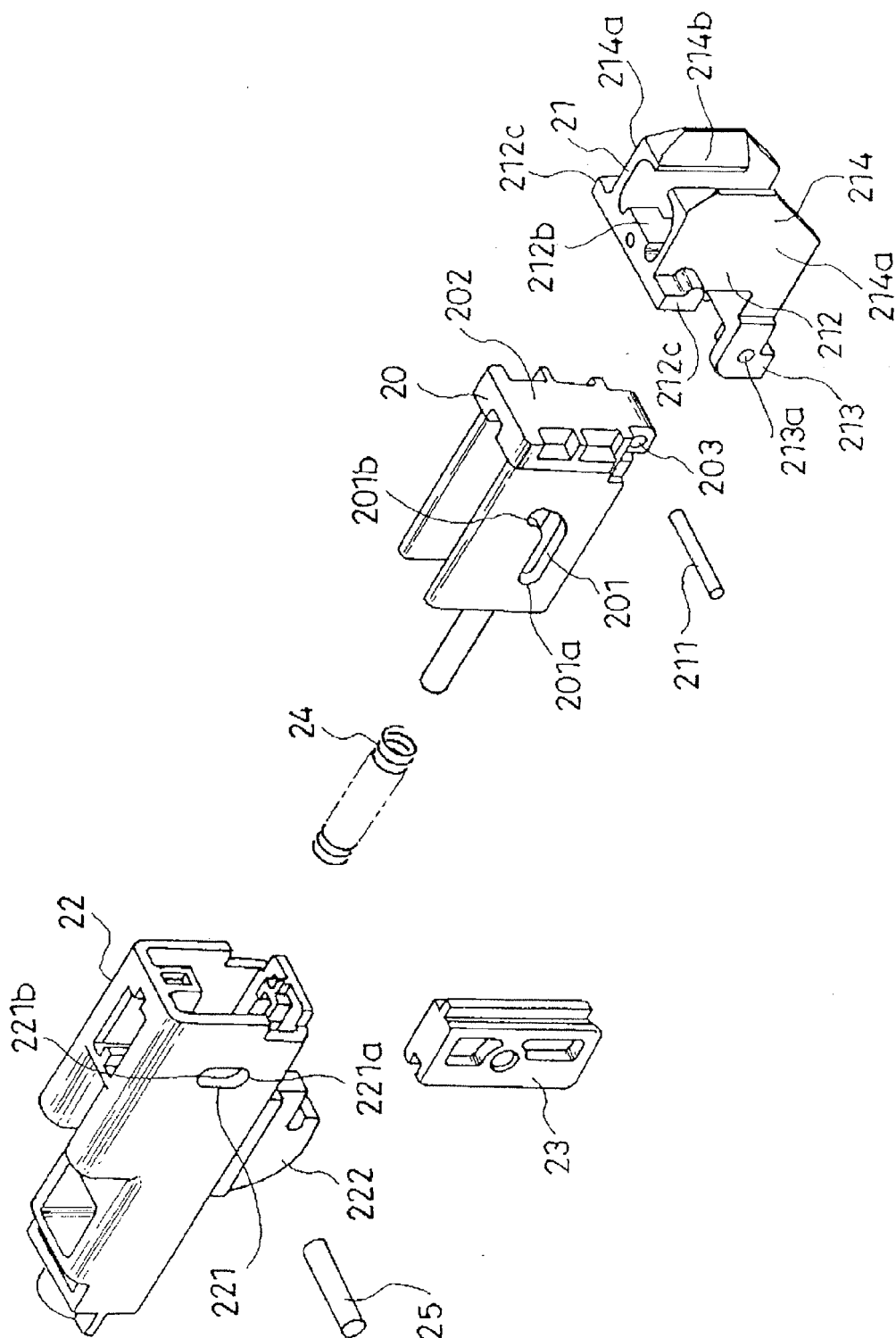
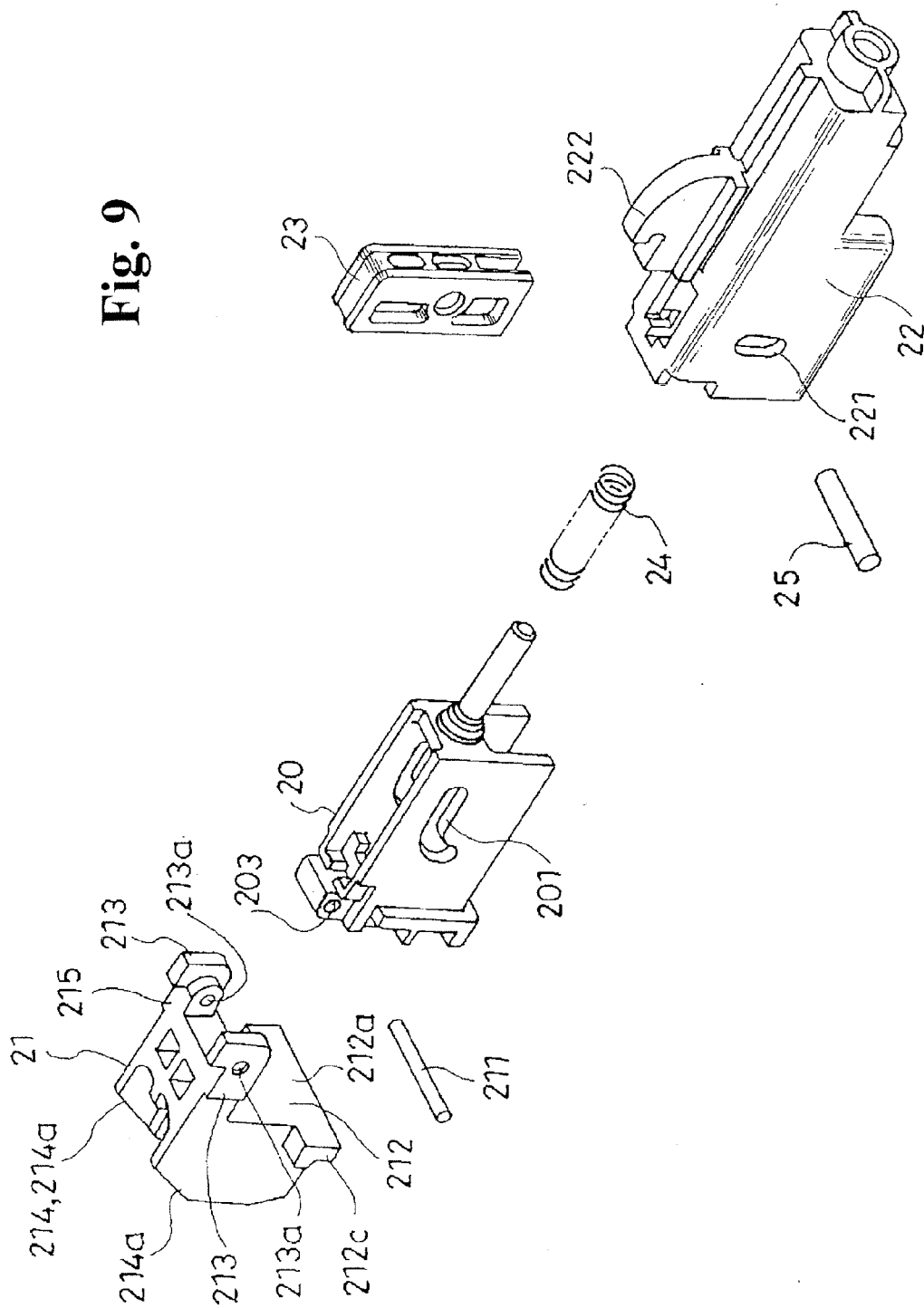


Fig. 8

Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/050289

A. CLASSIFICATION OF SUBJECT MATTER

E05F1/16(2006.01) i, E05F3/00(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)

E05F1/16, E05F3/00

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 1996-2012

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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 A	JP 2007-309088 A (Nifco Inc.), 29 November 2007 (29.11.2007), entire text; all drawings & US 2010/0293859 A1 & EP 2014856 A1 & WO 2007/122831 A1 & KR 10-2009-0004989 A & CN 101421481 A	1-4 5



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

06 March, 2012 (06.03.12)

Date of mailing of the international search report

19 March, 2012 (19.03.12)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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- JP 4402133 B [0003]
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