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(54) **DEVICE FOR CONTROLLING OPENING AND CLOSING OF A DOOR, SHUTTER OR WINDOW**

(57) A device for controlling opening and/or closing of a door leaf (1) hinged to a frame (2) has a receiving unit (30) arranged on the frame (2) and an engagement unit (20) with a pin projecting from the door leaf. The receiving unit (30) has a slidable element and a catcher pivotally connected to the slidable element and config-

ured to guide the engagement unit (20) in a controlled way. The device (10) further includes a guiding element connected to the catcher and configured to be in a connected state to control the rotation of the catcher during closing of the door leaf (1) and in a disconnected state during opening of the door leaf (1).

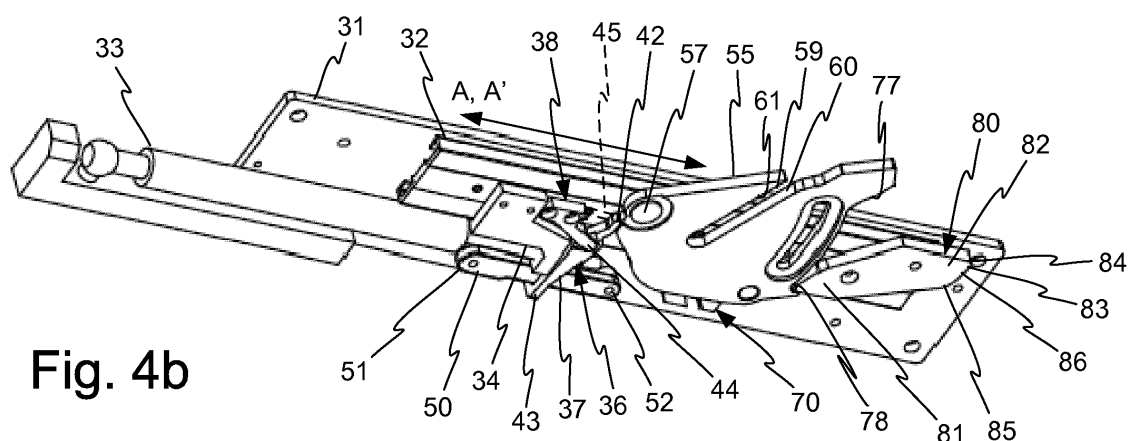


Fig. 4b

Description

TECHNICAL FIELD

[0001] The present invention relates to a device for controlling opening and closing of a pivotable member and more specifically it concerns a device for controlling opening and/or closing of a door, shutter or window.

BACKGROUND

[0002] Today there are devices for controlling and dampening of e.g. a door, window or shutter in for example hospitals, offices or other types of buildings. Oftentimes doors, in residential buildings, do not have these devices mostly because doors of this type available on the market are very expensive. Instead one has to experience door slamming, risks of getting a finger caught in the door, broken or damaged doors, or doors, windows or shutters that are heavy to open, e.g. for children, seniors or persons with disabilities. In some countries, there are regulations defining the maximum opening force needed for opening a door. However, devices on the market do not provide an acceptable opening force nor a closing force that is high enough to close the door with an acceptable closing procedure. Oftentimes, the force that the user needs to apply to open the door has to be much higher than the opening force the device delivers to close the door properly. This is due to friction and the compression of weather seals among other things. Often an extra mechanism has to be added to the device in order to create the desired closing force which leads to increased costs and further manufacturing steps. These problems are present in devices of the type shown in EP2468998A1 and DE1901664A1.

[0003] When it comes to design it is important that functional devices do not interrupt the general design of the object, such as a door, shutter or window. Many of the known devices have components that are visible both from e.g. the door leaf and within the door frame. Such an example is shown in EP2468998A1 and DE3912740A1.

[0004] Other problems with known techniques is that the control device is in a connected state between the frame and the door leaf all the time which means that the door leaf may only be left open in a predetermined end position. The door leaf is then closed in a controlled way with a predetermined speed which is a non-desired feature when a door has to be closed quickly.

[0005] Further background art is disclosed in EP2341207A1.

SUMMARY

[0006] An object of the present invention is to provide improvements over prior art. This object is achieved by a technique defined in the appended independent claims; certain embodiments being set forth in the related de-

pendent claims.

[0007] In one aspect, there is provided a device for controlling opening and closing of a pivotable member hinged to a frame where the device comprises a receiving unit arranged either on the pivotable member or on the frame, and an engagement unit arranged on the other of the pivotable member or frame. The engagement unit comprises at least one engagement portion projecting from the pivotable member or frame, whichever the engagement unit is arranged to. The receiving unit comprises a slidable element movable back and forth in a direction, a catcher which is pivotally connected to the slidable element and configured to guide the engagement portion of the engagement unit in a controlled way. The receiving unit further comprises a spring element which is connected to the slidable element and configured to control the movement of the slidable element in said direction, and a guiding element which together with the catcher is configured to be in a connected state to control the rotation of the catcher during closing of the pivotable member and in a disconnected state during opening of the pivotable member.

[0008] According to this aspect, there is provided a device which in a controlled way opens and closes e.g. a door, shutter or window without risking the door to slam, be damaged or be too heavy to open. Furthermore, the device provides safe opening and closing so that the risk of crushed fingers is reduced. Another advantage with the inventive device is that it does not affect the overall design of the door, window or shutter. Yet another advantage is that the inventive device complies with new regulations, for example in Norway, which state that an opening force must not exceed 20N. Meanwhile, in order to achieve a complete closing the device must generate a closing force of about 70N. By the inventive device then is provided an opening force less than 20N and a closing force about 70N.

[0009] In an embodiment, the catcher comprises a cam surface against which the engagement portion is guided in a controlled way. This design is advantageous since the movement of the engagement portion always may be predicted as the engagement portion moves along the cam surface.

[0010] In yet another embodiment, the catcher comprises a slot in which the engagement portion is guided in a controlled way. This has the same advantages as above, i.e. that the movement of the engagement portion always may be predicted as the engagement portion moves along the cam surface.

[0011] In a further embodiment, the slot or cam surface, in an open position of the catcher, is arranged to extend in a second direction and, in a closed position of the catcher, is arranged to extend in a third direction. A first angle formed between the first direction and the second direction is larger than a second angle formed between the first direction and the third direction. This angular arrangement promotes the conditions for meeting the opening and closing force requirements.

[0012] In a preferred embodiment the first angle is between 55° and 80° and wherein the second angle is between 15° and 45°.

[0013] In an alternative embodiment, the device further comprises a stopping element having a curved cam surface along which a second engagement portion of the engagement unit is guided during the opening and closing of the pivotable member. The curved cam surface is shaped such that the second engagement portion, when the catcher is in its open position, pushes on the curved cam surface in such a way that the slidable element is slightly displaced in the first direction. This design is advantageous since it enables the slidable element to be locked in a position which facilitates the receiving of the first engagement portion in the catcher.

[0014] In yet another embodiment, the guiding element comprises at least one cam surface along which engagement means of the catcher is guided during the connected state. This arrangement is advantageous since the rotation of the catcher is controlled and in a way dampened during the closing of the door leaf.

[0015] In an embodiment the guiding element comprises a guiding part which is arranged so that the engagement means of the catcher is disengaged from the second guiding part and the guiding means during the disconnected state. This design is advantageous since it allows the engagement means to move and the catcher to rotate unhindered during the opening of the door leaf.

[0016] In a further aspect, there is provided a device for controlling opening and closing of a pivotable member hinged to a frame. The device comprises a receiving unit arranged either on the pivotable member or on the frame, and an engagement unit arranged on the other of the pivotable member or frame, wherein the engagement unit comprises:

- at least one engagement portion projecting from said pivotable member or frame, whichever the engagement unit is arranged to, and wherein the receiving unit comprises:
 - a slidable element movable back and forth in a direction,
 - a catcher pivotally connected to the slidable element and configured to guide the engagement portion of the engagement unit,
 - a spring element connected to the slidable element and configured to control the movement of the slidable element in said direction, and
 - a guiding element which together with the catcher is configured to be in a connected state to control the rotation of the catcher during closing of the pivotable member and in a disconnected state during opening of the pivotable member,

wherein the guiding element comprises a first guiding part having a first cam surface, and a second guiding part having a second cam surface, wherein

the second guiding part is arranged so that the engagement means of the catcher is guided on the opposite side of the second cam surface with respect to the second guiding part during the disconnected state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Embodiments of the invention will be described in the following, reference being made to the appended drawings which illustrate non-limiting examples of how the inventive concept can be reduced into practice.

Fig. 1a is a perspective view of a door structure comprising a device according to a first aspect, Fig. 1b is another perspective side view of the door structure in Fig. 1a,

Fig. 1c is a partial view of the device in Fig. 1b on a larger scale,

Figs 2a-c are perspective views of a device according to an alternative embodiment,

Fig. 3a is a view of an engagement unit according to an embodiment,

Fig. 3b is an exploded view of the engagement unit in Fig. 3a,

Fig. 4a is a view of a receiving unit according to an embodiment arranged in its cover portion,

Fig. 4b is a view of the receiving unit in Fig. 4a without its cover portion,

Fig. 4c is an exploded view of the receiving unit in Fig. 4a,

Figs 5a and 5b illustrate a device with the engagement unit in Fig. 3 and the receiving unit in Fig. 4 engaged with each other in a closed state,

Figs 6-11 illustrate the device in Fig. 3a during opening of a pivotable door leaf,

Figs 12-18 illustrate the device in Fig. 3a during closing of a pivotable door leaf,

Fig. 19a illustrates an open position of a catcher according to an embodiment,

Fig. 19b illustrates a closed position of the catcher in Fig. 19a,

Fig. 20a illustrates an alternative open position of the catcher in Fig. 19a,

Fig. 20b illustrates an alternative closed position of the catcher in Fig. 19a,

Fig. 21 is an exploded view of a receiving unit according to a second aspect,

Fig. 22 is an isometric view of the receiving unit in Fig. 21 assembled, and

Figs 23-27 illustrate the device in Fig. 22 during closing of a pivotable door leaf.

DETAILED DESCRIPTION OF EMBODIMENTS

[0018] With respect to Figs 1a-1c a pivotable member 1 and a frame 2 are shown, where the pivotable member 1 is hinged to the frame 2. The pivotable member 1 is

preferably a door, shutter or window and the frame is thus preferably a door frame, shutter frame or window frame. The structure of the pivotable member, which in this case is a door leaf 1, shown in the enclosed drawings, and the frame, in this case a door frame 2, comprises a device 10 for controlling opening and/or closing at least partly, i.e. the opening and/or closing operation of the door leaf 1.

[0019] The device 10 has an engagement unit 20 and a receiving unit 30 where the engagement unit 20, in this case, is provided on the door leaf 1 and the receiving unit 30 is provided on the frame 2 in such a way that the engagement unit 20 is located above the receiving unit 30 and engage with each other in a closed state, i.e. when the door leaf 1 is arranged within the door frame, see for example Fig. 2a. All figures show an embodiment where the engagement unit 20 is arranged integrally with-in or on the top of the door leaf 1, i.e. on a top surface 3 of the door leaf 1, in such a way that no component of the engagement unit 20 protrudes outside the door leaf 1, and where the receiving unit 30 is arranged underneath the top frame structure 4 or preferably integrated in the top frame structure 4. Most components of the receiving unit 30 are either covered by a cover portion 29, see Fig. 4a, and/or integrated within the top frame structure 4 after it has been installed so that only a few components are exposed to the surroundings and the engagement unit 20 and not as visible as Fig. 1a shows.

[0020] In an alternative embodiment, the engagement unit and the receiving unit are arranged along the side of door leaf and frame respectively and in yet another embodiment they may be arranged in the bottom of the door leaf and frame respectively. The device may thus be arranged wherever suitable along or within the sides of the door leaf and along or within the frame structure.

[0021] In yet another embodiment, the engagement unit is arranged in the frame structure instead on the door leaf and the receiving unit is then arranged in the same way but in the door leaf instead of the frame structure.

[0022] By "opening" and "closing" is in this disclosure meant during opening and closing when the device is used, i.e. the opening of the door leaf 1 ends when the engagement unit 20 is no longer in contact with the receiving unit 30 and the closing begins when the engagement unit 20 is again in contact with the receiving unit 30. This description focuses on when the device is in use and therefor it should be understood that a closing starts when the engagement unit 20 makes its first contact with the receiving unit 30, see Fig. 12 and the opening ends when the engagement unit 20 disconnects from the receiving unit 30, see Fig. 10. However, Fig. 11 shows a state where there is no connection between the engagement unit 20 and the receiving unit 30 and the door leaf 1 may rotate without being affected by the device 10. What happens with the door leaf 1 during this state is when describing the device 10 irrelevant.

[0023] Figs 2a-2c show an alternative embodiment where the door leaf 1 is provided with a hinged flap 5

which is arranged to cover an opening of the top frame structure 4, where the opening is provided to allow components of the receiving unit 30 to move unhindered in and out of the top frame structure 4. In the beginning of the opening operation, at least one component of the receiving unit 30 moves in such a way that it protrudes from the frame structure 4, but since the flap 5 is hinged it allows the component to push on the flap 5, which then folds away from the component, so it may move unhindered. When the at least one component of the receiving unit 30 stops affecting the flap 5, it returns to its idle position, i.e. where it protrudes upwards from the top surface of the door leaf 1, which is shown in e.g. Fig. 2b

[0024] Fig. 3a is a perspective view of the engagement unit 20 and Fig. 3b is an exploded view of the same, where the engagement unit 20 has a first pin-shaped engagement portion 21 and a second pin-shaped engagement portion 22. The two pins 21, 22 are arranged on a support portion 23 which in this case is a fixed support plate but which in another embodiment may be a movable support portion. Also the first and second pins 21, 22 are in this case fixed but may thus in another embodiments be movable in order to be suitably arranged for different applications. The engagement unit 20 further comprises mounting means 24 to be installed in the door leaf 1, preferably within two notches (not shown) in the door leaf 1, in order to mount the engagement unit 20 in said door leaf 1.

[0025] Fig. 4a is a bottom view of the receiving unit 30 in an assembled state surrounded by the cover portion 29, Fig. 4b is a bottom view of the receiving unit 30 without the cover portion 29 and Fig. 4c is an exploded view which more clearly shows all the components of the receiving unit 30 including the cover portion 29. The receiving unit 30 comprises a support portion 31 which supports all the components directly or indirectly of the receiving element 30. To the support portion 31 a slidable element 32 is connected, from now on called a slider configured to slide back and forth in a direction A of a first plane A', where in this case the direction A is parallel to the width of the door leaf 1. The first plane A' is parallel to or in level with the extension of the bottom surface of the top frame structure 4, i.e. the surface facing the top surface 3 or the door leaf 1 in a closed state.

[0026] The receiving unit 30 further comprises a spring element 33, which preferably includes a gas spring, and which is attached to the support portion 31 and connected to the slider 32 by means of connecting means 34. The spring element 33 is arranged to control the movement of the slider 32 during opening and closing and to make sure that the slider 32 always returns to its idle state, which is when the receiving unit 30 is in its closed state, i.e. when the door leaf 1 is in its closed position which is shown for example in Fig. 5a. The spring element 33 is configured to achieve a dampening effect on the slider 32 until the very end of the closing procedure. Just before the spring element 33 has returned the slider 32 to its idle state, the spring element 33 accelerates speed of the

slider 32 in order to accelerate the last rotation of the door leaf 1. The acceleration provides the door leaf 1 with additional rotational moment in order to overcome the forces, often frictional forces, of the sealing joint (not shown) provided on the door leaf 1 or frame 2. This feature makes it easier to achieve a desired closing force without affecting the opening force.

[0027] Furthermore, the receiving unit 30 comprises a locking element 36 which is configured to lock the slider 32 in its position when the slider 32 has reached its maximum displaced state. The locking element 36 includes a locking arm 37 and connection means 38, which preferably are made in one piece, where the connection means 38 has a fixing portion 39 which is fixed to the slider 32 and a connection arm 40 which connects the locking arm 37. The connection arm 40 is preferably connected to an intermediate portion 41 of the locking arm 37, i.e. away from the end portions 42, 43 of the locking arm 37. The connection point between the connection arm 40 and the locking arm 37 creates a pivot or a point of rotation 44 around which the locking arm 37 may rotate. The point of rotation 44 is preferably placed off-centre, closer to the first end 42 than to the second end 43 of the locking arm 37.

[0028] The first end portion 42 of the locking arm 37 is preferably also connected to the fixing portion 39 of the connection means 38 by means of a spring 45, which in an unloaded state holds the locking arm 37 in an idle and unlocked state. The second end portion 43 of the locking arm 37 is provided with a through hole 47 in which an elongated member 50 moves. The elongated member 50 has a first and a second end portion 51, 52, which are fixed to the support portion 31 in such a way that the elongated member 50 is spaced from the support portion 31. The first end portion 51 differs from the second end portion 52 in that it has a larger cross section. The locking arm 37 is, by means of the through hole 47, able to slide along the elongated member 50 and lock itself against the second end portion 52. The locking operation of the locking arm 37, which results in the slider 32 being placed in its locked state, is possible since when the slider 32 is in its maximum displaced state, the spring element 33 exerts a pressure in the point of rotation 44 of the locking arm 37, wherein the locking arm 37, since the point of rotation 44 is arranged closer to the first end portion 42 of the locking arm 37, starts to rotate or performs a tilting motion around the point of rotation 44 which leads to the second end 43 of the locking arm 37 creating a clamping effect on the elongated member 50, lock itself and placing the slider 32 in its locked state, see for example Fig. 10.

[0029] The locking arm 37 and the slider 32 are released from the locked state by means of a catcher 55. The catcher 55 has a closed position which is when the door, shutter or window 1 is closed in its frame 2, and an open position which is when the door, shutter or window 1 is open, i.e. not in its position within the frame 2. The closed portion of the catcher 55 may be seen e.g. in Fig. 5a and the open position may be seen e.g. in Fig. 9.

When the catcher 55 moves from its open position to its closed position it pushes, by means of a protrusion 56, on the first end portion 42 of the locking arm 37 so that the tilted position and thus the clamping effect of the second end portion 43 ceases, unlocking the locking arm 37 and the slider 32. The protrusion 56 may be just a small edge or a surface in alternative embodiments.

[0030] The catcher 55 is pivotally mounted to the slider 32 in a pivot or a point of rotation 57 and arranged to catch and to guide the first pin 21 of the engagement unit 20 during the initial opening motion of and the finishing closing motion of the door leaf 1, i.e. the first pin 21, and the catcher 55 are not engaged during the entire opening and closing motion. In order to catch the first pin 21 the catcher 55 is provided with a slot 59 having a first and a second cam surface 60, 61 between which the first pin 21 may move. The slot 59 is in this embodiment substantially straight, but it may in other embodiment have another shape, which in the open position of the catcher 55 extends in a second direction B defining a second plane B' and which in the closed position of the catcher 55 extends in a third direction C defining a third plane C'. This is more clearly shown in Figs 19a-b and 20a-b, where Figs 19a and 20a show the open position and 19b and 20b the closed position. In the open position of the catcher 55, the first plane A' and the second plane B' form a first angle α , which preferably is between 55° and 80°, which in an even more preferred embodiment is between 60° and 70°. In the closed position of the catcher 55 the first plane A' and the third plane C' form a second angle β , which preferably is between 15° and 45°, which in an even more preferred embodiment is between 20° and 40°. The great difference between the opening angle α and the closing angle β makes it possible achieve a large closing force and at the same time achieve a small opening force.

[0031] Furthermore, the catcher 55 comprises engagement means 63 configured to engage with a stationary guiding element 70 of the device 10 during closing of the door leaf 1, where the guiding element 70 is configured to guide and control the motion and rotation of the catcher 55 in a controlled way which indirectly means that the motion and rotation of the catcher 55 will be dampened. Preferably, as is shown in Figs 12-18, the guiding element 70 is only used during closing of the door leaf 1 or to be more specific just in the end of the closing motion of the door leaf 1 as it approaches the frame 2. This will from now on be called a connected state. The opposite state is a disconnected state which occurs during the opening of the door leaf 1. In the disconnected state the engagement means 63 is preferably not in contact at all with the guiding element 70, see Figs 6-11 which is an advantage since there occurs no additional opening forces as the engagement means 63 no longer guided in the guiding element 70 but instead moves freely without any counter forces acting on it. In an alternative embodiment the engagement means 63 may run along an outside surface of the guiding element 70 without cre-

ating any significant counter forces.

[0032] The guiding element 70 is fixed to the stationary support portion 31 and includes a first guiding part 71 and a second guiding part 72 which are spaced from each other so that the engagement means 63 may run between them. The first guiding part 71 has a slanted cam surface 73 which extends in a fourth direction D at a third angle γ , which preferably is between 30° and 80° but which is about 55° in the figures, with respect to the first direction A. The second guiding part 72 has a corresponding slanted cam surface 74 which extends in a fifth direction E which in this case is parallel to the fourth direction D. In the shown embodiment the two guiding parts 71, 72 form a slot 75 in which the engagement means 63 runs during closing of the door leaf 1 but the preferred guiding may in another embodiment be achieved with only one of the guiding part 71, 72 where the engagement means 63 then will be guided by means of the respective slanted cam surfaces 73, 74. From now on, however, focus will be on the shown embodiment.

[0033] During the closing of the door leaf 1 the engagement means 63 moves through the slot 75 and in the closed state, i.e. when the door leaf 1 is arranged within its frame 2, see e.g. Figs 5a and 5b, the engagement means 63 is located outside the guiding element 70 and not within the slot 75. During in the opening of the door leaf 1, as can be seen in Figs 6-11, the engagement means 63 moves outside the second guiding part 72 and back, ready to guide the engagement means 63 during the next closing of the door leaf 1. This means that the engagement means 63 in a closed position of the catcher 55 is in the disconnected state and the engagement means 63 in a sequence just after the open position of the catcher 55 is in a connected state with the guiding element 70.

[0034] In an alternative embodiment, the cam surface of the second guiding part comprises a sloping surface (not shown) along which the engagement means of the catcher is guided at the end of closing the pivotable member, i.e. just before the closed position of the catcher. The sloping surface creates an increase of the rotational speed of the door leaf just at the very end of the closing.

[0035] The catcher 55 further comprises a first counter surface 77 and a second counter surface 78 which together define a maximum rotation of the catcher 55 between its open position and closed position. In order to prevent the catcher 55 from rotating further, the device 10 also includes a stopping element 80 which is arranged to engage the first counter surface 77 in the closed position of the catcher 55 and the second counter surface 78 in the open position of the catcher 55. The stopping element 80 is connected to the slidable element 32 and includes an arrow shaped first end portion 81 which is arranged to engage the first and second counter surface 77, 78 of the catcher 55 so that the catcher 55 does not rotate more than the maximum allowed rotation. The stopping element 80 also includes a second end portion 82 having a curved cam surface 83. The curved cam

surface 83 includes a first and a second radius 84, 85 and in this embodiment a substantially straight cam surface 86, which in another embodiment may have another shape, there in between. The first radius 84 is preferably smaller than the second radius 85. The curved cam surface 83 is configured to guide the second pin 22 of the engagement unit 20 during the end of opening, see Fig. 8-10.

[0036] During the end of the opening procedure, see Fig. 10, when the catcher 55 is in its open position, the second pin 22 pushes on the curved cam surface 83 in such a way that the slidable element 32 is slightly displaced in the first plane A'. The displacement, which is a displacement away from its idle state, created by the second pin 22 allows the locking element 36 to lock the slidable element 32 in a position which enables the catcher 55 to receive the first pin 21 without it missing the cam surface 60 or slot 59 in the beginning of the following closing action. During the rest of the opening procedure, and during the entire closing procedure the second pin 22 is preferably disengaged from the stopping element 80.

[0037] All components of the device 10 are shown in an assembled state in Figs 5a and 5b. The figures show the door leaf 1 in a closed state located within the frame 2. In this closed state the slidable element 32 and the spring element 33 are in their idle state, the locking element 36 is in its unlocked state, the first pin 21 of the engagement unit 20 is arranged within the slot 59, the engagement means 63 of the catcher 55 is in the disconnected state and the stopping element 80 is engaged with the first counter surface 77. The opposite state is shown e.g. in Fig. 11a and 11b. In this open state the slidable element 32 and the spring element 33 are in their non-idle state due to the locking element 36 which is in its locked state, the first pin 21 of the engagement unit 20 is located outside the slot, the engagement means 63 of the catcher 55 is in the disconnected state but ready to move in to the connected state and the stopping element 80 is engaged with the second counter surface 78.

[0038] Figs 6-11 illustrate the opening procedure of the door leaf 1 with the device 10. As soon as the door leaf 1 is opened, the catcher 55 starts to rotate counter clockwise around its point of rotation 57 from the closed angle α to the open angle β . Due to the large difference between the opening angle β and the closing angle α , which has been described above, the opening force is very little compared to the closing force, which is created when the catcher 55 rotates clockwise towards a closed position as is illustrated in Figs 12-18.

[0039] In a second aspect, a member 1000 for controlling opening and closing of a pivotable member 100 is provided. This device 1000 is shown in Figs 21-27, whereby Figs 23a-b, 24a-b, 25a-b, 26a-b and 27a-b substantially correspond to Figs 13a-b, 14a-b, 15a-b, 16a-b and 18a-b, respectively. In Figs 23a-b the door leaf 100 is controllably closed by the spring force, and a damping cylinder becomes engaged. In Figs 24a-b the damping

cylinder starts to work, and in Figs 25a-b the door 100 is closed to the position where the damping ceases and acceleration starts for larger closing force. In Figs 26a-b, the door leaf 100 is closed with an accelerating closing speed for larger closing force.

[0040] The member 1000 of Figs 23-27 is hinged to a frame 200 and comprises a receiving unit 3000 arranged either on the pivotable member 100 or on the frame 200, and an engagement unit 2000 arranged on the other of the pivotable member 100 or frame 200. Further, the engagement unit 2000 comprises at least one engagement portion projecting from the pivotable member 100 or frame 200, whichever the engagement unit 2000 is arranged to. The receiving unit 3000 comprises a slidable element 320 movable back and forth in a direction A, a catcher 550 pivotally connected to the slidable element 320 and configured to guide the engagement portion of the engagement unit 2000, a spring element 330 connected to the slidable element 320 and configured to control the movement of the slidable element 320 in the direction A, and a guiding element 700 which together with the catcher 550 are configured to be in a connected state to control the rotation of the catcher 550 during closing of the pivotable member 100 and in a disconnected state during opening of the pivotable member 100. The catcher 550 further comprises engagement means 630 configured to engage with a stationary guiding element 700 of the member 100 during closing of the door leaf 100.

[0041] In this embodiment, the spring element 330 comprises two parts as is best seen in Fig. 21. The two parts comprise a spring cartridge 331 and a damping unit 332, which cooperate during the closing of the door. Also, the elongated member 50 and the locking element 36 described in connection with the first aspect, are in this embodiment replaced by the catcher 550, the engagement means 630 and the guiding element 700. Otherwise the main functions are similar to the ones described in connection with the first aspect, presented in Figs 1-20.

[0042] The device and its components may preferably be made of plastic, metal, any other suitable material or a combination of materials.

[0043] Finally, although the inventive concept has been described above with reference to specific embodiments, it is not intended to be limited to the specific form set forth herein. Rather, the invention is limited only by the accompanying claims and, other embodiments than the specific above are equally possible within the scope of these appended claims.

Claims

1. A device for controlling opening and closing of a pivotable member (1) hinged to a frame (2), said device comprising a receiving unit (30) arranged either on said pivotable member (1) or on said frame (2), and an engagement unit (20) arranged on the other of said pivotable member (1) or frame (2),

wherein the engagement unit (20) comprises:

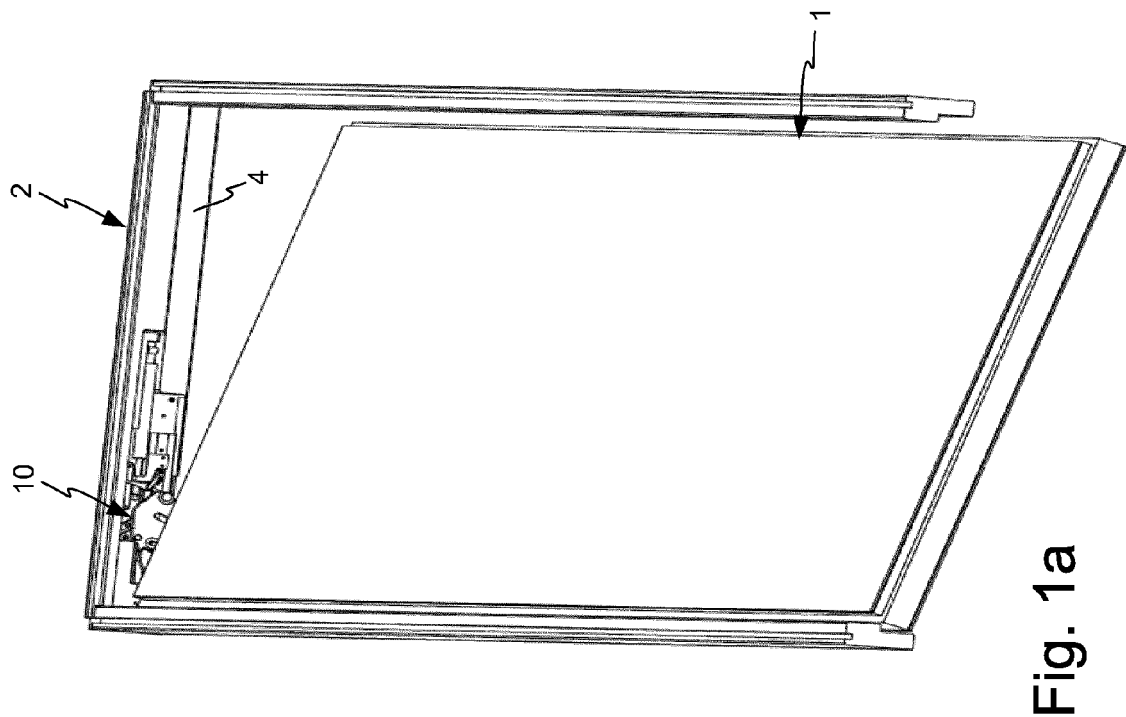
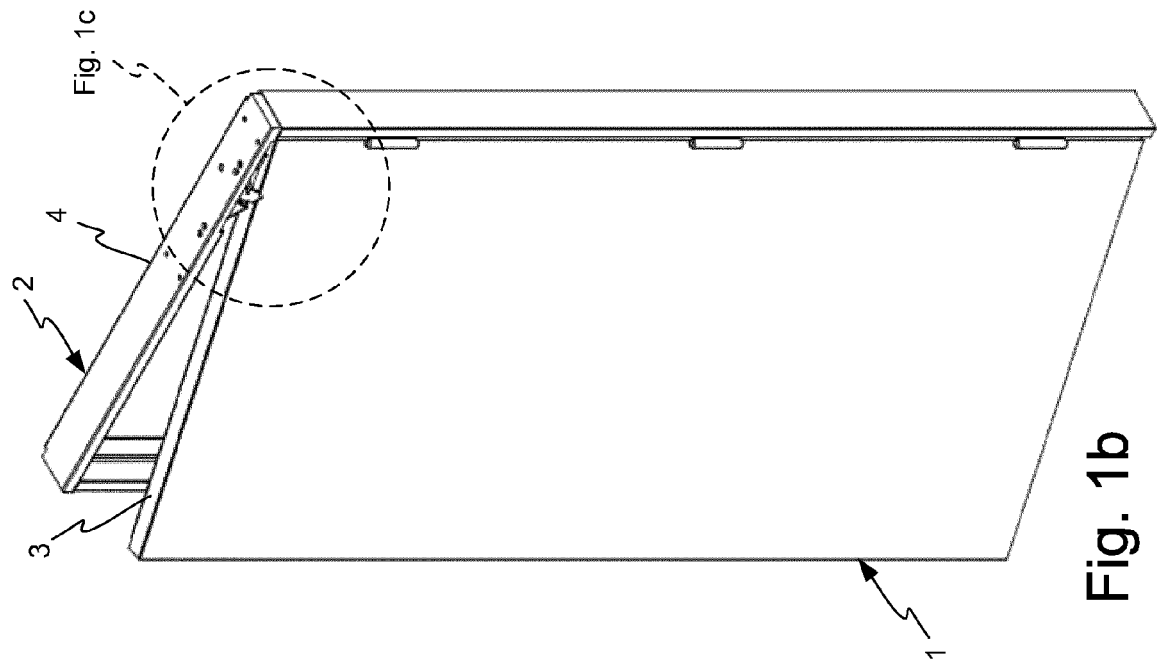
- at least one engagement portion (21) projecting from said pivotable member (1) or frame (2), whichever the engagement unit (20) is arranged to,

and wherein the receiving unit (30) comprises:

- a slidable element (32) movable back and forth in a direction (A),
- a catcher (55) pivotally connected to the slidable element (32) and configured to guide the engagement portion (21) of the engagement unit (20),
- a spring element (33) connected to the slidable element (32) and configured to control the movement of the slidable element (32) in said direction (A), and
- a guiding element (70) which together with the catcher (55) is configured to be in a connected state to control the rotation of the catcher (55) during closing of the pivotable member (1) and in a disconnected state during opening of the pivotable member (1).

2. The device according to claim 1, wherein said at least one engagement portion is a pin (21).
3. The device according to claim 1 or 2, wherein said at least one engagement portion (21) extends perpendicularly from said pivotable member (1) or frame (2).
4. The device according to any one of the preceding claims, wherein the catcher (55) comprises a cam surface (60, 61) against which the engagement portion (21) is guided.
5. The device according to any one of the preceding claims, wherein the catcher (55) comprises a slot (59) in which the engagement portion (21) is guided.
6. The device according to claim 5, wherein the slot (59) or cam surface (60, 61), in an open position of the catcher (55), extends in a second direction (B) and, in a closed position of the catcher (55), extends in a third direction (C), wherein a first angle (α) formed between the first direction (A) and the second direction (B) is larger than a second angle (β) formed between the first direction (A) and the third direction (C), wherein the first angle (α) preferably is between 55° and 80° and the second angle (β) is between 15° and 45° .
7. The device according to any one of the claims 4-6, wherein the slot (59) or cam surface (60, 61) is a substantially straight slot (59)/cam surface (60, 61).

8. The device according to any one of the preceding claims, wherein the catcher (55) further comprises a first counter surface (77) and a second counter surface (78) which together define a maximum rotation of the catcher (55) between the open position and closed position of the catcher (55). 5
9. The device according to any one of the preceding claims, further comprising a stopping element (80) which is arranged on the slidable element (32) and configured to prevent the catcher (55) from rotating more than a maximum rotation; wherein the stopping element (80) preferably comprises an end portion (81) which is configured to engage the first and second counter surface (77, 78) of the catcher (55) in order to prevent the catcher (55) from rotating more than the maximum rotation. 10
10. The device according to claim 9, wherein the stopping element (80) further comprises a curved cam surface (83) along which a second engagement portion (22) of the engagement unit (20) is guided during the opening and closing of the pivotable member (1); wherein the curved cam surface (83) preferably is shaped such that the second engagement portion (22), when the catcher (55) is in its open position, pushes on the curved cam surface (83) in such a way that the slidable element (32) is slightly displaced in the first direction (A). 15 20 25
11. The device according to any one of the preceding claims, wherein the guiding element (70) comprises at least one cam surface (73, 74) along which engagement means (63) of the catcher (55) is guided during the connected state; wherein the guiding element (70) preferably comprises a first guiding part (71) having a first cam surface (73), and a second guiding part (72) having a second cam surface (74); wherein the engagement means (63) of the catcher (55) is guided in between the first cam surface (73) and the second cam surface (74) during the connected state; wherein the cam surface (74) of the second guiding part (72) preferably comprises a sloping surface along which the engagement means (63) of the catcher (55) is guided at the end of closing the pivotable member (1), i.e. just before the closed position of the catcher (55), in order to create an increase of the rotational speed of the pivotable member (1); wherein the second guiding part (72) preferably is arranged so that the engagement means (63) of the catcher (55) is guided on the opposite side of the second cam surface (74) with respect to the second guiding part (72) during the disconnected state; and wherein the second guiding part (72) preferably is arranged so that the engagement means (63) of the catcher (55) is disengaged from the second guiding part (72) during the disconnected state. 30 35 40 45 50 55
12. The device according to any one of the preceding claims, wherein the spring element (33) is configured to provide dampening effect acting on the slidable element (32) during closing.
13. The device according to any one of the preceding claims, wherein the spring element (33) is configured to provide a speed increase of the slidable element (32) during the end of closing.
14. The device according to any one of the preceding claims, further comprising a locking element (36) connected to the slidable element (32), and which is configured to lock the slidable element (32) in its location when the catcher (55) is in its open position; wherein the locking element (36) preferably comprises a pivotable locking arm (37) which is configured to lock the slidable element (32) in its location when the catcher (55) is in its open position; and wherein the locking arm (37) preferably comprises an end portion (43) having an opening (47) slidable along and arranged around an elongated element (50) of the device, and wherein the locking arm (37) in a locked state is tilted such that it performs a clamping effect on the elongated element (50).
15. A door, shutter or window arrangement comprising a device according to any one of the preceding claims.



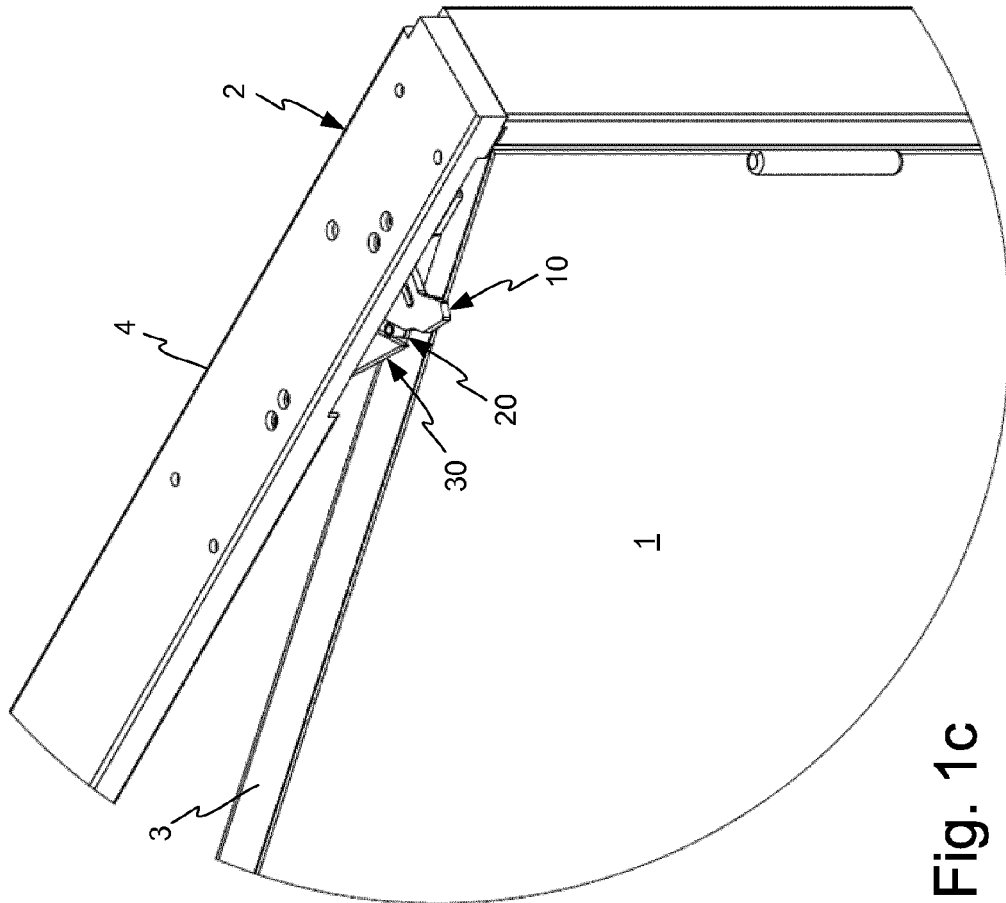


Fig. 1c

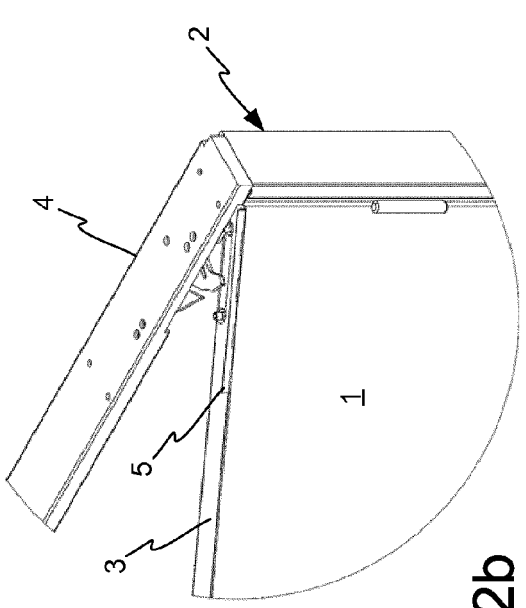


Fig. 2b

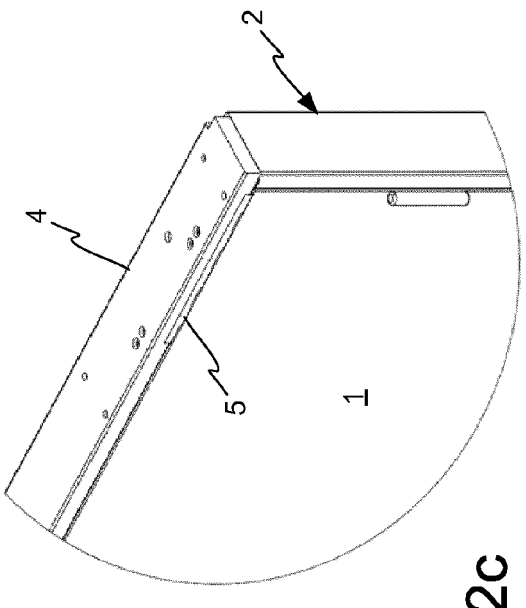


Fig. 2c

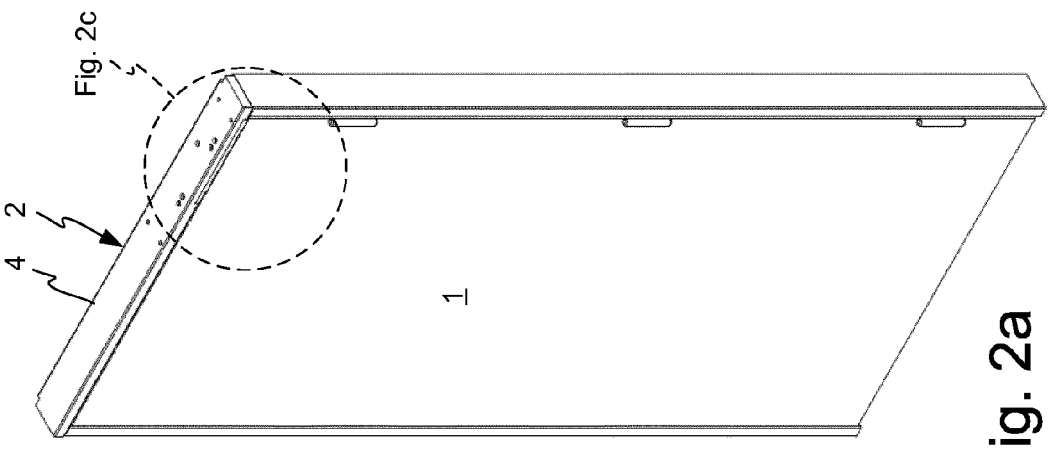


Fig. 2a

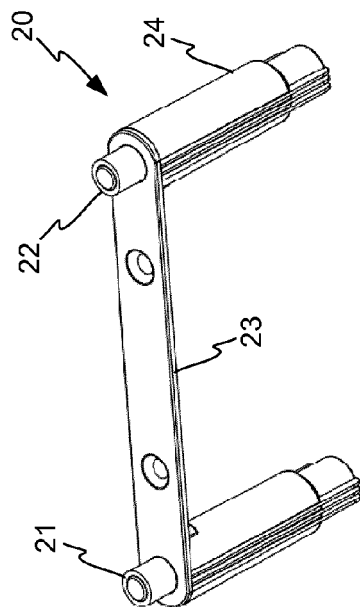


Fig. 3a

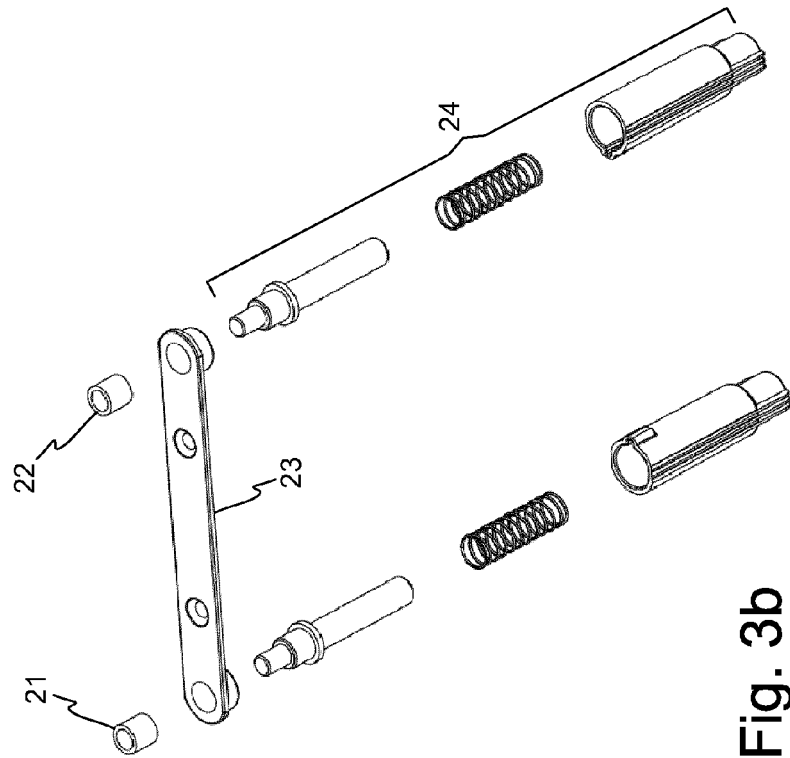
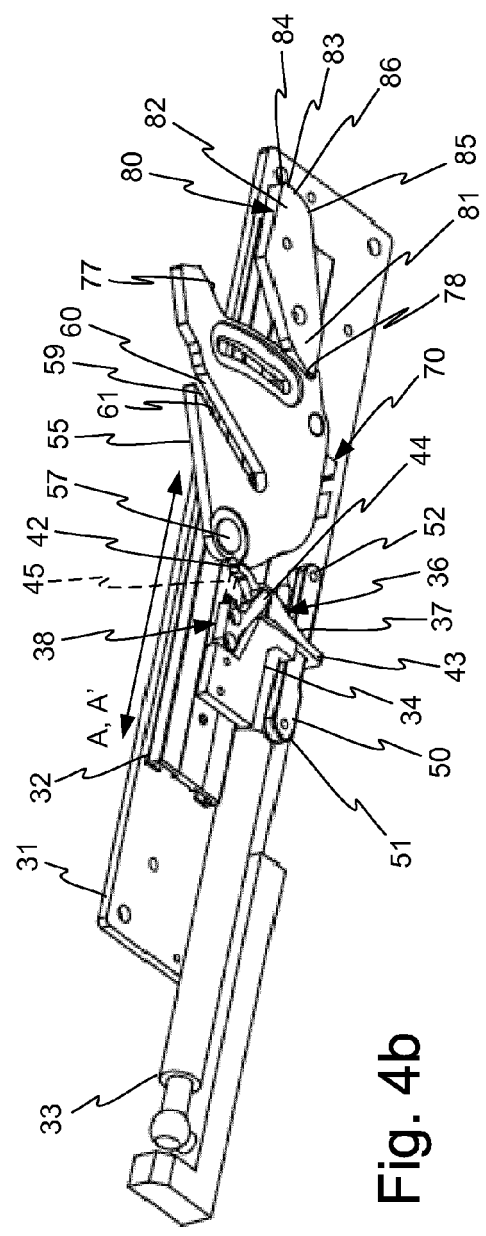
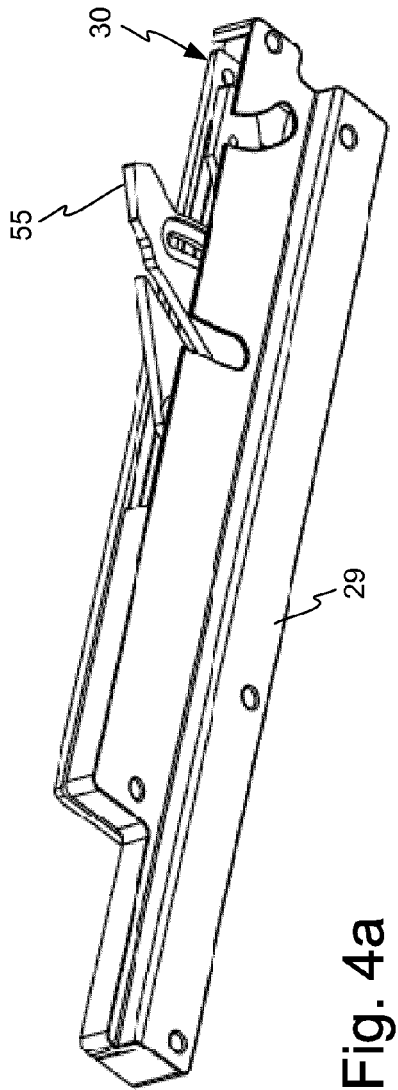


Fig. 3b



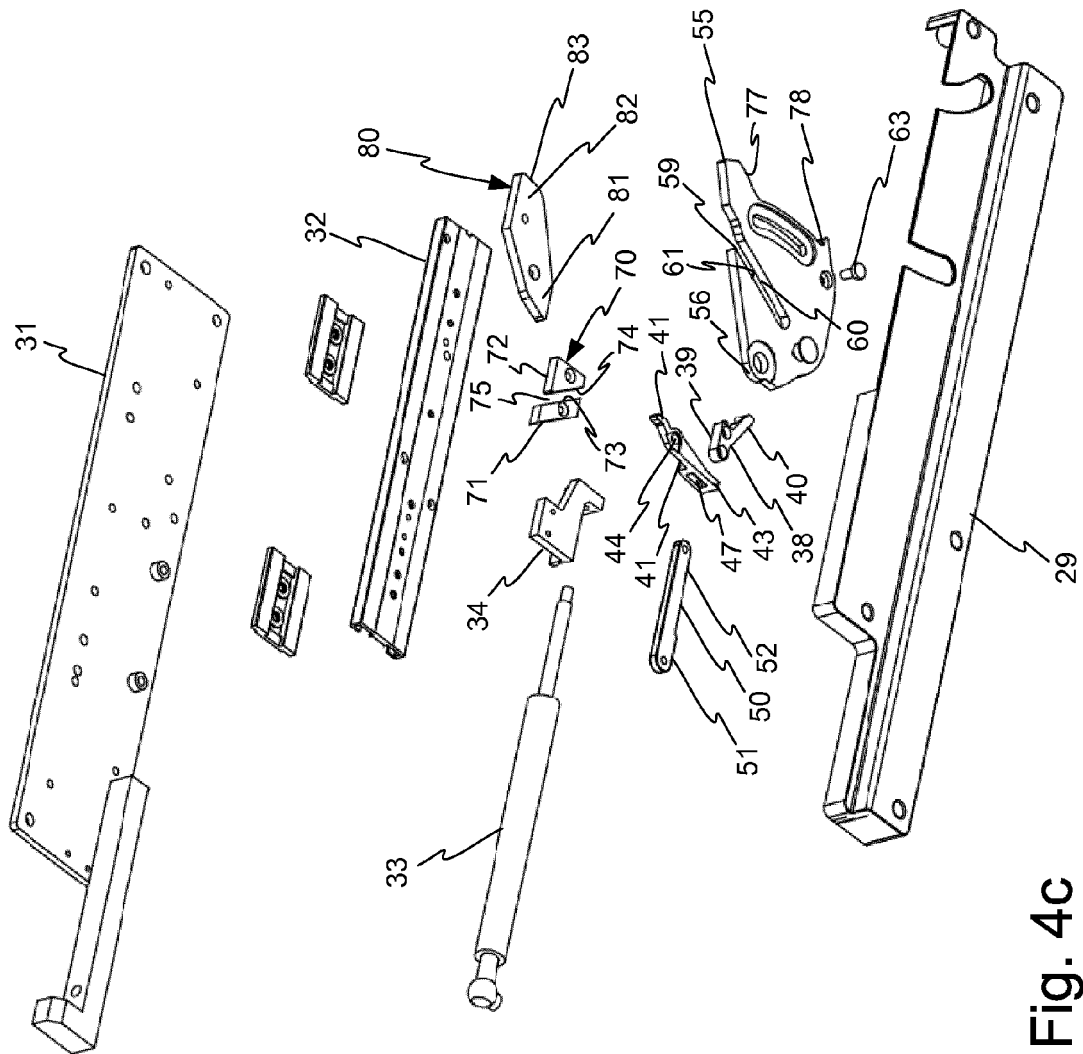
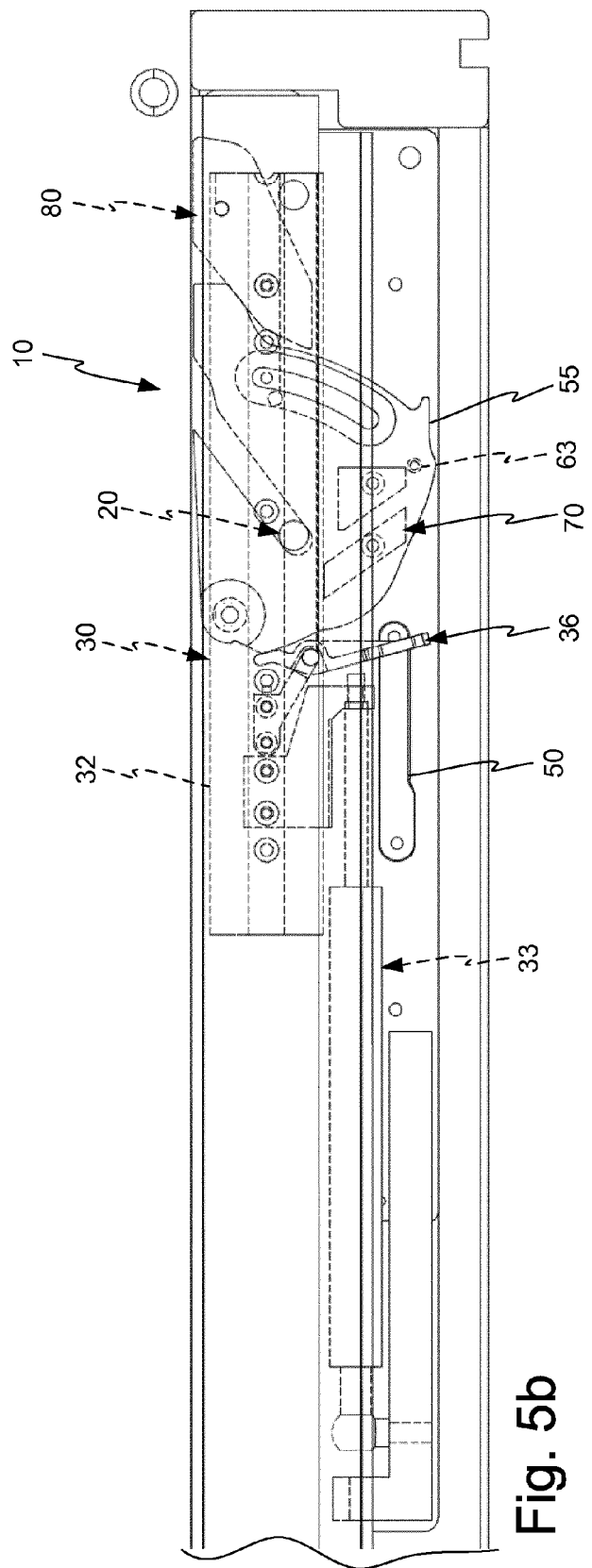
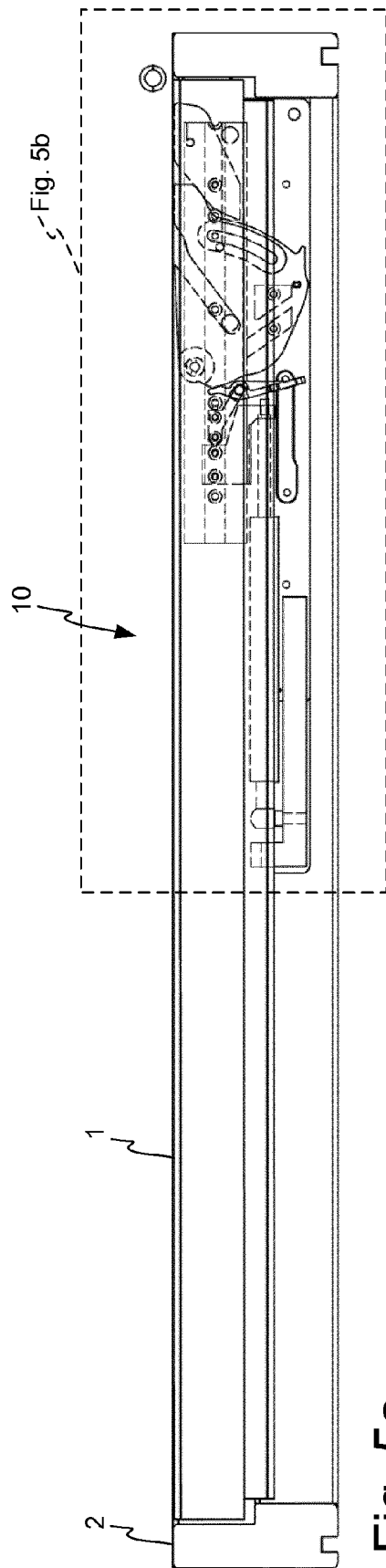


Fig. 4c



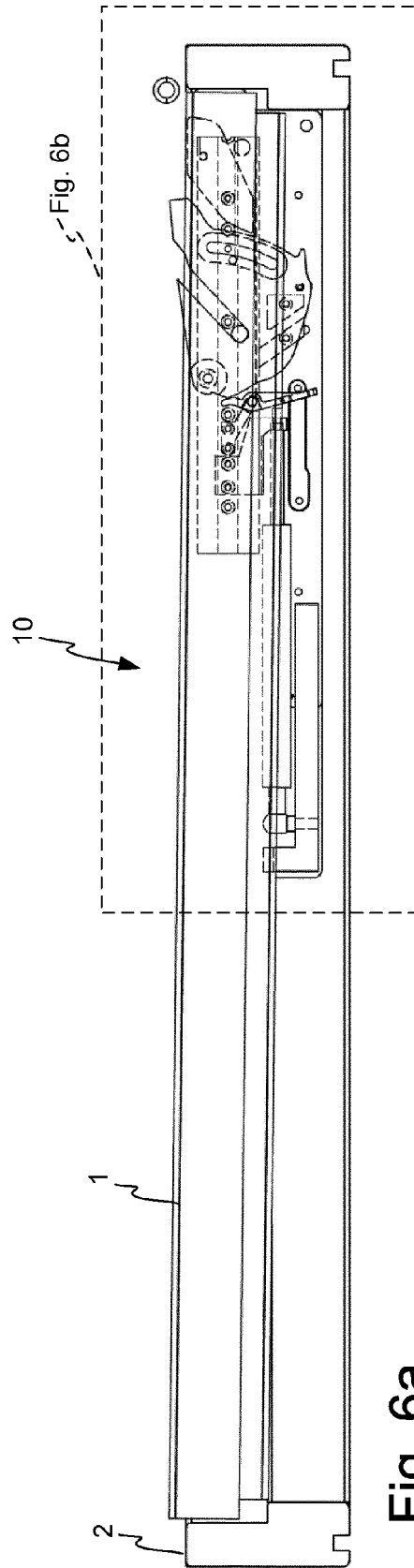


Fig. 6a

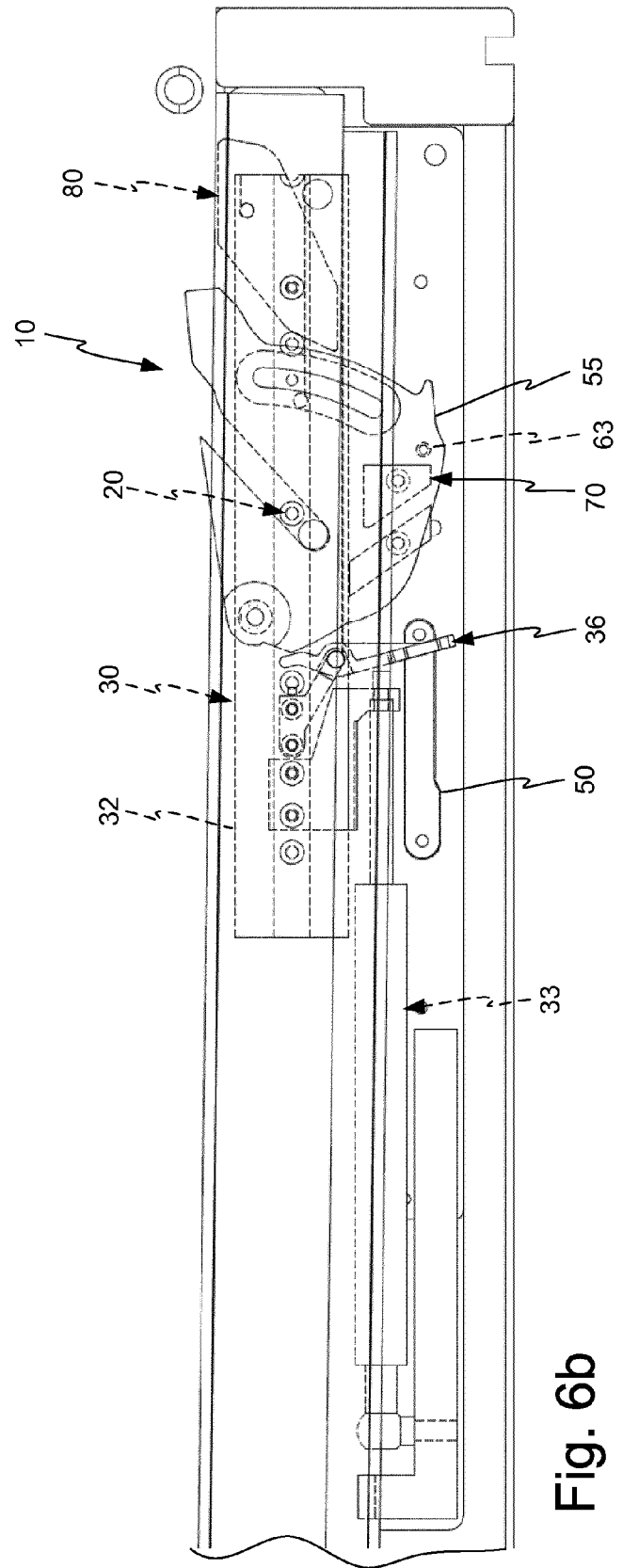


Fig. 6b

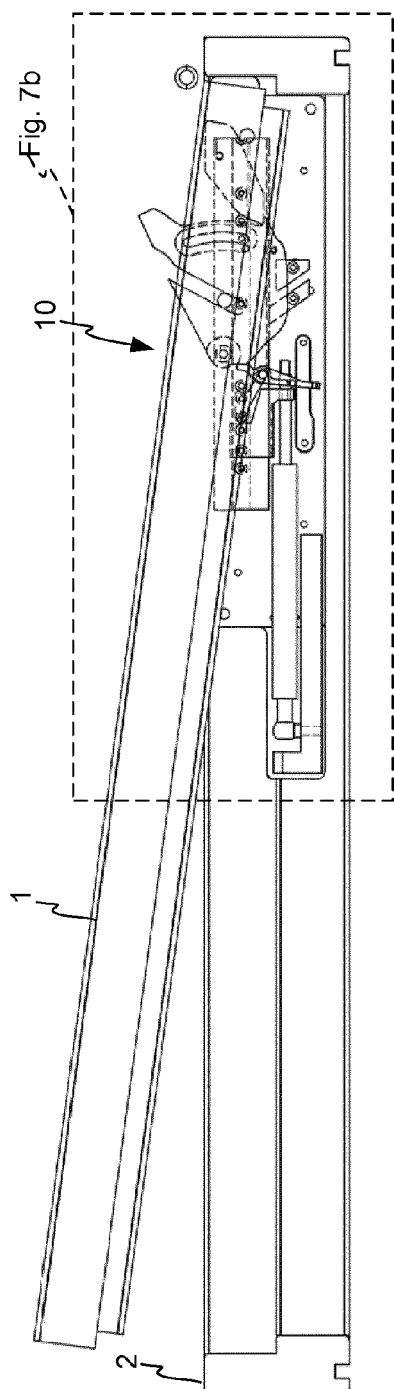


Fig. 7a

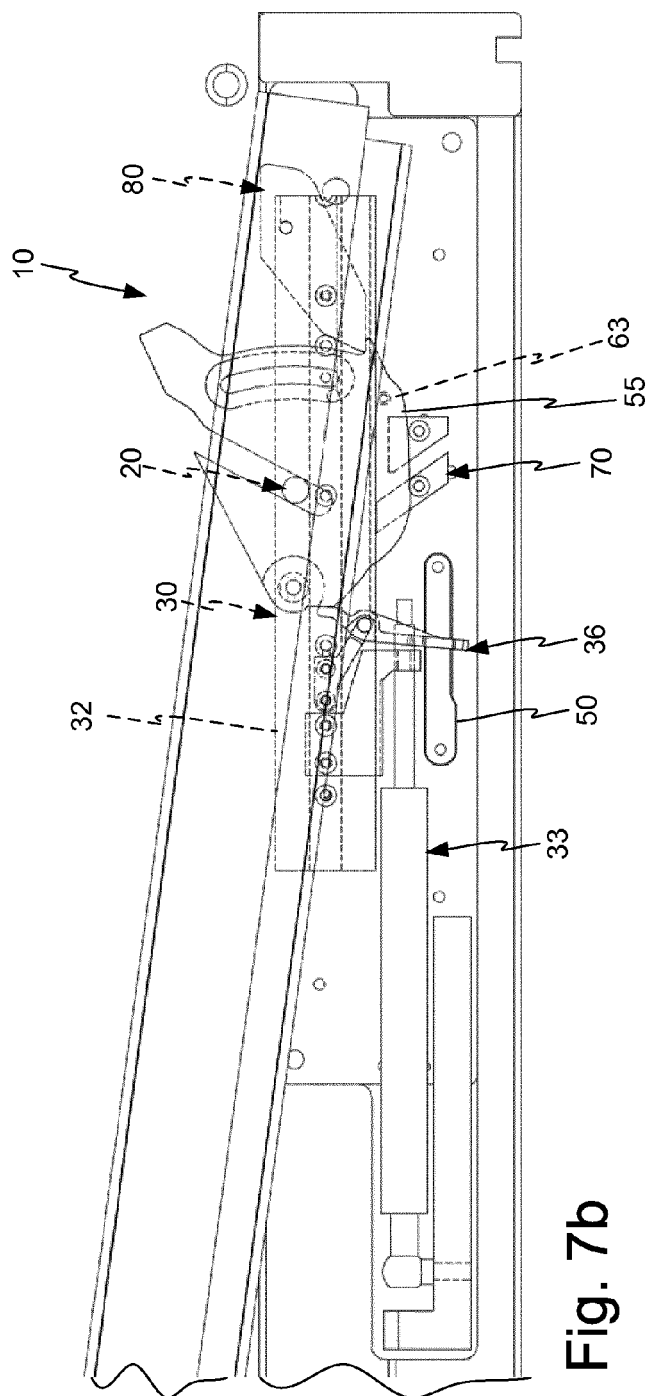


Fig. 7b

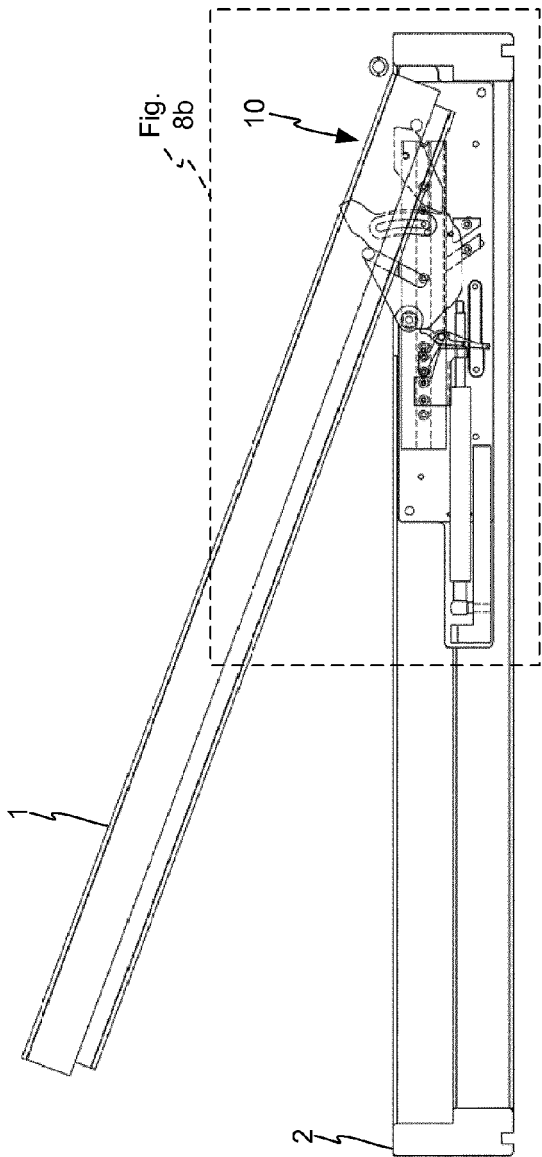


Fig. 8a

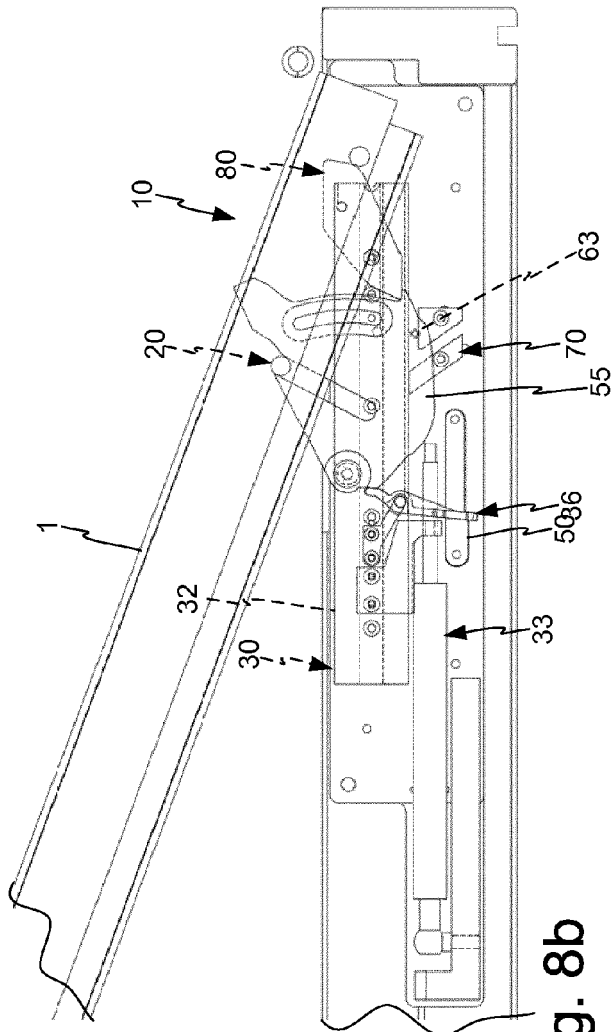
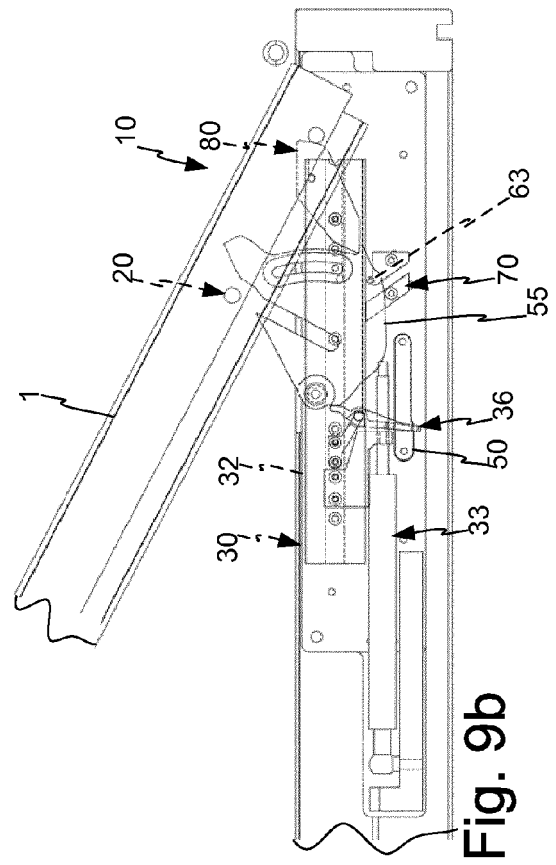
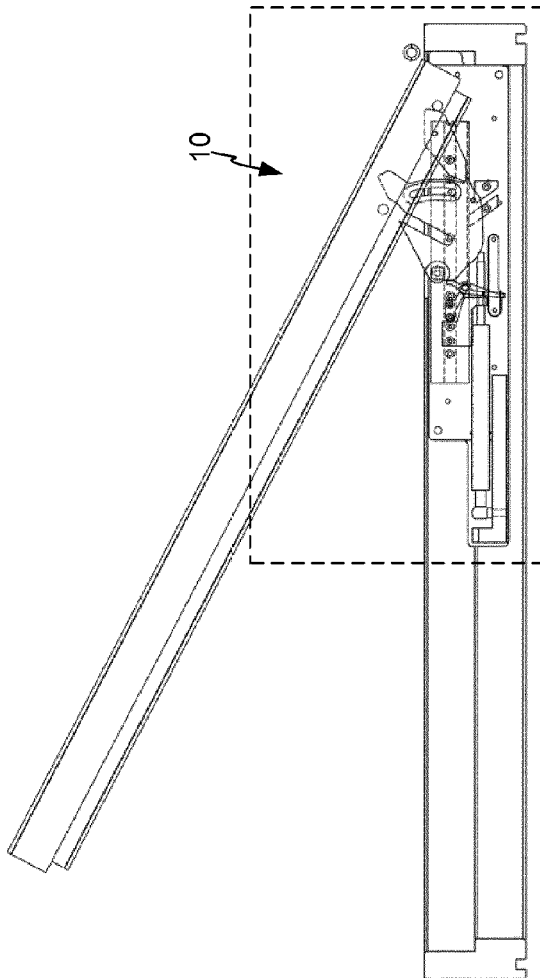


Fig. 8b



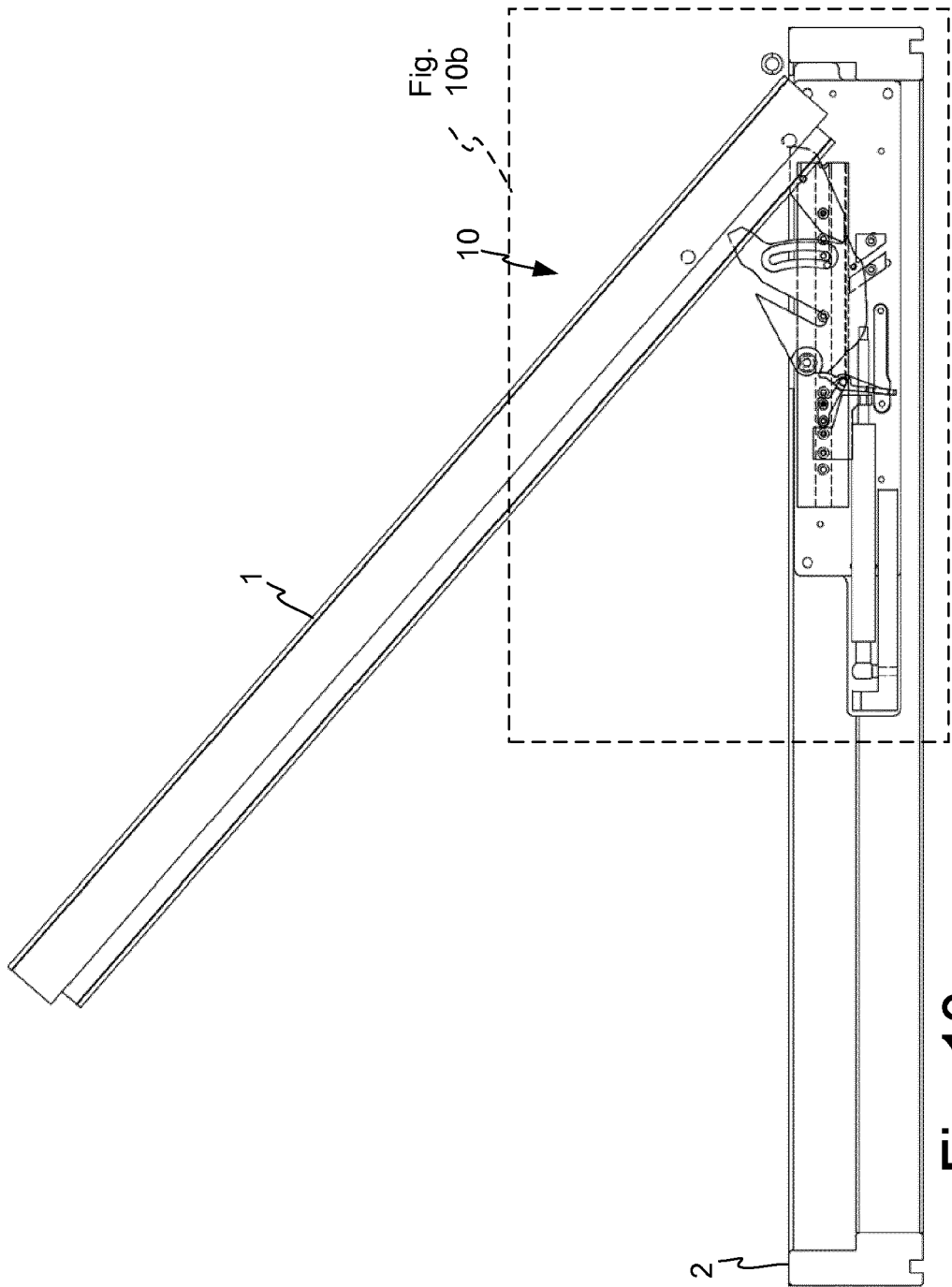


Fig. 10a

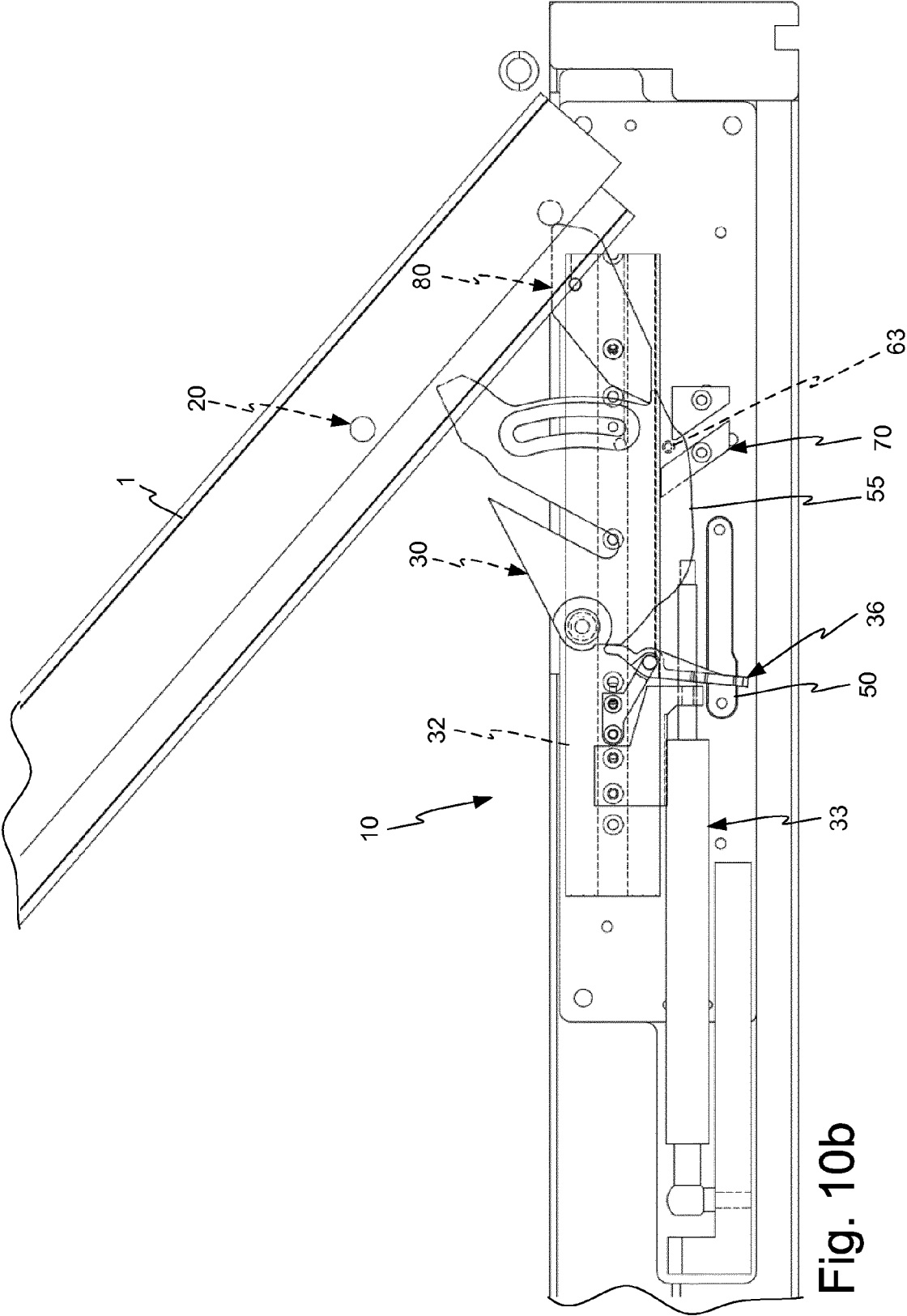


Fig. 10b

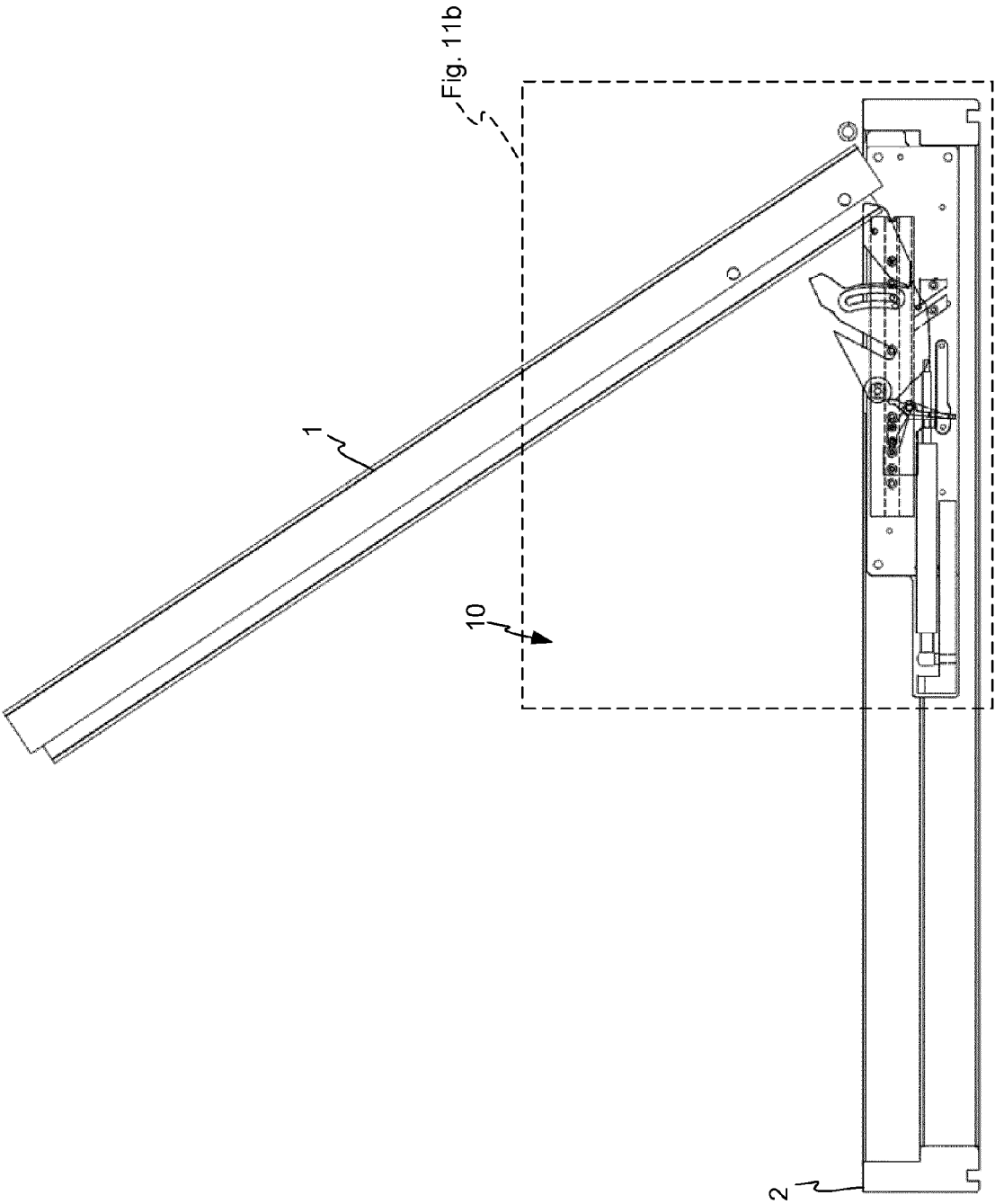


Fig. 11a

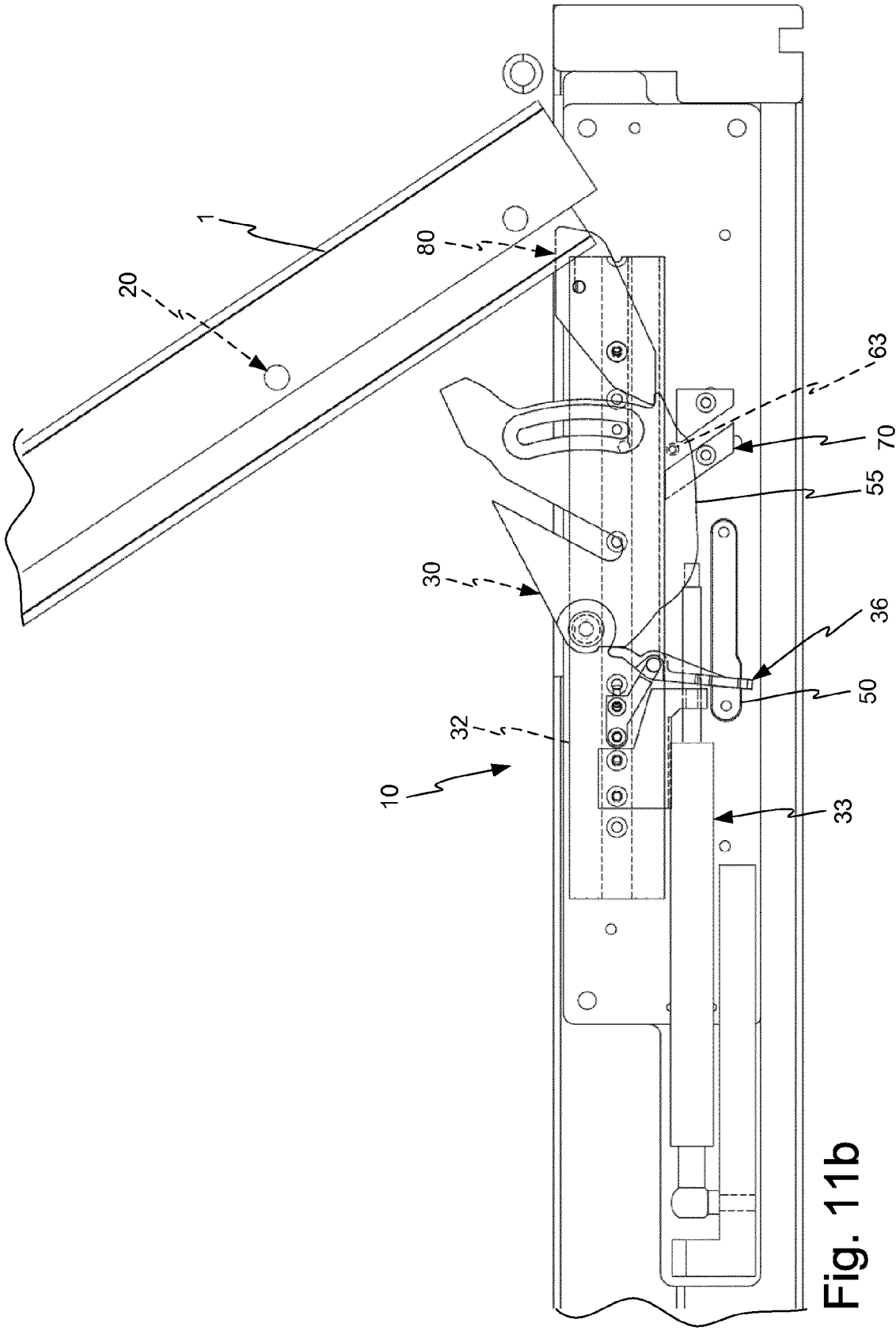
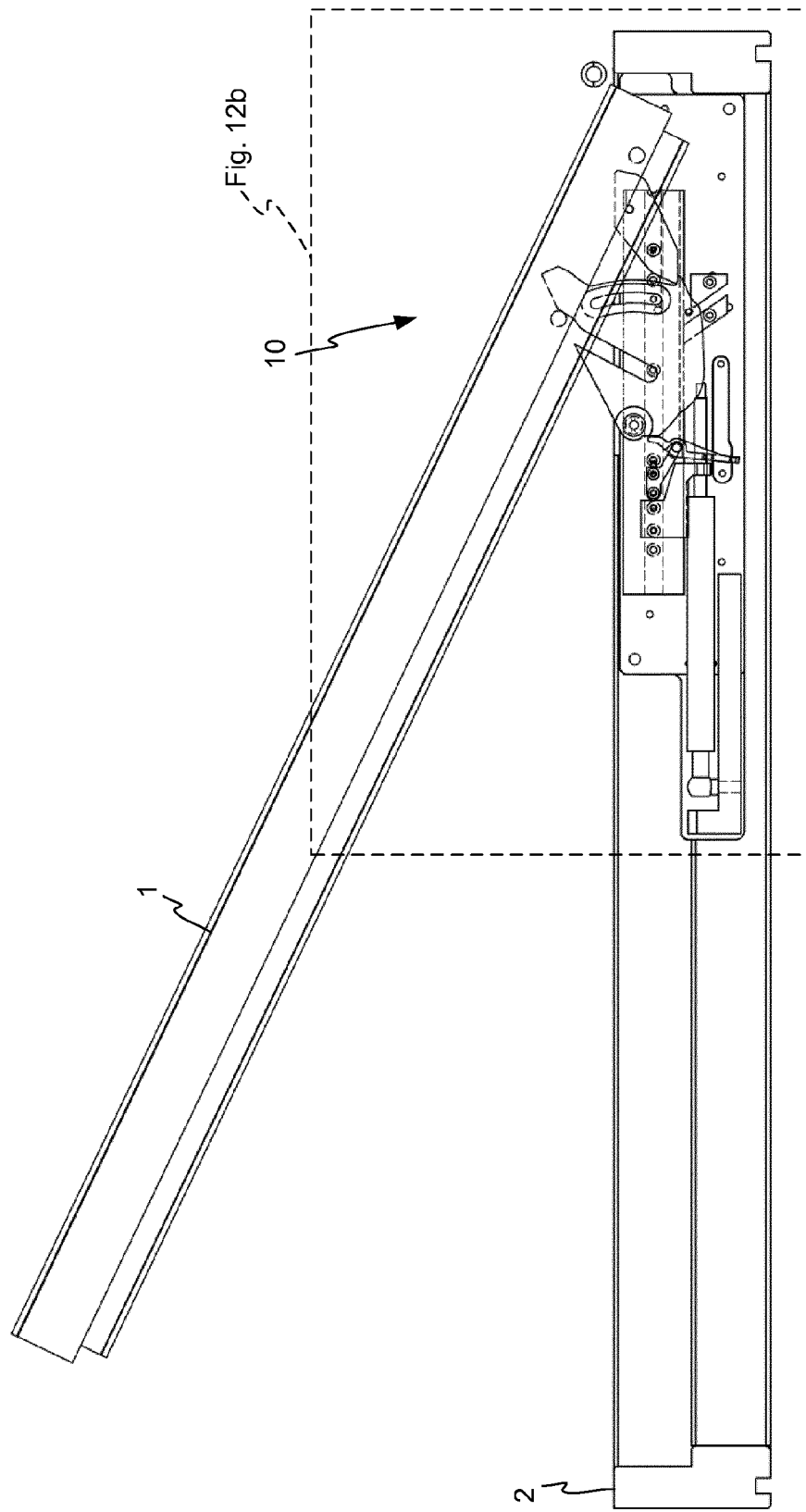


Fig. 11b



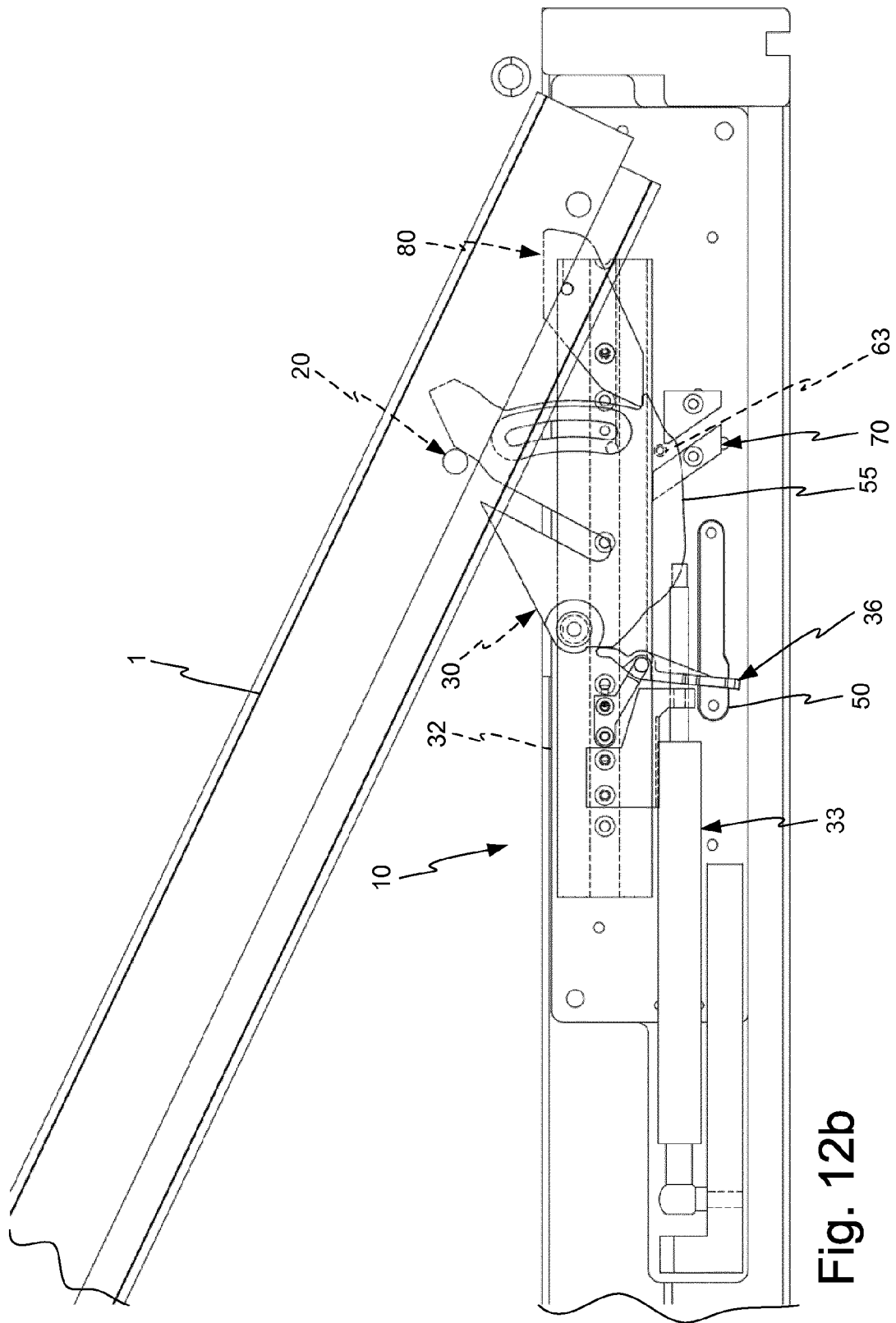
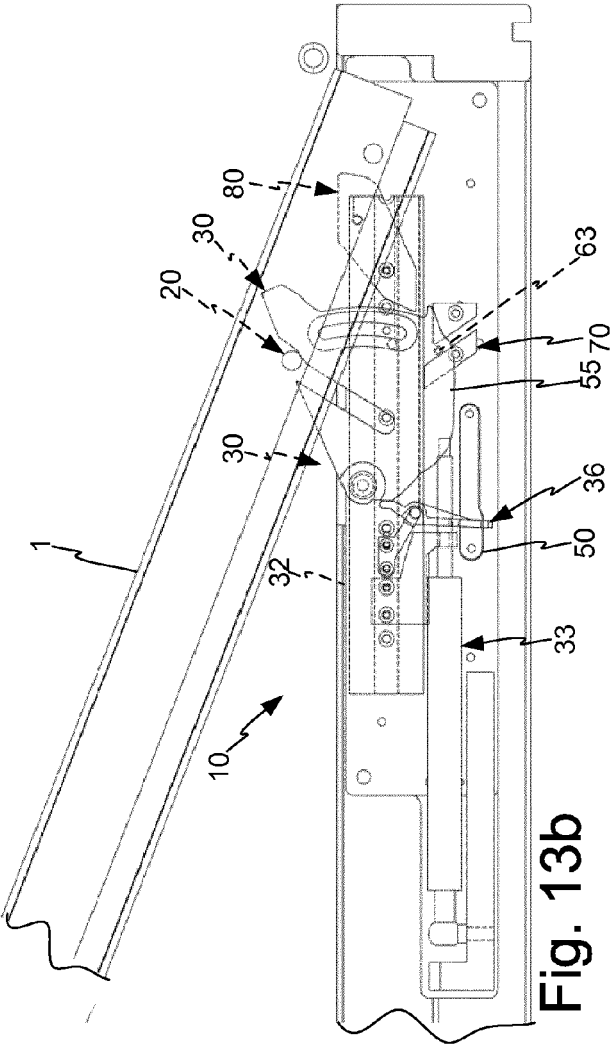
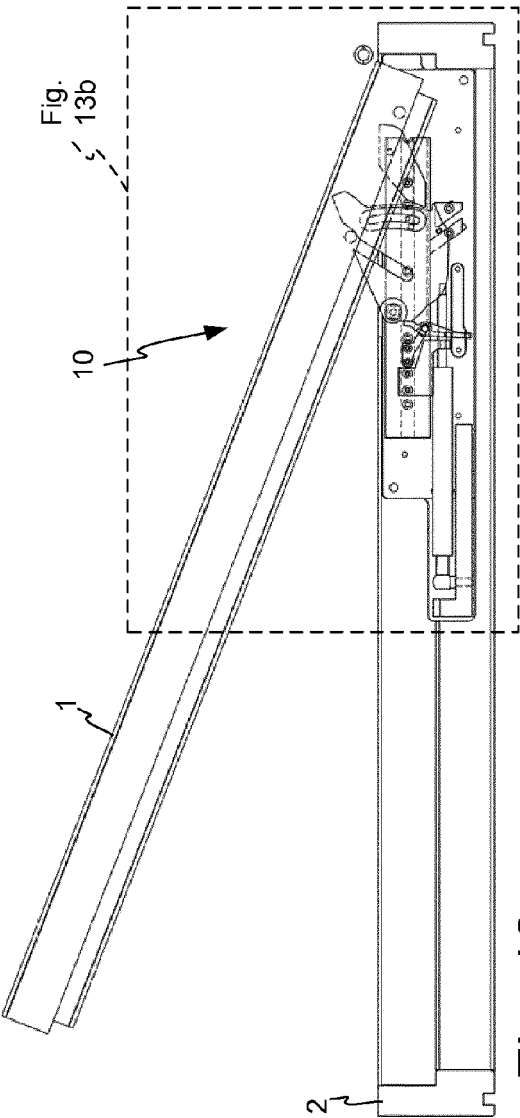
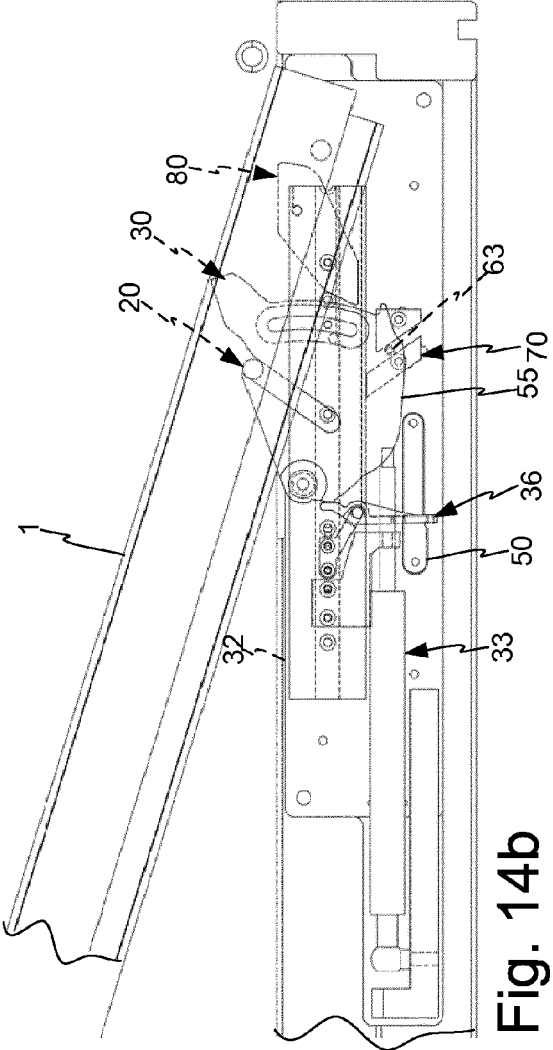
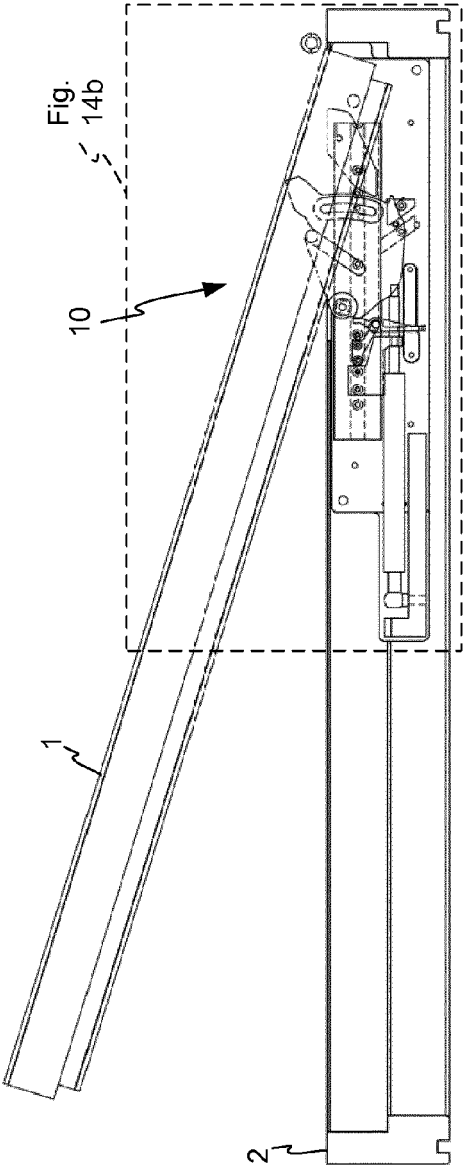


Fig. 12b





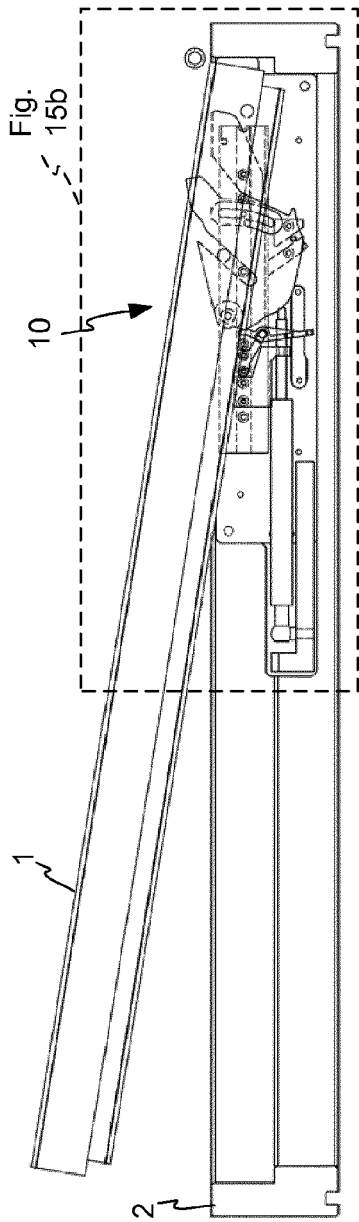


Fig. 15a

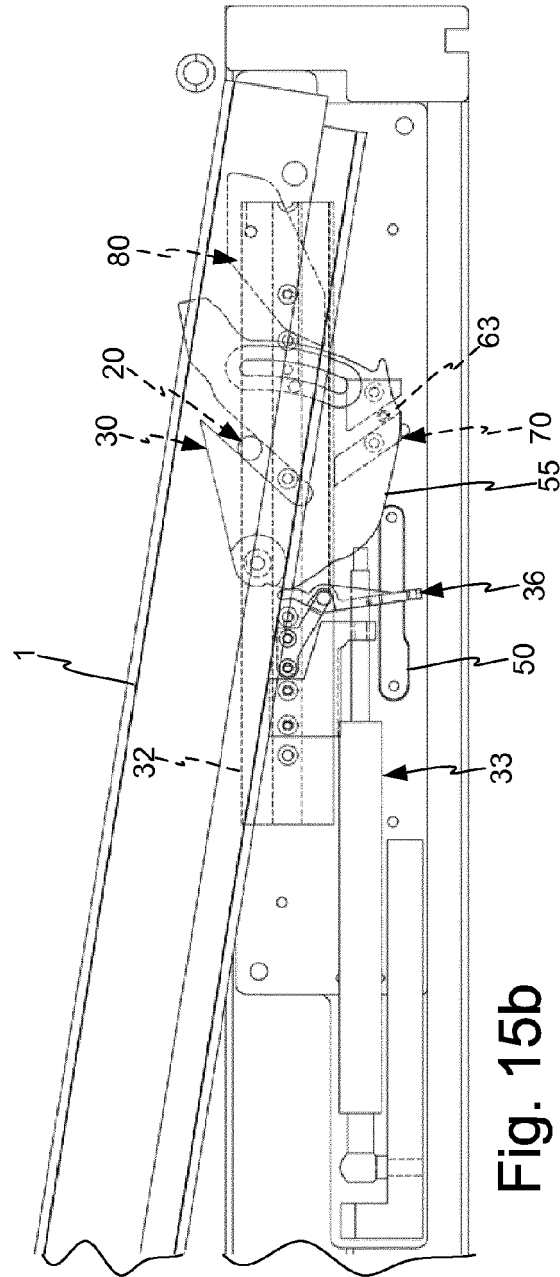
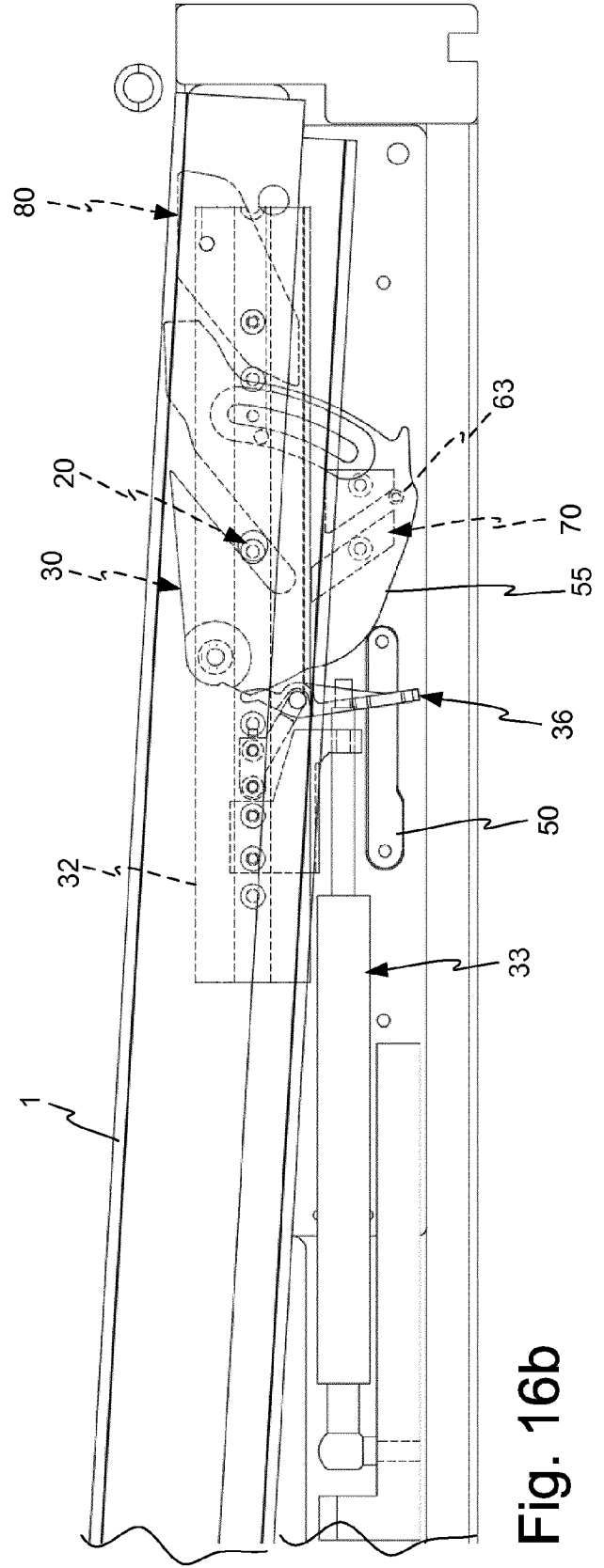
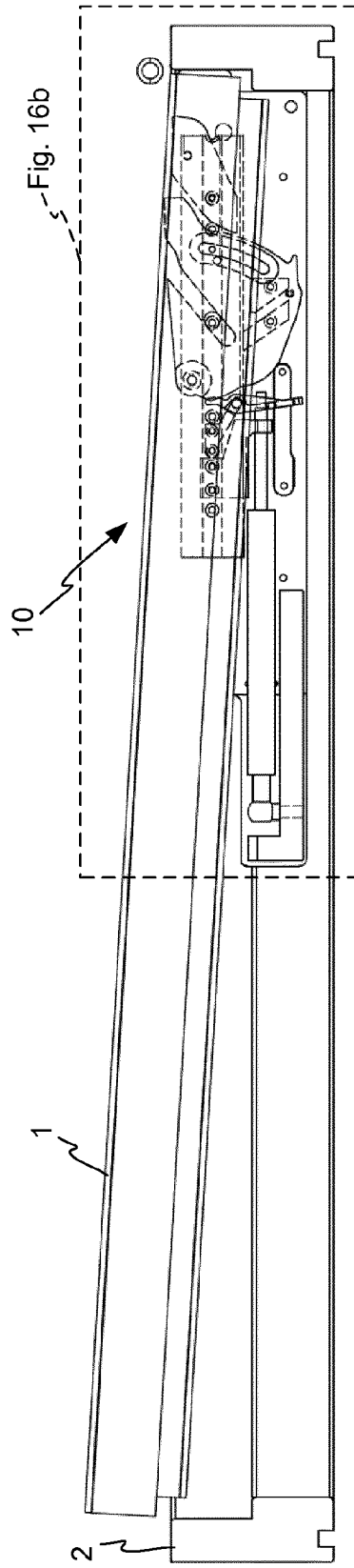


Fig. 15b



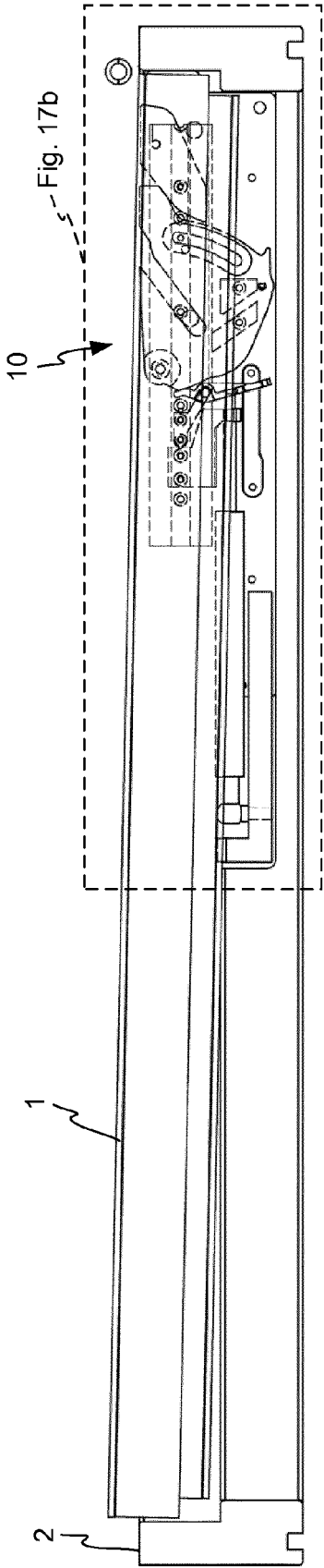


Fig. 17a

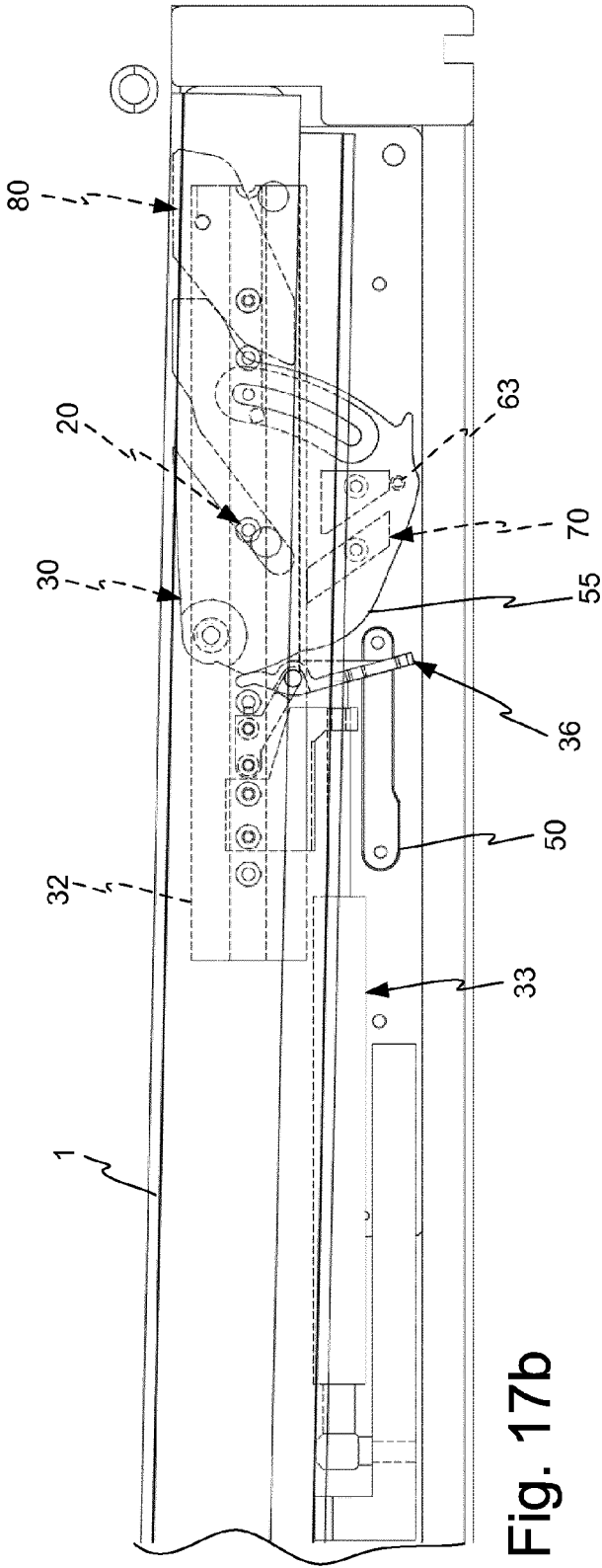


Fig. 17b

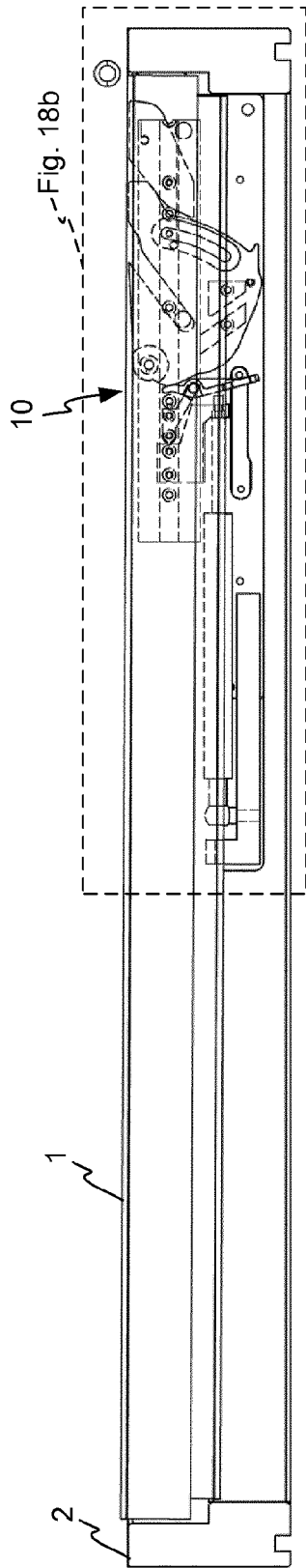


Fig. 18a

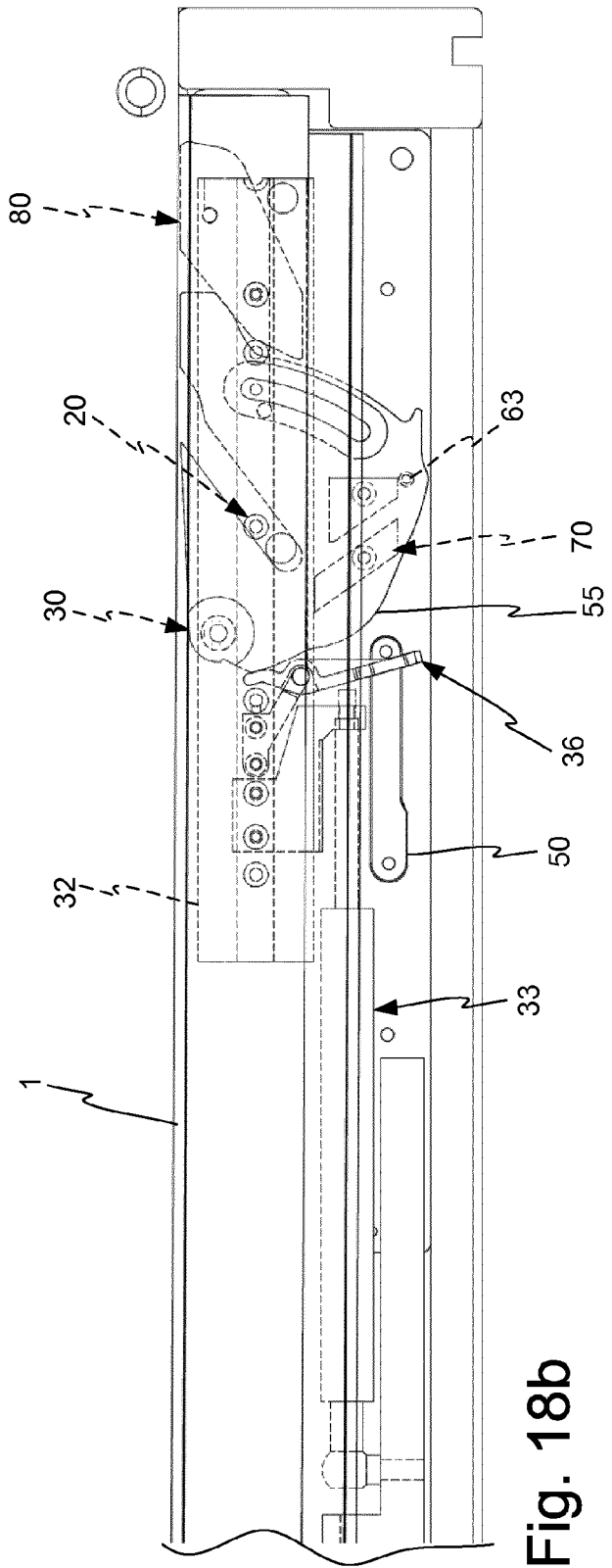
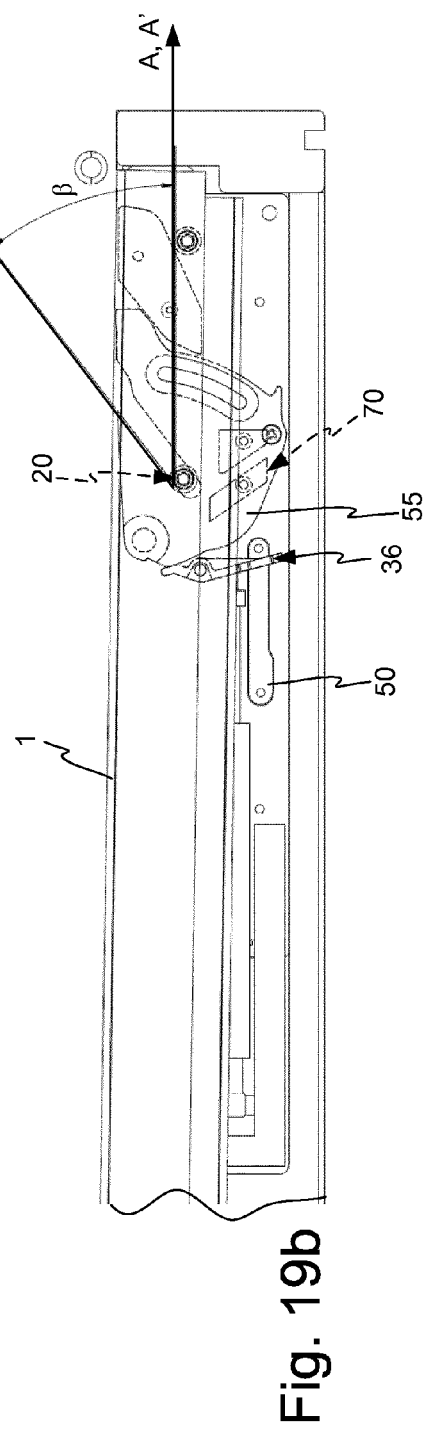
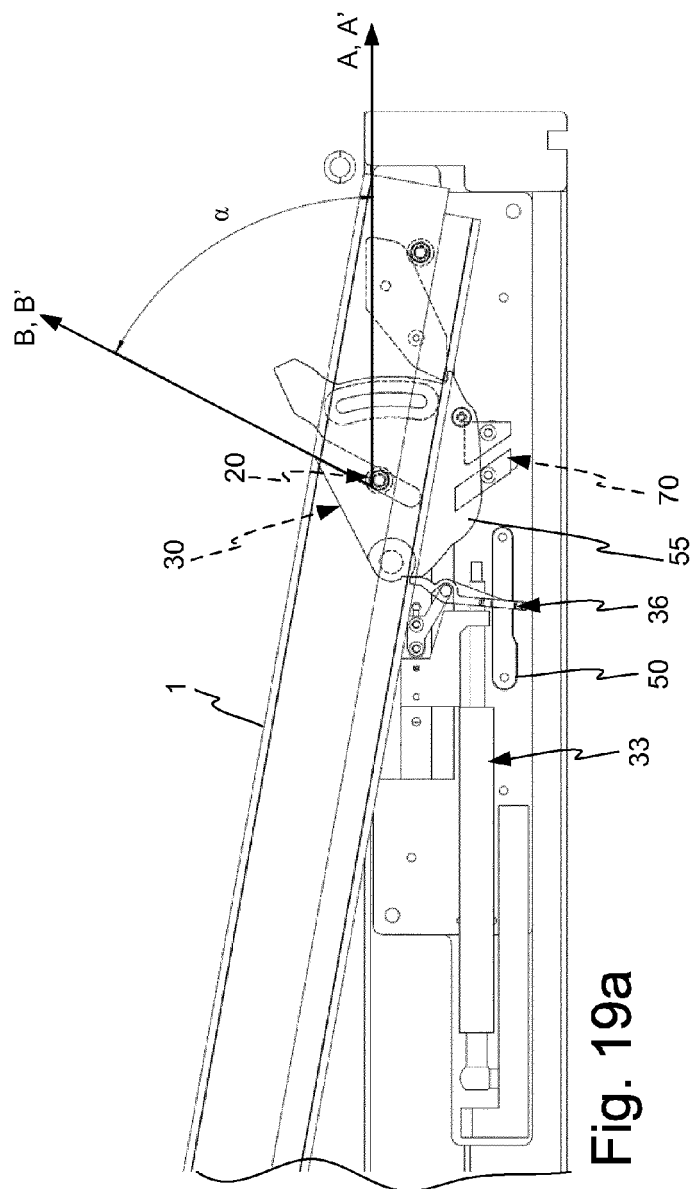
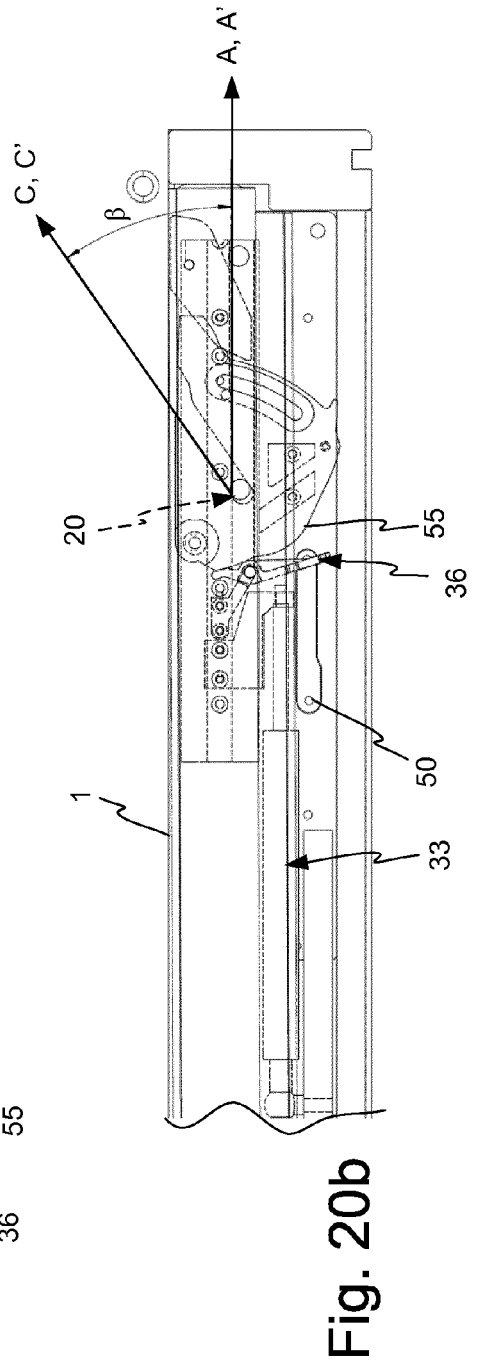
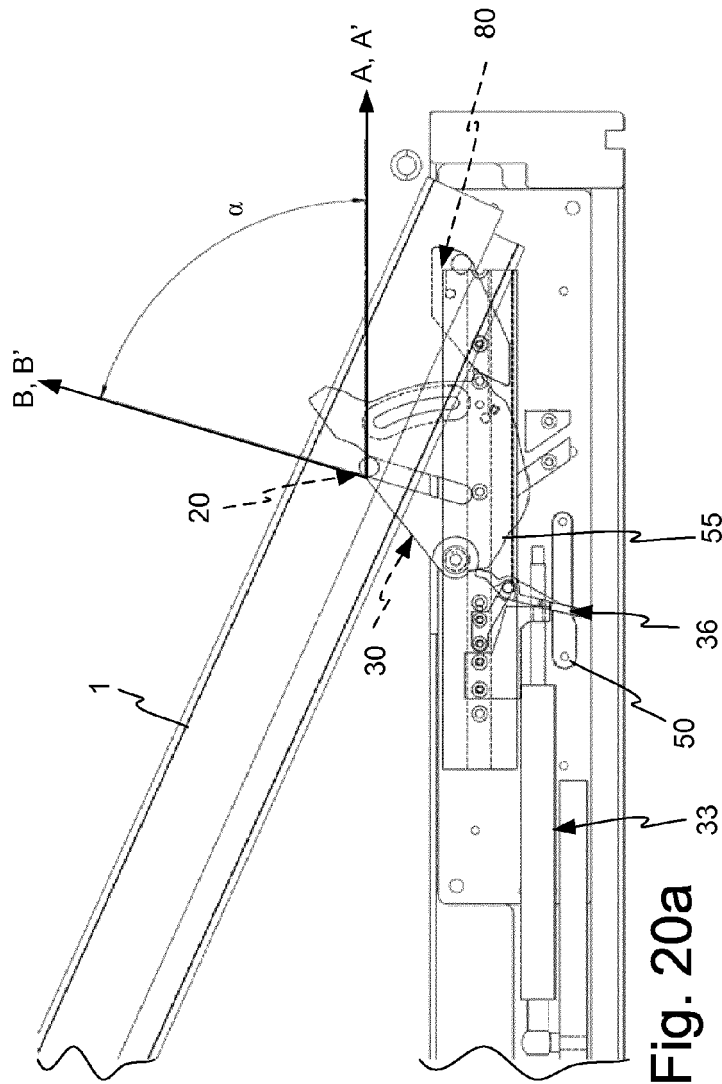


Fig. 18b





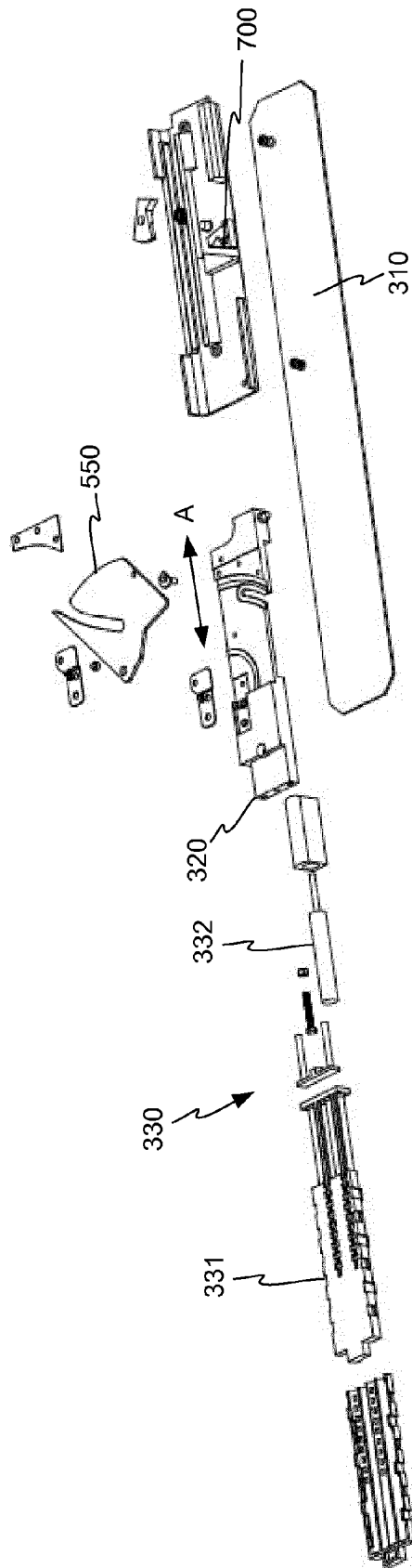


Fig. 21

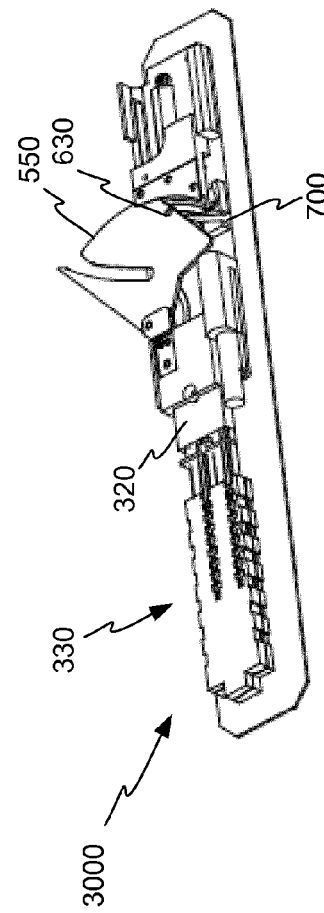


Fig. 22

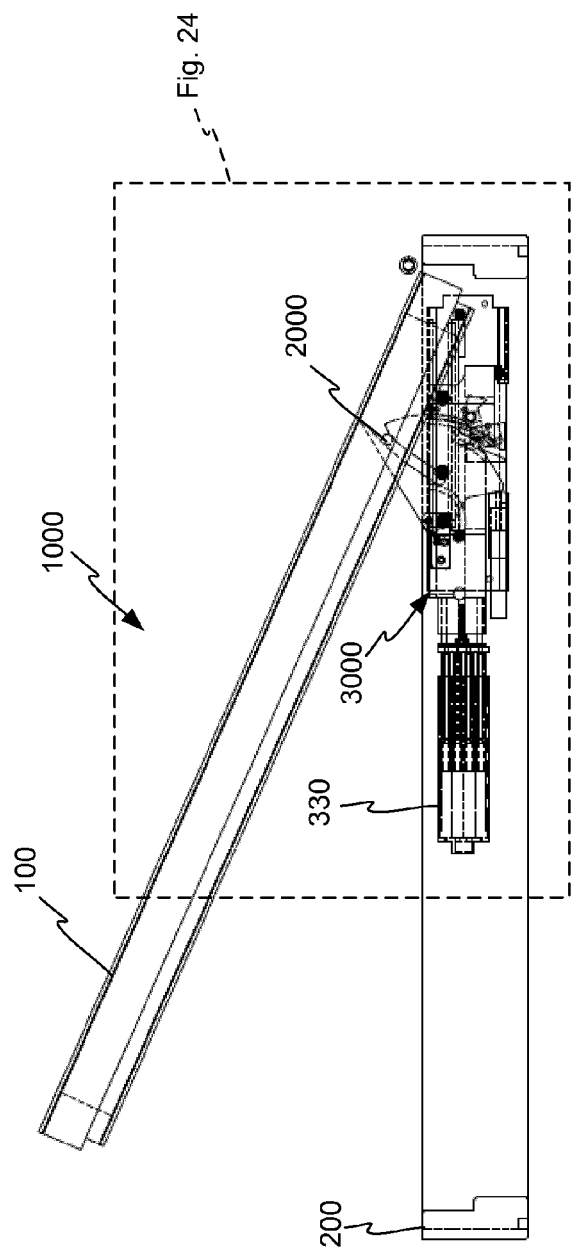


Fig. 23a

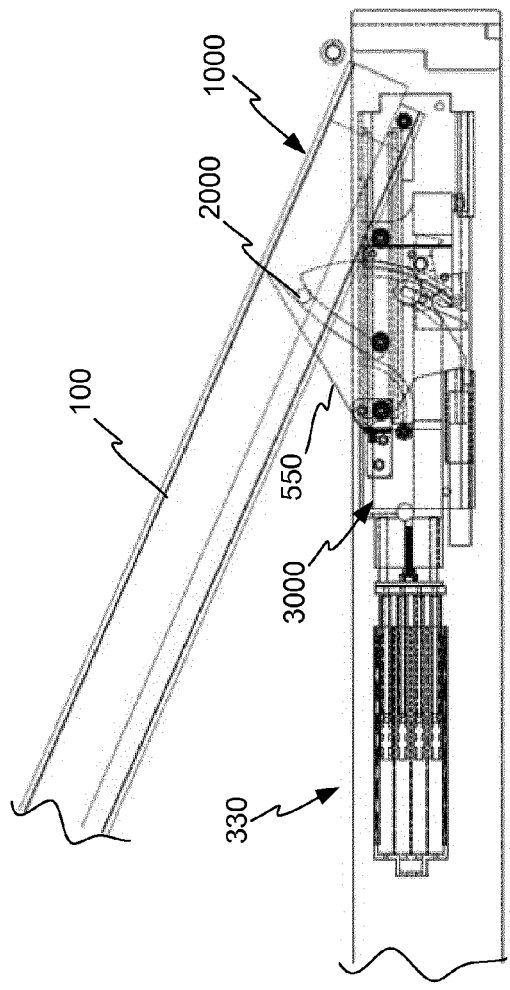


Fig. 23b

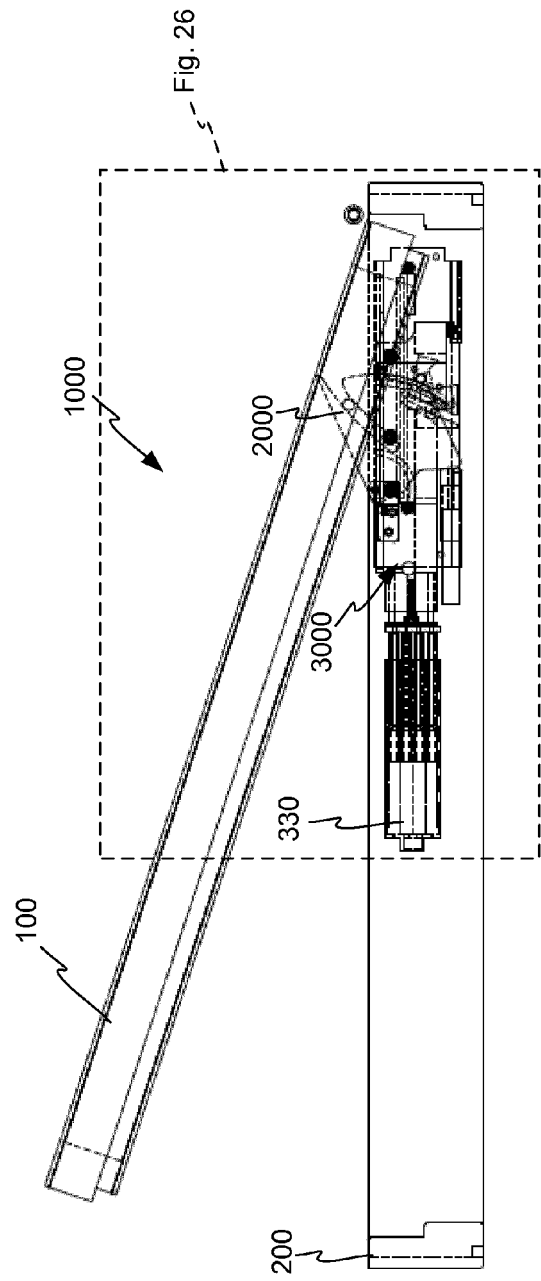


Fig. 24a

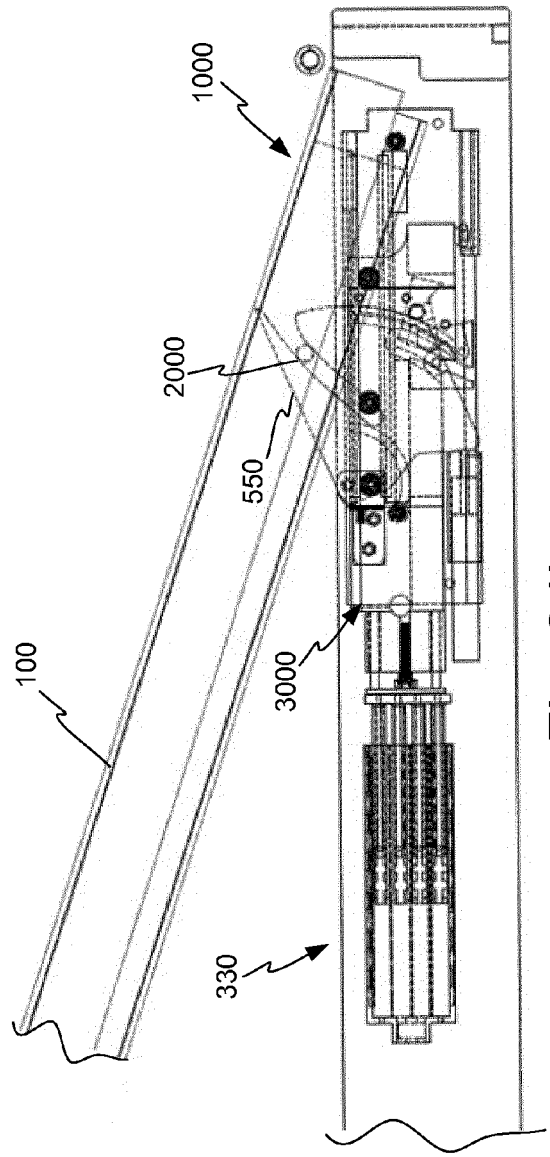


Fig. 24b

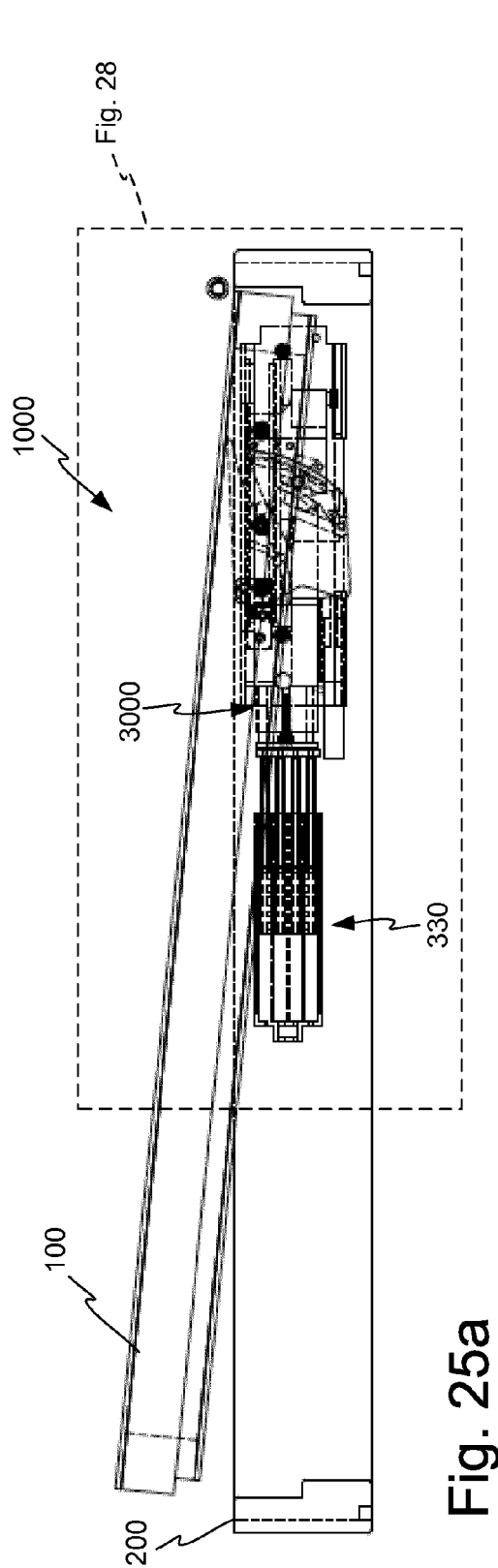


Fig. 25a

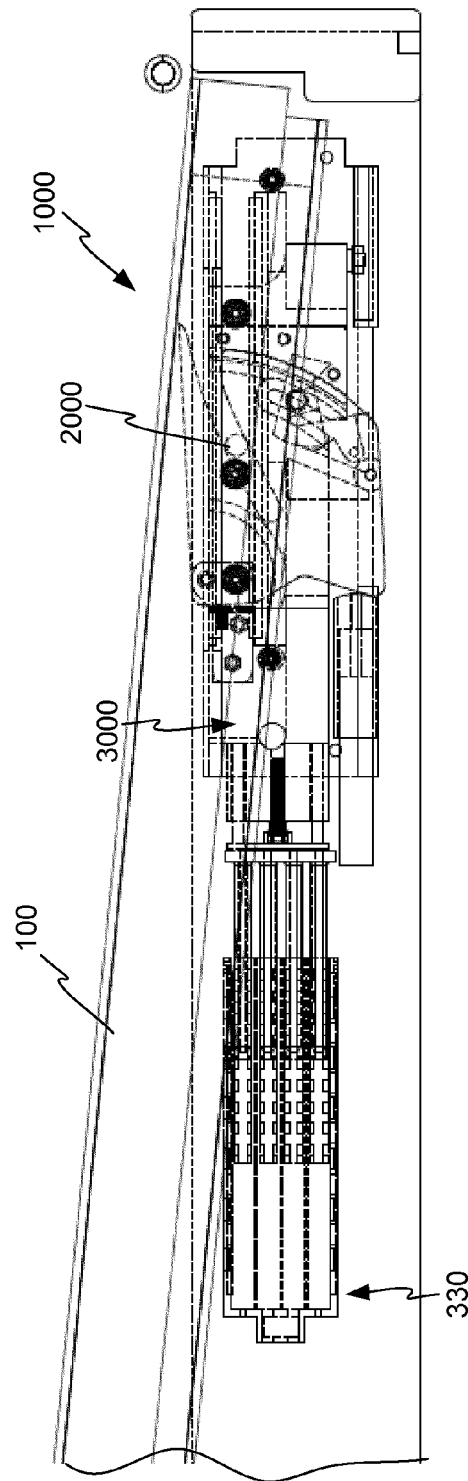


Fig. 25b

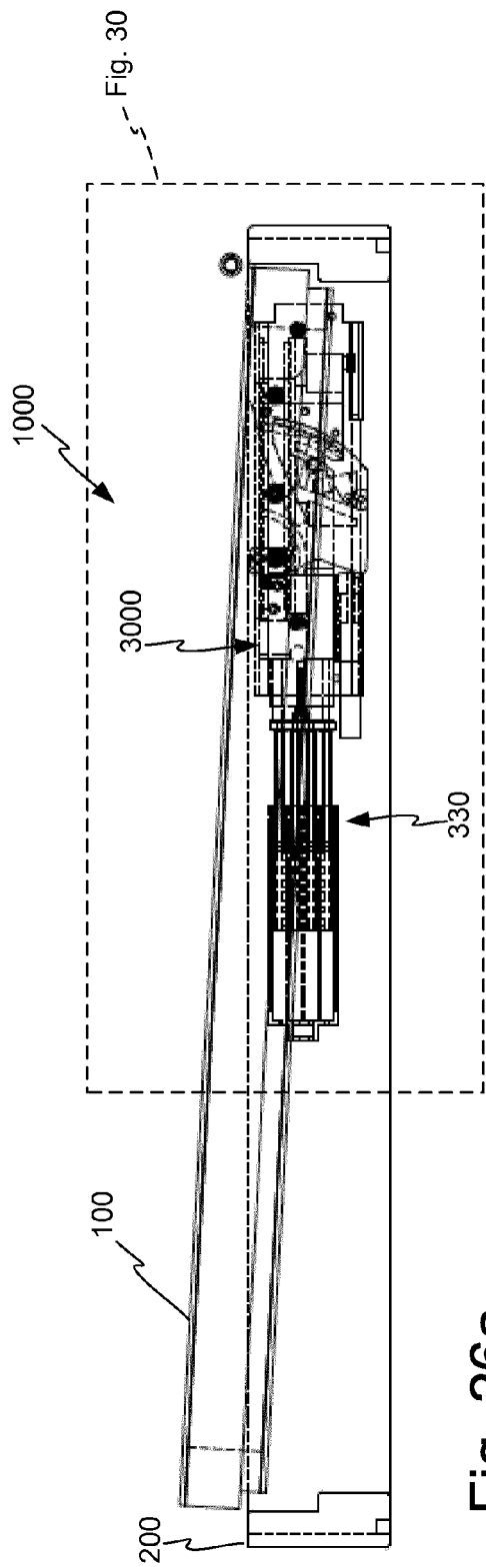


Fig. 26a

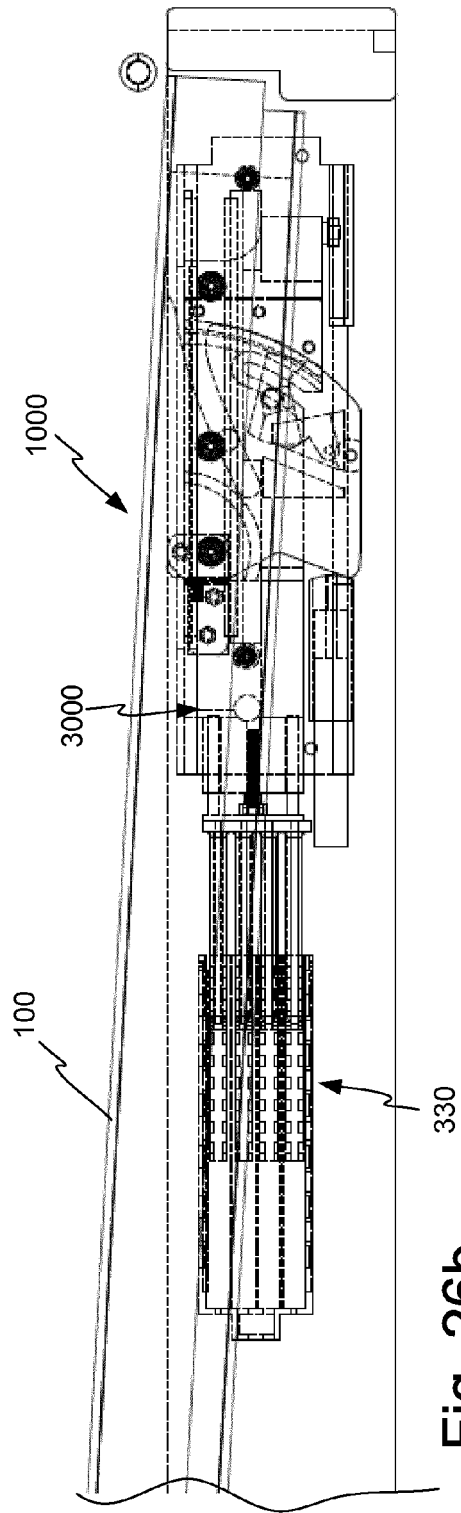
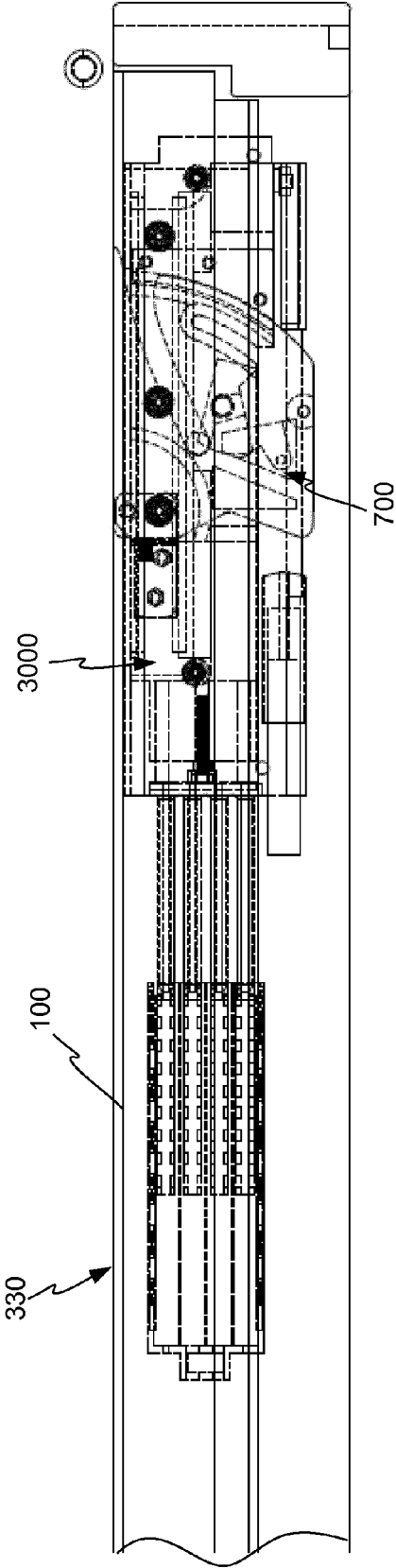
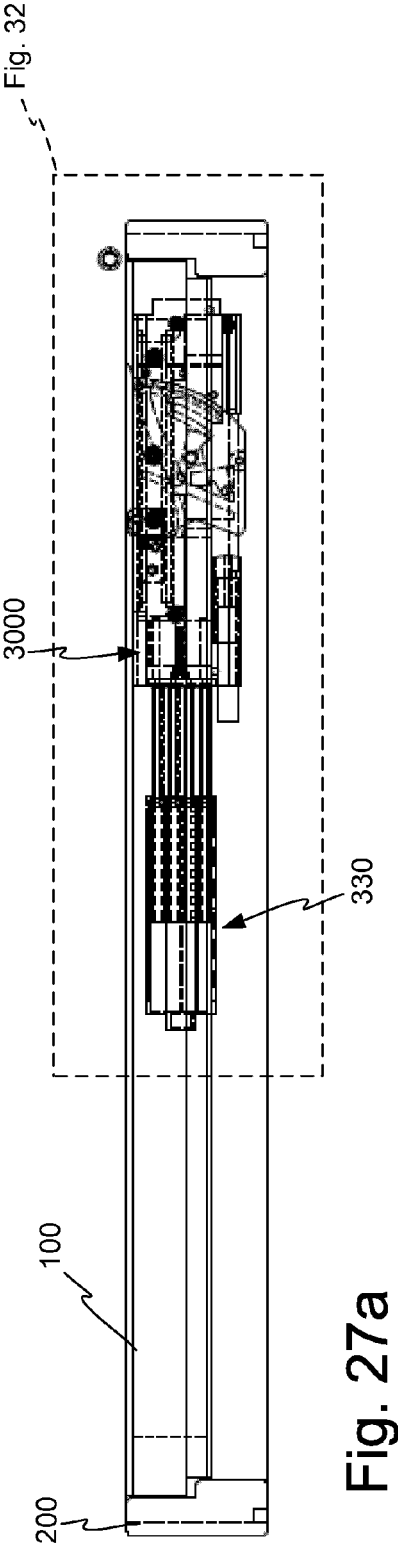


Fig. 26b





EUROPEAN SEARCH REPORT

Application Number
EP 15 17 6405

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2006/012187 A1 (ADACHI TAKEFUMI [JP] ET AL) 19 January 2006 (2006-01-19) * paragraph [0046] - paragraph [0059] * * figures 1,2,6-13 *	1-15	INV. E05F5/02
A,D	EP 2 341 207 A1 (NIFCO INC [JP]) 6 July 2011 (2011-07-06) * paragraph [0024] * * paragraph [0027] * * paragraph [0030] - paragraph [0033] * * figures 1-9 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 November 2015	Examiner Prieto, Daniel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

1
EPO FORM 1503 03.02 (P04C01)

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EP 15 17 6405

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The members are as contained in the European Patent Office EDP file on
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20-11-2015

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