



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.05.2018 Bulletin 2018/18

(51) Int Cl.:
E05D 15/58 (2006.01)

(21) Application number: **17198620.1**

(22) Date of filing: **26.10.2017**

(84) Designated Contracting States:
**AL 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 RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(72) Inventors:
• **Harrison, Peter James**
Wolverhampton, WV10 7HW (GB)
• **Fletcher, Peter Hedley**
Wolverhampton, WV10 7HW (GB)
(74) Representative: **Gee, Steven William**
D.W. & S.W. GEE
1 South Lynn Gardens
London Road
Shipston on Stour, Warwickshire CV36 4ER (GB)

(30) Priority: **27.10.2016 GB 201618181**

(71) Applicant: **J. Banks & Co. Limited**
Featherstone, Wolverhampton WV10 7HW (GB)

(54) **SLIDE AND TURN DOOR ASSEMBLY, SUPPORT MECHANISM THEREFOR AND ACTUATING MECHANISM FOR SECURING THE SUPPORT MECHANISM**

(57) The invention relates to a slide and turn door assembly, to a support mechanism therefor, and to an actuating mechanism for securing the support mechanism. The slide and turn door assembly fills an opening (4) having a top edge (5) and a bottom edge (6), and has a first door panel (1) mounted for hinged movement. A second door panel (2) is mounted for sliding movement and for turning movement relative to the top and bottom edges. The second door panel (2) has a captive edge (11) and a free edge (13), the captive edge being mounted to the top edge (5) of the opening (4) by a support

mechanism. The second door panel (2) is movable along the top and bottom edges to an opening position at which the free edge (13) can move away from the top and bottom edges. The support mechanism has a lock member (60) which is movable in a locking direction between an unlocking position and a locking position, the lock member in its locking position securing the support mechanism in the opening position. The locking direction is substantially parallel to the captive edge (13) of the second door panel (2).

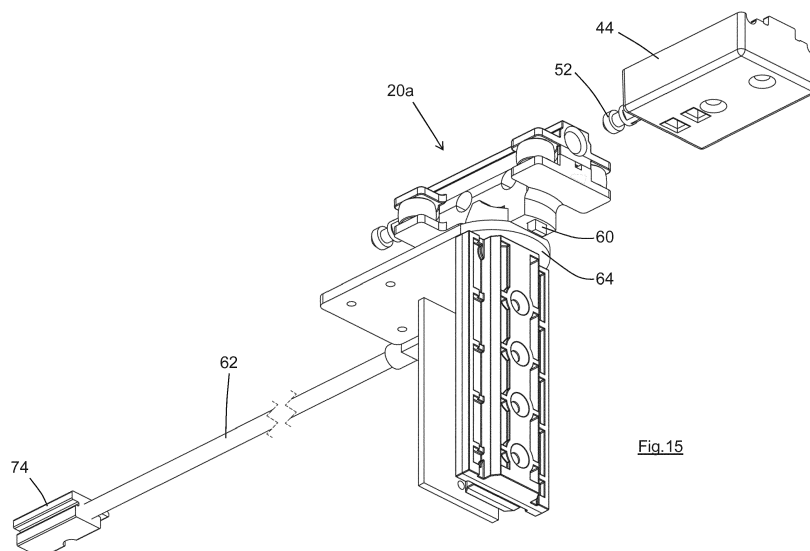


Fig. 15

Description

FIELD OF THE INVENTION

[0001] The invention relates to a slide and turn door assembly, to a support mechanism therefor, and to an actuating mechanism for securing the support mechanism.

BACKGROUND TO THE INVENTION

[0002] Slide and turn door assemblies (sometimes referred to simply as "slide and turn doors" or "slide and swing doors") are a particular form of opening panel and an example is shown in Figs.1-6.

[0003] The slide and turn door assembly of Figs. 1-6 comprises a set of door panels 1, 2 and 3 which are designed for location in an opening 4 in the wall of a building (not shown). In Figs.1-6 there are three door panels 1,2,3, though it will be understood that a slide and turn door assembly can comprise two or more door panels, the number and size of the door panels being chosen to fit the opening.

[0004] As shown in Figs. 1-6, typically the door panels will be of a height to span the distance between the top edge 5 and the bottom edge 6 of the opening 4, so that the set of door panels comprises the required number of panels arranged side by side to fill the opening 4.

[0005] In addition to the top edge 5 and the bottom edge 6, the rectangular opening 4 is bordered by upright stiles 7 and 8.

[0006] The door panel 1 is mounted to the stile 7 by a number of hinges (not seen), so that it can swing or pivot between its closed position as shown in Fig.1 and its open position of Fig.2. The opening and closing movement of the door panel 1 does not require any movement of the door panels 2 and 3 and if entry or egress is required through the opening 4 it is possible to open and close only the door panel 1. The door panel 1 is often referred to as the "traffic door" as it is often used alone for entry and egress.

[0007] Though not shown in the drawings, the door panel 1 will carry an operating handle and locking componentry so that it may be retained and locked in the closed position of Fig.1. The locking componentry can engage the panel 2, and/or the top and/or bottom edges 5, 6, as desired. The locking componentry of the door panels 2 and 3 is similarly not shown in the drawings, but will be readily apparent to a person of skill in this art.

[0008] The door panels 1,2,3 each comprise a substantially rigid frame 9 surrounding a glazing panel 10.

[0009] The mounting of the door panels 2 and 3 differ from that of the door panel 1. Specifically, each of the door panels 2, 3 is mounted to the top and bottom edges 5,6 by respective support mechanisms as explained in detail below. The door panels 1-3 are not permanently connected to each other, but they are arranged to be sufficiently close together in the closed position of Fig.1

so that suitable seals (not shown) which lie between neighbouring door panels can provide the desired weatherproofing.

[0010] As above explained, the slide and turn door assembly may be used with only the door panel 1 being opened and closed. Alternatively, the door panel 2, and if desired also the door panel 3, may also be opened, as shown in Figs. 3-6.

[0011] After the first door panel 1 has been swung open to the position of Fig.2, the second door panel 2 may be moved translationally (slid) along the top and bottom edges 5,6 to its swinging or opening position as shown in Fig.3. Once in its opening position, the door panel 2 may be swung or pivoted to its open position as shown in Fig.4.

[0012] If it is also desired to open the door panel 3, that panel may subsequently be slid along the top and bottom edges 5,6 to its swinging or opening position as shown in Fig.5 and then swung or pivoted to its open position as shown in Fig.6.

[0013] Slide and turn door assemblies have the particular advantage that they maximise the size of the opening which is available for ventilation or access. A set of patio doors, for example, will typically comprise one fixed panel and one sliding panel. Since only the sliding panel is movable, a fully-opened set of patio doors can provide slightly less than half of the opening for ventilation or access. A slide and turn door assembly on the other hand can provide almost all of the opening 4 for ventilation or access as seen in Fig.6.

[0014] Accordingly, slide and turn doors are particularly beneficial for buildings containing private swimming pools for example, and also for restaurants having indoor and outdoor areas which can be separated when desired by closing the doors, or combined into substantially a single area when the doors are opened.

[0015] For ease of understanding, the edges 11 and 12 of the respective door panels 2 and 3 (which edges are retained in alignment with the top edge 5 and the bottom edge 6) are referred to herein as the "captive" edges of these door panels, and the edges 13 and 14 of the door panels (which edges can swing away from the top edge 5 and the bottom edge 6) are referred to as the "free" edges of the door panels 2,3 respectively.

[0016] The doors panels 2 and 3 are typically (permanently) mounted to the top and bottom edges 5, 6 by a support mechanism in the form of a wheeled carriage or bogie adjacent to the captive edges 11, 12. The carriages carry a respective pivot post or the like upon which the door panel can swing. The door panels 2 and 3 are also (releasably) mounted to the top and bottom edges 5, 6 adjacent to their free edges 13, 14, by way of wheeled carriages, rollers and/or skids.

[0017] The door panels 1-3 are typically double-glazed, and the weight of the door panels is therefore substantial. The componentry which permits the door panels 2 and 3 to slide along the top and bottom edges 5, 6 and then swing to the open position, must therefore be robust if the slide and turn door assembly is to undergo

many cycles of operation without failure. It is also critical that the door panels 2 and 3 are correctly moved to their opening position before then can swing, and their captive edge must be held securely in that position whilst they are open. It is therefore necessary that the captive edge 12 of the door panel 3 does not move to the left as drawn in Fig.6 before the door panel 3 is swung back to its closed position, as otherwise the momentum of the closing door panel 3 could cause significant damage to components of the door assembly (and similarly for the captive edge 11 of the door panel 2 shown in Fig.4).

[0018] In addition, it is necessary that the top end of the captive edge 12 of the door panel 3 remain in the opening position of Figs. 5 and 6 as the door panel 3 is swung open. At the start of its swinging movement the door panel 3 is closely aligned with the top and bottom edges 5, 6, but moves out of alignment as the door panel 3 is turned. In particular, the free edge 14 of the door panel 3 soon moves sufficiently far from the top and bottom edges 5, 6 so that it is no longer supported and the free edge 14 and will tend to drop under the weight of the door panel 3. If the top end of the captive edge 12 is not securely held in the opening position, it can slide along the top edge 5 (to the left as drawn in Figs. 5 and 6) allowing the free edge to drop, which can be alarming and dangerous for the user. The top end of the captive edge 11 of the door panel 2 must similarly be securely held in the opening position of Figs. 3 and 4.

[0019] The manufacturers of most slide and turn door assemblies seek to provide some means of securing the captive edge of the door panel in its opening position, particularly at the top end of the captive edge. The reliability and effectiveness of the securing means will often limit the size (and therefore the weight) of the door panels which can be used, i.e. the general desire to increase the width of the door panels so as to maximise the glazed area is countered by the requirement for the captive edges to be secured in their opening positions, which requirement becomes harder to achieve reliably as the weight of the door panels increase.

[0020] It would be possible to mount a user-actuatable locking mechanism upon the door panels 2 and 3 adjacent to the top edge 5, such as a slidable bolt or the like. Such an arrangement is not preferred, however, as it detracts from the uncluttered appearance of the slide and turn door assembly. Accordingly, it is generally desired to provide a means to secure the locking edge upon the support mechanism for the door panels which can be largely or totally obscured from view.

[0021] One known slide and turn door assembly is described in US 2011/009461. In this document a set of magnets is provided to secure the door panels in their chosen positions, and in particular to hold the captive edges in their opening positions. The free edges of the door panels are supported by respective rollers which run along a track at the bottom edge; when a door panel is in its opening position the magnets also act to lift the roller so that the free edge is released from the track and

the door panel can be swung open.

[0022] Another known slide and turn door assembly is described in WO 2009/141494. In this disclosure the weight of the door panels is suspended from a guide rail at the top edge of the opening. The top end of the captive edge of a door panel is mounted to a support mechanism which engages the guide rail. The guide rail has primary support surfaces and the support mechanism has a first set of rollers lying upon the primary support surfaces. A second set of rollers is located at the top end of the free edge of the door panel, the second set of rollers lying upon secondary support surfaces of the guide rail. There is a cut-out in the secondary support surfaces allowing the second set of rollers to move away from the guide rail when the door panel is located in its opening position. The support mechanism includes a substantially hemispherical locking element at the top end of the captive edge, which locking element is aligned with a substantially spherical recess in the secondary support surfaces. It is arranged that the hemispherical locking element rotates with the door panel and as the door panel is swung open the locking element rotates within the recess, preventing movement of the support mechanism (and therefore the captive edge) along the guide rail.

[0023] Another slide and turn door assembly (of the present Applicant) is disclosed in EP 3 075 938. In this arrangement, the support mechanism for a captive edge comprises a wheeled carriage and the carriages of neighbouring door panels can be secured together by a cooperating resilient clip and a boss. Specifically, the boss of the first carriage can locate into a fixed resilient clip. The first carriage also has a resilient clip and the boss of the second carriage can locate into the resilient clip of the first carriage, and so on. The boss is acircular and rotates with its door panel; during relative sliding movement the boss can enter and leave the resilient clip without impairment, but as the door panel is swung open the boss rotates within the resilient clip and in the rotated position prevents movement of the carriage (and therefore the captive edge).

[0024] The known apparatus for locking the captive edges in their opening positions are not always successful or reliable in practice. It is recognised that the door panel is most likely to drop under its own weight as it clears the bottom edge and becomes totally supported at its captive edge; in that position the door panel has swung away from the top and bottom edges of the assembly by only a few degrees and there is a great tendency for the top end of the captive edge to slide along the top edge as the door panel drops. Providing a reliable support mechanism which permits sliding movement of the captive edge when the door panel is aligned with the top and bottom edges and yet prevents sliding movement when the door panel has been swung only a few degrees is difficult to achieve in practice, and is not always achieved by the known prior art documents described above.

[0025] The slide and turn door panels described in WO

2011/135131 and DE 10 2010 037 604 seek to overcome this problem by utilising additional support channels projecting in the opening direction of the door panel. The additional support channels support the free edge of the door panel during the initial opening movement and therefore avoid the weight of the door panel being borne by the support mechanism of the captive edge until the door panel has swung through a much larger angle. The support channels are necessarily perpendicular to the top and bottom edges of the assembly and are unsightly, detracting significantly from the uncluttered appearance of the slide and turn door assembly, so that this apparent solution is not desired by most manufacturers. In any event, the additional support channels are of limited length and a reliable means must be provided to secure the captive edge when the free edge has cleared the additional support channel.

SUMMARY OF THE INVENTION

[0026] The inventors have sought to provide a slide and turn door assembly which seeks to avoid the above-stated problems. In particular, the inventors seek to provide a support mechanism for the captive edge of a slide and turn door panel which does not hinder the sliding of the door panel, but which has means to securely hold the captive edge of the door panel in the opening position when the door panel is swung open.

[0027] According to the first aspect of the invention there is provided a slide and turn door assembly for an opening having a top edge and a bottom edge, a first door panel mounted for hinged movement and a second door panel mounted for sliding movement along the top and bottom edges and for turning movement relative to the top and bottom edges, the second door panel having a top edge, a bottom edge, a captive edge and a free edge, the captive edge being mounted to the top edge of the opening by a support mechanism, the support mechanism being movable along the top edge to an opening position at which the free edge can move away from the top and bottom edges, the support mechanism having a lock member which is movable in a direction substantially parallel to the captive edge between a locking position and an unlocking position, the lock member in its locking position securing the support mechanism in the opening position.

[0028] Preferably, the support mechanism is a carriage, ideally a wheeled carriage mounted for sliding movement along the top edge of the opening.

[0029] The lock member may locate into a lock recess in the top edge of the opening, whereby to secure the support mechanism directly to the top edge of the opening. Preferably, however, the lock member engages a lock recess of a projecting peg. The projecting peg may be mounted adjacent to the top edge so that it is substantially immovable in the direction along the top edge. If the slide and turn door assembly has three door panels the support mechanism for the second door panel can

also carry a projecting peg for engagement by the lock member of the third panel, and so on for assemblies with four and more door panels.

[0030] Desirably, the lock member is engaged by a drive element or drive plate adapted to drive the lock member to its locking position. Preferably the lock member is moved to its unlocking position by a resilient element such as a torsion spring. In such an arrangement the lock member can be positively driven to its locking position by movement of the drive plate in a locking direction; movement of the drive plate in an unlocking direction can allow the lock member to be moved to its unlocking position by the resilient element.

[0031] Preferably, the drive plate is connected to a drive bar mounted to the top edge of the second door panel. The drive bar can be driven automatically as the second door is swung open so that the lock member is automatically actuated. Alternatively, the drive bar can be driven manually by the user. In the manually driven embodiments it is preferably arranged that the drive bar must be moved so as to actuate the lock member before the second door panel is swung open.

[0032] Preferably the drive bar is connected to a control member which cooperates with a control groove at the top edge of the opening. The control member is preferably located close to the free edge of the second door panel and moves along the control groove during sliding movement of the second door panel to help to maintain the alignment of the free edge of the second door panel during sliding movement. The control member moves out of the control groove as the second door panel is swung open.

[0033] In automatically actuated embodiments the control member is preferably a drive member and the control groove terminates in an angled drive slot. It is arranged that turning or swinging movement of the second door panel causes movement of the drive member along the angled drive slot, which in turn causes movement of the drive bar and movement of the drive plate and actuation of the lock member. It is thereby arranged that the support mechanism is secured automatically as the second door panel is swung open.

[0034] Ideally the drive member is mounted closer to the free edge of the second door panel than to the captive edge. It will be understood that the farther the drive member is located away from the captive edge the more sensitive the securing of the support mechanism and captive edge will be. Thus, it is desired that only a few degrees of turning/swinging movement of the second door panel should be required to actuate the lock member and secure the support mechanism in position; that few degrees of rotating movement will correspond to a very small distance close to the captive edge but a much greater distance at the free edge - locating the drive member close to the free edge will result in a more sensitive arrangement.

[0035] It can be arranged, for example, that in automatic embodiments the lock member will be actuated

before the free edge of the second door panel has cleared the bottom edge of the opening, so that the captive edge is secured in the opening position before the free edge becomes unsupported. Similarly, when the second door panel is swung closed, the free edge can engage its supporting slide (for example) before the captive edge is (automatically) released.

[0036] A similar support mechanism may also be located at the bottom end of the captive edge of the second door panel. Whilst it is recognised that the weight of the second door panel seeks to push the bottom end of the captive edge towards its neighbouring panel it may nevertheless be desirable for the bottom end of the captive edge to be secured in a similar way to the top end, for example so as to utilise common componentry.

[0037] In manually actuated embodiments a control slot communicates with an end of the control groove, and through which the control member can leave the control groove as the door panel is swung open. The control slot is preferably substantially perpendicular to the control groove. It is arranged that the control member is movable manually, causing corresponding movement of the drive bar and drive plate and actuation of the lock member. In one embodiment the second door panel has a corner drive mechanism which permits the user to move a control peg along the free edge of the door panel, the corner drive converting the movement along the free edge into movement along the top edge of the door panel. Such a corner drive mechanism avoids any requirement for the user to access the control member directly, which will be difficult in practice because the control member is located at the top edge of the door panel.

[0038] Desirably, whilst the control member is located in the control groove away from the control slot swinging/turning movement of the door panel is prevented. It can therefore be arranged that the control member must be moved into alignment with the control slot before the door panel can be swung open. Desirably, the control member can only be aligned with the control slot when the drive bar has been moved to actuate the lock member. Accordingly, the manual embodiments can include means to prevent any swinging movement of the door panel unless the support mechanism at the captive edge has been secured.

[0039] Preferably, the support mechanism includes a safety mechanism to ensure that the lock member cannot be released unless the door panel has been swung to its closed position and the control member returned to the control groove. The safety mechanism can comprise a modified lock plate, or a safety peg fitted to the corner drive mechanism, or both.

[0040] There is also provided a support mechanism for a slide and turn door, the support mechanism having a number of wheels or rollers and a pivot post to which a door panel can be mounted, the support mechanism having a lock member which is movable in a direction substantially parallel to the pivot post between a locking position and an unlocking position.

[0041] There is also provided an actuating mechanism for securing a support mechanism of a slide and turn door assembly, the actuating mechanism comprising a lock member adapted to move in a locking direction and a drive mechanism which cooperates with the lock member, the drive mechanism including a control member which is spaced from the lock member, the control member being adapted for mounting to a door of a slide and turn door assembly and to move along an edge of the door in a direction substantially perpendicular to the locking direction.

[0042] The actuating mechanism can be automatic in that it actuates the lock member without user input when the door is swung open. Alternatively the actuating mechanism can be manually operated. The manually-operated embodiments preferably include a safety mechanism to prevent inadvertent release of the lock member when the door is swung open.

[0043] According to a second aspect of the invention there is provided a slide and turn door assembly for an opening having a top edge and a bottom edge, a first door panel mounted for hinged movement and a second door panel mounted for sliding movement along the top and bottom edges and for turning movement relative to the top and bottom edges, the second door panel having a captive edge and a free edge, the captive edge being mounted to the top edge of the opening by a support mechanism, the second door panel being movable along the top edge to an opening position at which the free edge can move away from the top and bottom edges, the support mechanism having a lock member which is movable between a locking position and an unlocking position, the lock member in its unlocking position permitting sliding movement of the second door panel along the top edge, the lock member in its locking position securing the support mechanism relative to the top edge, the lock member being moveable from its unlocking position to its locking position by way of a drive component which is mounted adjacent to the free edge of the second door panel.

[0044] The invention according to this second aspect separates the movement of the lock member which occurs at the captive edge from the control of that movement which occurs at the free edge. Separating these elements enables the assembly to benefit from the much larger distance moved by the free edge of the second door panel than the captive edge for a given angle through which the second door panel is turned. Alternatively stated, the known assemblies seek to secure the captive edge by way of movement of a part of the support mechanism at the captive edge. When the second door panel has been turned or swung through only a few degrees the distance moved at the captive edge is very small and in order to react reliably to such small movements the prior art arrangements must be very sensitive. The present invention takes advantage of the much larger distance which is moved at the free edge, and can thereby provide a more reliable and effective support

mechanism.

[0045] In automated embodiments according to the second aspect the drive component is a drive member mounted adjacent to the free edge. The drive member is connected to the lock member by way of an elongate drive bar. In manual embodiments the drive component is a manually-movable drive peg mounted to the free edge of the second door panel. The manually-movable drive peg is made accessible when the second door panel is slid to its opening position.

[0046] There is also provided a support mechanism for a slide and turn door according to the second aspect of the invention, the support mechanism having a number of wheels or rollers to which a door panel can be mounted, the support mechanism having a lock member which is movable between an unlocking position and a locking position by way of a drive component, the drive component being connected to the lock member by way of an elongate drive bar.

[0047] The support mechanism is adapted for fitment to a door panel having a known width, and the elongate drive bar has a length approximately equal to the width of the door panel. The lock member can therefore be mounted adjacent to the captive edge of the door panel and the drive component can be mounted adjacent to the free edge of the door panel. The length is stated to be "approximately equal to the width of the door panel" since as described below it is not necessary that the lock member and drive component be mounted at precisely the captive and free edges respectively.

[0048] There is also provided an actuating mechanism for securing a support mechanism of a slide and turn door assembly according to the second aspect, the actuating mechanism comprising a lock member adapted to move between an unlocking position and a locking position, and a drive mechanism which cooperates with the lock member, the drive mechanism including a drive component which is spaced from the lock member by an elongate drive bar.

[0049] The slide and turn door assembly according to the second aspect can share the described optional features of the first aspect with which it is compatible, and vice versa. Similarly, the support mechanism and the actuating mechanism of each aspect of the invention can share the described optional features of the slide and turn door assemblies with which they are compatible.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0050] The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:

Fig.1 shows a perspective view of a slide and turn door assembly having three door panels, with all of the door panels in their closed positions;
Fig.2 shows a view as Fig.1, but with the first door

Fig.3 panel moved to its swung-open position;
Fig.4 shows a view as Fig.2 but with the second door panel moved to its opening position;
Fig.5 shows a view as Fig.3 but with the second door panel moved to its swung-open position;
Fig.6 shows a view as Fig.4 but with the third door panel moved to its opening position;
Fig.7 shows a view as Fig.5 but with the third door panel moved to its swung-open position;
Fig.8 shows a view similar to that of Fig.3, but with the frame and glazing panel of the second door panel removed;
Fig.9 shows an alternative view of the components of Fig.3;
Fig.10 shows a section through the bottom edge of the slide and turn door assembly;
Fig.11 shows a section through the top edge of the slide and turn door assembly;
Fig.12 shows another view of the slide and turn door assembly with the door panels in the positions of Fig.6;
Fig.13 shows a sectional view through a part of the support mechanism at the top end of the captive edge of the second door panel, with the second door panel spaced away from its opening position;
Fig.14 is a view as Fig.12 but with the second door panel in its opening position and the lock member actuated;
Fig.15 is another view of the support mechanism of the second door panel with the lock member in its locking position;
Fig.16 is a perspective view of the support mechanism of the second door panel in the position of Fig.12;
Fig.17 is a view as Fig.15 but with the second door panel in its opening position and the lock member in its unlocking position;
Fig.18 is a view as Fig.16 but with the lock mechanism actuated and the second door panel swung open;
Fig.19 is a view of the support mechanism at the bottom end of the captive edge of the second door panel, corresponding to the position of Figs. 12 and 15;
Fig.20 is a view of the support mechanism of Fig.18 corresponding to the position of Fig.16;
Fig.21 is a view of the support mechanism of Fig.18 corresponding to the position of Fig.17;
Fig.22 is a view from above of part of the slide and turn door assembly with an automatic actuating mechanism for securing the support mechanism, with the second door panel partly swung open;
Fig.23 is a view similar to that of Fig.21, but of a manual actuating mechanism;
Fig.24 is a view of the components of the manual actuating mechanism of Fig.22, in its non-actu-

- ated condition;
- Fig.24 is a view similar to that of Fig.23 but in its actuated condition;
- Fig.25 is a view of the corner drive and control member of the manual actuating mechanism of Fig.22, in its non-actuated condition;
- Fig.26 is a view similar to that of Fig.25 but in its actuated condition;
- Fig.27 is an end view of a second door panel fitted with the manual actuating mechanism of Fig.22, in its non-actuated condition;
- Fig.28 is a view similar to that of Fig.27 but with the door panel partly swung open;
- Fig.29 is a view of a part of the manual actuating mechanism of Fig.22;
- Fig.30 shows a view from above of part of the slide and turn door assembly in the position of Fig.6, fitted with the automatic actuating mechanism; and
- Fig.31 shows a view similar to that of Fig.30 but with a manual actuating mechanism.

DETAILED DESCRIPTION

[0051] The description of Figs. 1-6 is set out above and will not be repeated. Also, a large number of components of the present slide and turn door assembly are shared with the slide and turn door assembly of EP 3 075 938 and the disclosure of that document is incorporated herein so as to avoid unnecessary repetition.

[0052] Fig.7 shows the support mechanism or carriage 20a for the top end of the captive edge 11 of the door panel 2, and the support mechanism or carriage 20b for the bottom end of the captive edge 11. The support mechanisms 20a and 20b may be identical if desired, but in the present embodiment differ as explained below.

[0053] Figs.7 and 8 also show a support member 22 which is fitted to the bottom end of the free edge 13 of the second door panel 2. In Fig.7 the support member 22 is shown overlying a guideway 24 with which the support member 22 cooperates as the door is swung away from, and towards, the bottom edge 6. Though it is not present in this embodiment, it will be understood that a similar support member and guideway can be fitted at the top end of the free edge 13 if desired. In known fashion, the support member 22 and guideway 24 cooperate to ensure that the free edge 13 of the door panel 2 is correctly positioned as it moves away from and towards the bottom edge 6 during swinging movement of the door panel 2, and may include cooperating tapered slides in known fashion (see for example the cooperating slides shown in Figs. 7, 8, 10, 11 and 15 of EP 3 075 938).

[0054] The carriage 20b comprises four wheels or rollers 26, which are arranged in two pairs, each pair being mounted on a common axle (not seen). One roller in each pair is tangentially (peripherally) aligned to move along one of the two primary rails 28 (see Fig.9), in common with the arrangement of EP 3 075 938, for example.

[0055] The carriages 20a,b both have a respective mounting bracket 30 which has a number of fixing holes 32 (see Fig.12) by which the bracket 30 may be secured to the captive edge 11 of the second door panel 2, in known fashion.

[0056] The mounting bracket 30 is mounted upon a pivot post 34 (see Fig.12) which can pivot through approximately 90° (at least), whereby to allow the second door panel 2 to turn or swing through approximately 90° between the positions of Figs. 3 and 4.

[0057] Though not shown in the drawings, the support member 22 has a single wheel or roller adapted to move along a secondary rail 36 (see Fig. 9) which secondary rail is spaced vertically and horizontally from the primary rails 28. In other embodiments the support member can have two or more wheels or rollers which are tangentially (peripherally) aligned so as to move together along the secondary rail 36 (see for example the support member shown in Figs. 8, 10, 11 and 15 of EP 3 075 938).

[0058] The support member 22 is mounted adjacent to the bottom end of the free edge 13 of the second door panel 2. It will therefore be understood that the second door panel 2 is supported at its bottom edge by the first set of rollers 26 of carriage 20b at its captive edge 11, and by the roller(s) of support member 22 at its free edge 13. The respective rollers are therefore spaced apart, in this embodiment by a distance similar to the width of the second door panel 2. The respective rollers thereby facilitate the sliding (rolling) movement of the second door panel 2 along the bottom edge 6, with a minimum of frictional resistance and with minimum wear.

[0059] The rails 28 and 36 are ideally metallic, and the rollers 26 are also ideally metallic. The rails and rollers are therefore able to withstand many cycles of use without damage or wear, despite the considerable weight of the second door panel 2.

[0060] A comparison of Figs. 9 and 10 shows that in this embodiment there are no primary rails along the top edge 5, but such rails (similar to the primary rails 28 at the bottom edge 6) could be provided if desired so as to commonise the componentry. Accordingly, the carriage 20a does not have rollers corresponding to the rollers 26 (but in an alternative embodiment having primary rails along the top edge the carriage 20a could have rollers).

[0061] Whilst it is not necessary to support the weight of the door panel 2 at the top edge 5, it is necessary to maintain the correct alignment of the door panel in its sliding and swinging conditions. The carriage 20a provides the necessary support at the top end of the captive edge 11.

[0062] It will be seen from Fig.9 that the carriage 20b lies partially within a recess 40 at the bottom edge 6. The carriage 20b has side rollers 42 which rotate about axes which are substantially perpendicular to the rotational axes of the rollers 26 (and therefore substantially vertical in use). The side rollers 42 engage and roll along the side walls of the recess 40 as the carriage 20b moves along the bottom edge 6.

[0063] A cross-section through the top edge of the opening 4 is shown in Fig.10. The carriage 20a similarly has side rollers 42 which engage and roll along the side walls at the recess 40 of the top edge 5 as the carriage 20b moves along the top edge 5.

[0064] The respective side rollers 42 provide "side-ways" support of the captive edge 11 at both the top and bottom edges 5, 6, which is particularly important to support the offset weight of the door panel 2 when in the swung-open position.

[0065] As represented in Fig.7, the carriages 20a,b are mounted to move (to the left and right as drawn) along the top and bottom edges 5,6, between the positions of the second door panel 2 shown in Figs. 2 and 3. The primary rails 28 are continuous along the bottom edge 6 and the rollers 26 remain in contact with the primary rails throughout the opening and closing movements. In other embodiments the primary rails can terminate away from a stile 7 and/or 8, but provided they terminate beyond the range of movement of the rollers 26 that is of no consequence to the invention.

[0066] The recesses 40 are continuous along the top and bottom edges 5,6 and the side rollers 42 of the respective carriages 20a,b remain in contact with the side walls of the recesses throughout the opening and closing movements of the door panel 2.

[0067] As also represented in Fig.7, the support member 22 is mounted to move (to the left and right as drawn) along the secondary rail 36 at the bottom edge 6. Importantly, however, the secondary rail 36 terminates part way along the bottom edge 6, and in particular terminates close to the position occupied by the free edge 13 of the second door panel 2 when the second door panel is in its opening position as seen in Figs. 3, 7 and 8). In this position, the roller(s) of the support member 22 has moved off the end of the rail 36 and is no longer supported by the rail. The weight of the second door panel 2 acting at the free edge 13 is transferred from the support member 22 to a slide which forms a part of the underside of the support member 22 and which cooperates with a part of the guideway 24.

[0068] It will be understood that in the position of Fig.3 the support member 22 overlies and engages the guideway 24 mounted at the bottom edge 6; the support member and guideway have cooperating tapered lead-ins and are configured to lift the free edge 13 of the second door panel 2 by a small distance (perhaps less than 1 mm for example) as the second door panel 2 approaches its opening position. Lifting the free edge 14 by even such a small distance is sufficient to transfer the weight of the second door panel 2 from the rail 36 prior to swinging of the second door panel 2.

[0069] Fig.11 shows the carriages 20b of the second and third door panels 2,3 with those door panels in their swung open positions of Fig.6. It will be seen that the carriage 20b of the second door panel 2 engages a fixed stop 44, and that the carriage 20b of the third door panel 3 engages the carriage 20b of the second door panel 2.

A similar situation occurs at the top edge 5.

[0070] Figs. 12-17 show the actuating mechanism for securing the top end of the captive edges 11, 12 in their opening positions, and Figs. 18-20 show the slightly different actuating mechanism for securing the bottom end of the captive edges 11, 12.

[0071] A different actuating mechanism is provided at the bottom end of the captive edge in this embodiment to reflect the fact that as a door panel 2, 3 is initially swung open the weight of the door panel seeks to force the top ends of the captive edges apart and the bottom ends of the captive edges together so that different forces need to be countered at the top and bottom ends. It will be understood, however, that the actuating mechanism shown in Figs. 12-17 could be replicated at the bottom end of the captive edges so as to commonise the actuating mechanisms if desired.

[0072] The carriages 20a of the second door panel 2 and the third door panel 3 are given the same reference numeral and in this embodiment are physically identical, at least in all relevant respects.

[0073] The first carriage 20a of the second door panel 2 has a recess 50 for receiving a projecting peg 52 carried by the fixed stop 44. The projecting peg 52 has a lock recess 54 which can be engaged by a lock member 60. In this embodiment the projecting peg 52 and the lock recess 54 are substantially circular in cross-section, but that is not essential and other cross-sectional shapes could be used.

[0074] As seen in Fig.14, the end 56 of the lock member 60 can project into the recess 50. The end 56 is part-circular in profile to match the size and shape of the lock recess 54. The lock member is shown in its locking position in Figs.13 and 14 and in its unlocking or released position in Fig.12.

[0075] Figs.12 and 15 represent parts of the assembly when the door panel 2 is spaced away from its opening position, so that the carriage 20a is separated from the fixed stop 44. Subsequent sliding movement of the door panel 2 to its opening position brings the carriage 20a into engagement with the fixed stop 44, during which movement the projecting peg 52 enters the recess 50 as shown in Fig.16.

[0076] Figs. 15-17 also show the drive bar 62 and drive element or drive plate 64 of the actuating mechanism. The drive plate 64 is slidably mounted upon the carriage 20a, between the positions shown in Figs. 12 and 13. In Fig.12 (and also in Fig.16) the lock member 60 is not actuated whereas in Fig.13 the lock member is actuated. It will be seen that the leading end of the drive plate 64 is chamfered and cooperates with a tapered end of the lock member 60. It will be understood that movement of the drive plate 64 towards the top right hand corner of the page as viewed in Fig.16 will cause the lock member 60 to be pressed upwardly as viewed, into the locking position of Figs.13 and 14.

[0077] It will also be seen from Fig.13 that in the opening position of the second door panel 2, the lock

recess 54 of the projecting peg 52 of the fixed stop 44 is aligned with the lock member 60 so that the end 56 of the lock plate can move into the lock recess 54.

[0078] It will furthermore be understood that leftwards movement (as viewed in Fig. 13) of the carriage 20a, away from the fixed stop 44, is prevented by the lock member 60 retaining the projecting peg 52, so that the carriage 20a, and therefore the top end of the captive edge 11 of the second door panel 2, is secured in its opening position as long as the lock member 60 remains in its locking position.

[0079] Arranging the lock member 60 to move between its locking and unlocking positions in a direction substantially perpendicular (and ideally precisely perpendicular) to the direction of movement of the carriage 20a provides a robust and reliable mechanism for securing the carriage 20a in its opening position.

[0080] Fig.17 represents carriage 20a with the second door panel 2 swung through approximately 90° to its swung-open position of Fig.4. It will be understood that the drive plate 64 overlies the lock member 60 in that position (and in all positions between those of Figs. 13 and 17). The lock member 60 is therefore held in its locking position and the top end of the captive edge 11 is secured in the opening position throughout the swinging movement of the door panel 2.

[0081] The actuating mechanism for the carriage 20b at the bottom end of the captive edge 11 is slightly different as seen in Figs. 18-20. The carriage 20b has a much smaller drive plate 66 which is not connected to a drive bar. Instead, the drive plate 66 has an opening 70, the drive plate being chamfered at its underside to cooperate with the tapered end of the lock member 72. The carriage 20b engages a fixed stop 44 having a projecting peg 52 in a similar fashion to the carriage 20a at the top end of the captive edge 11.

[0082] In the opening position of Fig. 19 the lock recess 54 of the projecting peg 52 is aligned with the lock member 72. It will be understood from Fig. 20 that when the door panel 2 is swung open the drive plate 66 rotates with the door panel 2, the chamfer adjacent to the opening 70 and the tapered sides of the lock member 72 causing the lock member 72 to be driven downwardly as drawn so as to locate the lock member 72 in the lock recess 54 and to secure the carriage 20b in the opening position.

[0083] It will be seen that the carriages 20a,20b each have a projecting peg 52; it is arranged that the third door panel 3 has similar carriages so that the captive edge of the third door panel 3 can be similarly secured in its opening position (and so on for fourth, fifth etc. door panels as required).

[0084] It will be observed that the projecting peg 52 has a tapered leading end, and that the recess 50 has a chamfered opening. These features are provided to accommodate manufacturing tolerances and small positional movements during use, and help to ensure the correct alignment of the projecting peg 52 each time it enters its recess 50. Because the lock members 60, 72 move

perpendicularly to the axis of the projecting peg 52, it is desirable that the projecting peg be substantially fixed in its longitudinal position relative to the fixed stop 44 (or carriage as appropriate), but it can be free to move laterally, perhaps by up to 1 mm or so, so as to accommodate manufacturing tolerances and/or lateral movement of the respective components during use.

[0085] It will be understood that in an alternative embodiment the lock member 60 (and/or 72) could be extended to move behind a keeper or the like mounted at the bottom of the recess 40 of the top edge 5 (and/or bottom edge). In such an alternative embodiment the support mechanism would secure the captive edges 11,12 (etc.) directly to the top and/or bottom edge 5,6. The arrangement shown is preferred, however, as it is expected to be easier for the installer to ensure that the captive edge 12 of the third door panel 3 is secured to the captive edge 11 of the second door panel (and so on as required). Providing a fixed stop 44 with its projecting peg 52 permits commonisation of the support mechanisms for each of the door panels 2,3 (etc.).

[0086] As explained below, two different actuating mechanisms for securing a support mechanism (and in particular a support mechanism at the top end of the captive edge) are described, i.e. two different actuating mechanisms for driving the lock member 60 to its locking position. Fig.21 shows the components of an automatic actuating mechanism whereas Figs. 22-29 show the components of a manual actuating mechanism.

[0087] Fig.21 shows the top edge of the second door panel 2, along which lies the drive bar 62. One end of the drive bar 62 is attached to the drive plate 64 of the support mechanism of carriage 20a as above described. The other end of the drive bar 62 is connected to a slide 74 which carries a control member 76. The control member 76 can move along a control groove 80 at the top edge of the second door panel 2. As seen in Fig.10, the control groove 80 is bordered along one side by the secondary rail 36 which runs part-way along the top edge and bordered along its other side by the depending lip 68 of the top edge 5.

[0088] The slide 74 and control member 76 can therefore move to the left and right as drawn in Fig.21, relative to the top edge of the door panel 2. The control groove 80 prevents significant lateral movement of the slide 74 and control member relative to the top edge of the door panel 2.

[0089] It will be understood that Fig.21 represents an artificial view towards the top edge of the door panel 2 and also towards the top edge 5 of the opening 4, both of which views cannot be seen in practice at the same time. In practice, when looking towards the top edge 5 of the opening 4 the drive bar 62, slide 74, control member 76 and carriage 20a will be hidden from view by the door panel 2. Nevertheless, representing all of these components in a single view is believed to be appropriate for a clear understanding of the operation of the device. (Fig.22 represents a similar artificial view.)

[0090] In this automatic embodiment the control member 76 is a drive member (or drove component), which as seen in Fig.17 is suitably in the form of a roller. The drive member 76 projects upwardly from the top edge of the second door panel 2 and during sliding movement of the door panel 2 the drive member 76 moves along the control groove 80. Because the drive member 76 is located close to the free edge 13 of the door panel 2, a separate support similar to the support 22 is not required to maintain the alignment of the top end of the free edge 13 of the door panel 2 during sliding movement.

[0091] The control groove 80 does not span the full width of the opening 4, but terminates at an angled drive slot 82 (in this embodiment the angled drive slot 82 is formed in a separate component mounted at the end of the secondary rail 36). The drive slot 82 is angled relative to the channel 80 as seen in Fig.21, in this embodiment by an angle of around 45°.

[0092] Fig.21 represents the second door panel 2 in its opening position, and partly swung open. The path of movement of the drive member 76 is represented by the dashed line in Fig.21.

[0093] If the second door panel 2 is not to be swung open, it can be slid into and away from its opening position without actuating the lock member 60. In particular the carriage 20a can be moved into and away from the position represented in Fig.16 repeatedly, without relative movement of the drive bar 62 and the drive plate 64. During such movement, the drive member 76 moves along the control groove 80 into and out of engagement with the end of the drive slot 82, but without passing through the drive slot.

[0094] The drive member 76 only moves along the drive slot 82 if the second door panel 2 is swung open, in which case the drive member 76 follows the path represented by the dashed line in Fig.21. The initial swinging movement of the second door panel 2 causes the drive member 76 to move towards the bottom of the page as viewed in Fig.21. Since the drive slot 82 is fixed in position, the drive member is forced along the drive slot 82, and the angling of the drive slot causes the drive member 76 and slide 74 to move to the right as viewed relative to the top edge of the door panel 2. That rightwards movement is communicated by the drive bar 62 to the drive plate 64, which is caused to move towards and over the end of the lock member 60, driving the lock member to enter the lock recess 54 of the projecting peg 52 (i.e. to the locking position represented by Fig.13).

[0095] Because the drive slot 82 is located some distance from the carriage 20a (and in particular is closer to free edge 13 than the captive edge 11), only a small angular movement of the door panel 2 is required to actuate the lock member 60. In particular it can be arranged that the lock member 60 is moved to its locking position whilst the carriage 22 is in engagement with the guideway 24, so that the captive edge 11 is secured before the free edge 13 becomes unsupported.

[0096] This automatic actuating mechanism of the

present invention therefore provides an apparatus for securing the captive edge of a door panel of a slide and turn door assembly which permits substantially unhindered sliding movement of the door panel into and out of its opening position without actuation of the lock member, and yet provides almost immediate automatic actuation of the lock member upon swinging or turning of the door panel.

[0097] Such rapid actuation is usually only required at the top end of the captive edge, however, and as above explained in the present embodiment the bottom edge does not have a drive member, drive bar and associated componentry (although that could readily be provided if desired).

[0098] When the door panel 2 is subsequently moved back to the swung-closed position of Fig.3, the drive member 76 engages the angled drive slot 82 and the drive bar 62 is driven to the left as viewed in Fig.21, which moves the drive plate 64 out of alignment with the lock member 60. The torsion spring 78 (Fig.12) moves the lock member 60 back to its unlocking position, releasing the projecting peg 52 and allowing the carriage 20a to slide along the top edge 5 as required.

[0099] The torsion spring 78 can if desired be replaced in other embodiments by a positive drive to the unlocking position, i.e. it can be arranged that the lock member and drive plate have cooperating angled surfaces which positively drive the lock member to its locking and unlocking positions depending upon the direction of movement of the drive plate.

[0100] A manual actuating mechanism is shown in Figs. 22-29 and is described below. It will be appreciated that many of the components of the manual actuating mechanism are identical to those of the automatic actuating mechanism described above and a detailed description of the common components is not repeated. For example, the support carriage 20a described above can be used in a manual actuating mechanism, with only the means for moving the drive bar 62 being altered. The same reference numeral 20a is therefore used for the support carriage of Fig.22.

[0101] The drive bar 162 of Fig. 22 is connected to a slide 174. The slide 174 can move along a control groove 180, suitably provided between the secondary rail 36 and the depending lip 68 as in the automatic actuating mechanism.

[0102] The slide 174 carries a control member 176, ideally in the form of a roller similar to the drive member 76. The control groove 80 terminates at a control slot 182 which is substantially perpendicular to the control groove 180. The control slot 182 in this embodiment is formed in a separate component mounted at the end of the secondary rail 36.

[0103] During sliding movement of the door panel 2 the control member 176 moves along the control groove 180. Importantly, however, even when the door panel 2 is in its opening position the control member 176 is out of alignment with the control slot 182.

[0104] A corner drive mechanism 184 is shown in Figs. 23 and 24. The particular structure of the corner drive mechanism is not important for the present invention and many of the corner drive mechanisms which are presently used in tilt and turn windows for example may be used with the present invention. Also, the profile from which the door panel 2 is formed may have a dedicated channel suitable for the corner drive mechanism, or the corner drive mechanism may be located away from the dedicated channel, as desired.

[0105] The corner drive mechanism 184 has a drive peg (or drive component) 186 mounted to the free edge 13 of the door panel 2. The control peg is visible and accessible when the second door panel 2 has been moved away from the third door panel 3, and in particular has been moved to its opening position of Fig.3. In known fashion, the corner drive mechanism 184 communicates (upwards and downwards as viewed) movement of the drive peg 186 along the free edge 13 of the door panel 2 into (leftwards and rightwards as viewed) movement of the slide 174 along the top edge of the door panel 2.

[0106] It will be understood that there is a rigid connection between the corner drive mechanism 184, the slide 174 and the drive bar 162, so that upwards movement as viewed of the drive peg 186 is communicated directly to the locking plate 64 and can actuate the lock member 60.

[0107] As above indicated, it is arranged that during sliding movement of the door panel 2 the control member 176 moves along the control groove 180 and does not become aligned with the control slot 182. If it is desired to swing the door panel 2, the door panel 2 is first moved into its opening position as in Fig.3 and then the drive peg 186 is moved upwardly in the orientation as drawn in Fig. 23. This drives the slide 174, drive bar 162 and drive plate 64 towards the bottom-right in the orientation as drawn in Fig. 23 to actuate the lock member 60. Also, this movement causes the control member 176 to move along the control channel 180 into alignment with the control slot 182. Because the door panel 2 can only be swung open if the control member 176 is aligned with the control slot 182, it is therefore arranged that the door panel 2 cannot be swung open until the lock member 60 has been actuated.

[0108] It will be understood that the drive peg 186 is visible and exposed when the door panel 2 has been swung open. It is therefore desirable (although not necessarily mandatory) to provide a safety mechanism to ensure that the drive peg 186 is not inadvertently or deliberately moved whilst the door panel is swung open. Two separate safety mechanisms are disclosed in the drawings, each of which may be used independently if desired.

[0109] The first safety mechanism is shown in more detail in Figs. 25-28. Figs. 25 and 27 represent the non-actuated condition, i.e. the condition in which the door panel 2 can slide along the top and bottom edges 5,6. In this condition the lock member has not been actuated

and the slide 174 is at the rightwards limit of its range of movement as seen in Fig.25. Figs. 26 and 28 represent the actuated condition, i.e. the condition in which the door panel 2 can swing open. In this condition the lock member has been actuated and the slide 174 is at the leftwards limit of its range of movement as seen in Fig.26.

[0110] The corner drive mechanism has a corner drive bar 188 which is connected directly to the slide 174 to communicate movement of the drive peg 186 to the slide 174. A safety peg 190 is mounted to the drive bar 188 and can rotate relative to the drive bar but is fixed in position along the drive bar. The safety peg 190 is biased to rotate clockwise as viewed in Figs. 25 and 26 by a torsion spring 192.

[0111] The mounting bracket of the corner drive mechanism 184 has a stepped end which provides a safety stop 194.

[0112] During sliding movement of the door panel 2 the safety peg 190 slides alongside the secondary rail 36 as shown in Fig.27. When the mechanism is actuated the safety peg 190 moves relative to the mounting bracket to lie alongside the safety stop 194. Notwithstanding the bias of the torsion spring 192, however, the safety peg 190 remains in the orientation shown in Figs.25 and 27 because of its engagement with the secondary rail 36, i.e. the secondary rail 36 prevents the anti-clockwise rotation of the safety peg 190 as viewed in Fig.27.

[0113] When the door panel 2 is subsequently swung open to the position of Fig.28, however, the safety peg 190 moves away from the secondary rail 36 and is rotated by way of the torsion spring 192 to engage the safety stop 194, i.e. the safety peg 190 moves into the position shown in Fig.26.

[0114] It will be understood that whilst the safety peg 190 engages the safety stop 192 the slide 174 cannot be moved towards the mounting bracket of the corner drive mechanism and the drive peg 186 cannot be moved downwardly as drawn. The lock member 60 can therefore not be released. When, however, the door panel 2 is subsequently closed the safety peg 190 engages the secondary rail 36 which causes the safety peg to rotate out of engagement with the safety stop 194, whereupon the drive peg 186 can be moved downwardly and the lock member 60 released.

[0115] The second safety mechanism is shown in Fig.29, and comprises a safety groove 196 in the drive plate 164. The chamfered opening 170 for the end of the lock member 60 communicates with the safety groove 196 and when the door panel 2 is aligned with the top and bottom edges 5,6 the drive plate 164 can move relative to the lock member 60 to drive the lock member into the lock recess 54 of the projecting peg 52 as above described. When the door panel 2 is subsequently rotated the drive plate 164 is similarly rotated relative to the carriage 120a and the end of the lock member 60 enters the safety groove 196 as is seen in Fig.29. It will be understood that the safety groove 196, or more accurately the peripheral lip surrounding the safety groove 196, pre-

vents the lock plate 164 being retracted to release the lock member 60, until the door panel has been swung closed. Only when the door panel 2 has been swung closed and is aligned with the top and bottom edges 5, 6 will the lock member 60 be aligned with the opening 170 so that the drive plate 164 can be retracted and the lock member released.

[0116] As shown in Fig.30 in relation to the automatic actuating mechanism, the third door panel 3 has a drive bar 62a, slide 74a and drive member 76a similar to those of the door panel 2 described in Fig.21. The drive member 76a also moves along the control groove 80 and engages the drive slot 82. The length of the drive bar 62a is shorter than the drive bar 62 to accommodate the different opening position of the third door panel 2. As shown in Fig. 30, if the slide 74 of the second door panel 2 is located at a distance X from the free end 13 of that door panel, then the slide 74a of the third door panel 3 must be located at a distance X+Y from its free end 14, the distance Y being the difference between the respective opening positions of the door panels 2 and 3, which is dependent upon the thickness of the second door panel 2.

[0117] A view similar to that of Fig.30 is provided in Fig.31 for the manual actuating mechanism, and also shows the different mounting position of the control members 176a and 176b for the different door panels. It is a feature of this embodiment, however, that the different mounting positions for the control members 176a,b (etc.) are preset by the manufacturer, i.e. the installer can fit the control member 176a,b in the appropriate preset position 198, 198a,b,c (etc.) for the particular door panel 2, 3 (etc.) and thereby avoid the requirement for on-site adjustment during installation. The spacing between the fitment positions 198,a,b,c can be determined in advance by knowing the distance Y between the respective opening positions of the door panels 2 and 3, i.e. by knowing the thickness of the door panels 2 and 3.

[0118] Though not shown in these drawings, slides can if desired be fitted to the bottom edge 6 to lift the door panels 2,3 slightly when they are in their closed positions (or can at least remove part of the weight of the door panels from the rollers 26). It is understood that the door panels 2 and 3 will likely remain in their closed positions for extended periods of time and it may be disadvantageous for the weight of the door panels to remain upon specific parts of the rollers and rails 28, 36 during those periods (the engagement between the rollers and rails having a small contact area). Removing some or all of the weight of the door panels from the rollers and rails will reduce the likelihood of damage to the rollers and/or rails due to sustained load bearing.

[0119] It will be understood that the component 76 in the automated embodiment of Figs. 12-21 provides two functions. Firstly, it acts as a control member ensuring that the free edge 13 of the second door panel 2 maintains its alignment with the top edge 5 during sliding movement (as the component 76 moves along the control groove 80). Secondly, it acts as a drive component to actuate

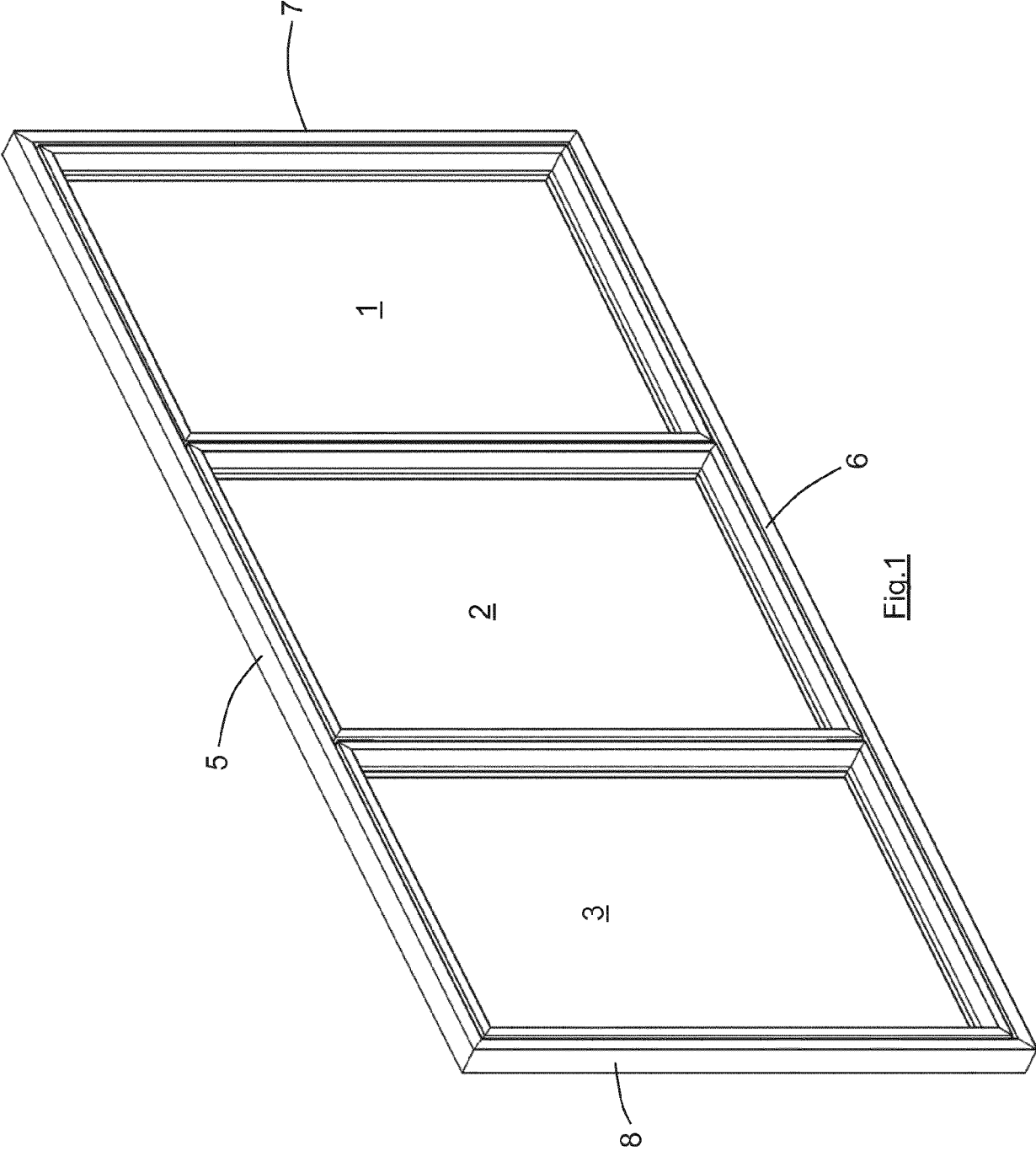
the lock member 60 (as the component 76 moves along the angled drive slot 82). In the manual embodiment of Figs. 22-29 these two functions are undertaken by different components, the component 176 acting as the control member and the peg 186 acting as the drive component.

Claims

1. A slide and turn door assembly for an opening (4) having a top edge (5) and a bottom edge (6), a first door panel (1) mounted for hinged movement and a second door panel (2) mounted for sliding movement along the top and bottom edges and for turning movement relative to the top and bottom edges, the second door panel (2) having a captive edge (11) and a free edge (13), the captive edge being mounted to the top edge (5) of the opening (4) by a support mechanism, the second door panel (2) being movable along the top and bottom edges (5,6) to an opening position at which the free edge (13) can move away from the top and bottom edges, the support mechanism having a lock member (60) which is movable in a locking direction between an unlocking position and a locking position, the lock member in its locking position securing the support mechanism in the opening position, the locking direction being substantially parallel to the captive edge (11) of the second door panel (2).
2. A slide and turn door assembly according to claim 1 in which the support mechanism has a recess (50) which can accommodate a projecting peg (52), and in which the lock member (60) in the locking position projects into the recess (50) to engage a lock recess (54) of the projecting peg (52).
3. A slide and turn door assembly according to claim 2 in which the projecting peg (52) enters the recess (50) in a direction substantially perpendicular to the locking direction.
4. A slide and turn door assembly according to any one of claims 1-3 in which the lock member (60) is engageable by a drive element (64) adapted to drive the lock member to its locking position, the drive element (64) being movable in a driving direction which is substantially perpendicular to the locking direction.
5. A slide and turn door assembly according to claim 4 in which the drive element (64) is connected to a drive bar (62; 162) mounted to the second door panel (2) and movable in the driving direction relative to the second door panel.
6. A slide and turn door assembly according to claim 5 in which the drive bar (62; 162) is connected to a control member (76; 176) which is movable along a

control groove (80; 180) at the top of the second door panel (2) during sliding movement of the second door panel (2).

7. A slide and turn door assembly according to claim 6 in which the control member (76; 176) moves out of the control groove (80; 180) when the second door panel (2) is swung open. 5
8. A slide and turn door assembly according to claim 6 or claim 7 in which the control member (76; 176) is located closer to the free edge (13) of the second door panel (2) than to the captive edge (11). 10
9. A slide and turn door assembly according to any one of claims 6-8 in which the control member (76) is moved in the driving direction relative to the second door panel (2) automatically as the second door panel is swung open. 15
20
10. A slide and turn door assembly according to claim 9 in which the control member (76) is a drive member and in which the control groove (80) terminates in an angled drive slot (82). 25
11. A slide and turn door assembly according to any one of claims 6-8 in which the control member (176) is manually movable in the driving direction relative to the second door panel (2). 30
12. A slide and turn door assembly according to claim 11 in which the control groove (180) terminates in a control slot (182) which is substantially perpendicular to the control groove. 35
13. A slide and turn door assembly according to claim 12 in which the control member (176) is moved into alignment with the control slot (182) as the lock member (60) moves to its locking position. 40
14. A support mechanism for a slide and turn door, the support mechanism having a pivot post (30) to which a door panel (2) can be mounted, the support mechanism having a lock member (60) which is movable in a direction substantially parallel to the pivot post between a locking position and an unlocking position. 45
15. An actuating mechanism for moving a lock member (60) in a locking direction to secure a support mechanism of a slide and turn door assembly, the actuating mechanism having a drive mechanism which cooperates with the lock member, the drive mechanism including a drive component (76; 186) which is spaced from the lock member by a drive bar (62; 162), the drive bar being movable in a direction substantially perpendicular to the locking direction. 50
55



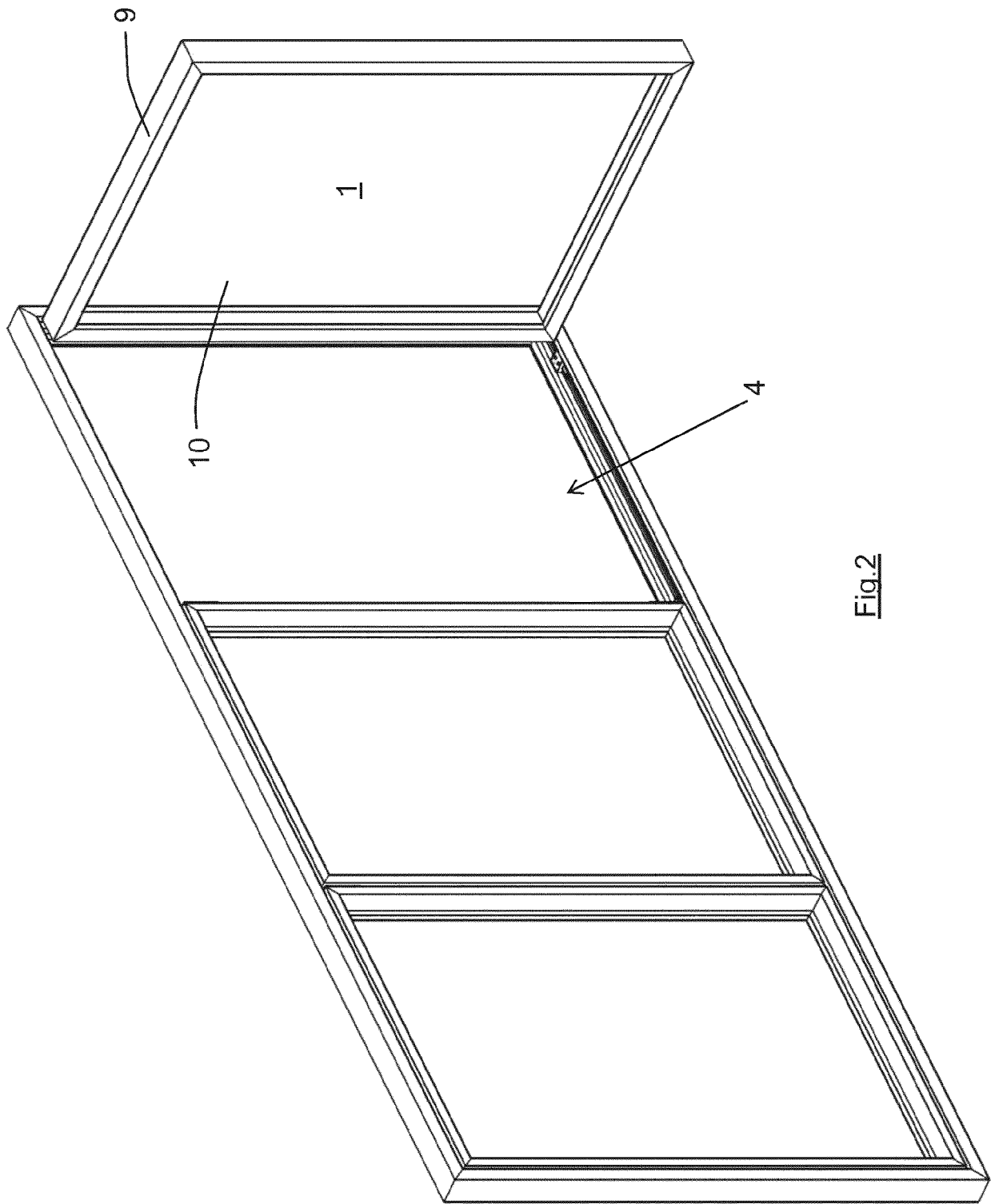


Fig. 2

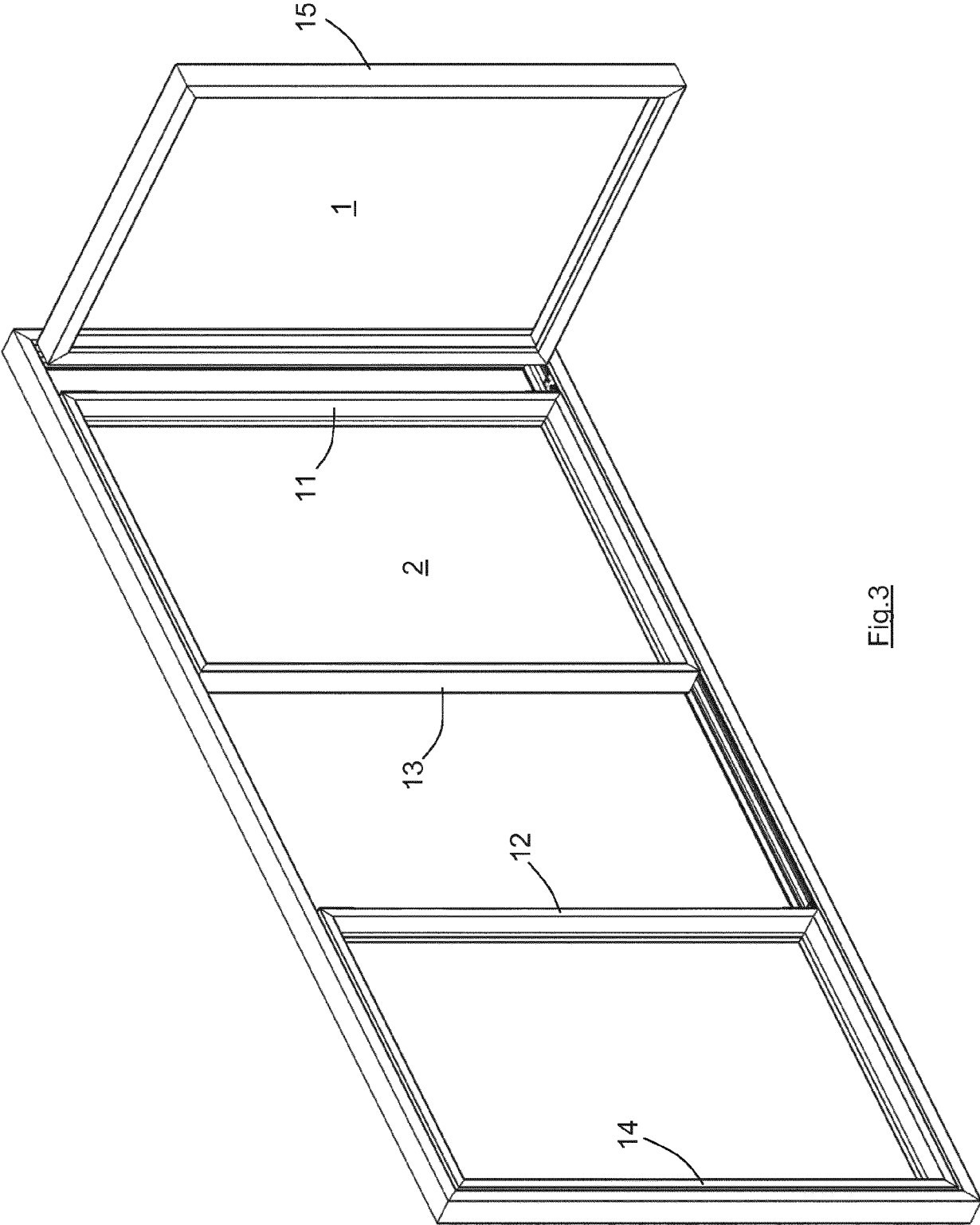


Fig. 3

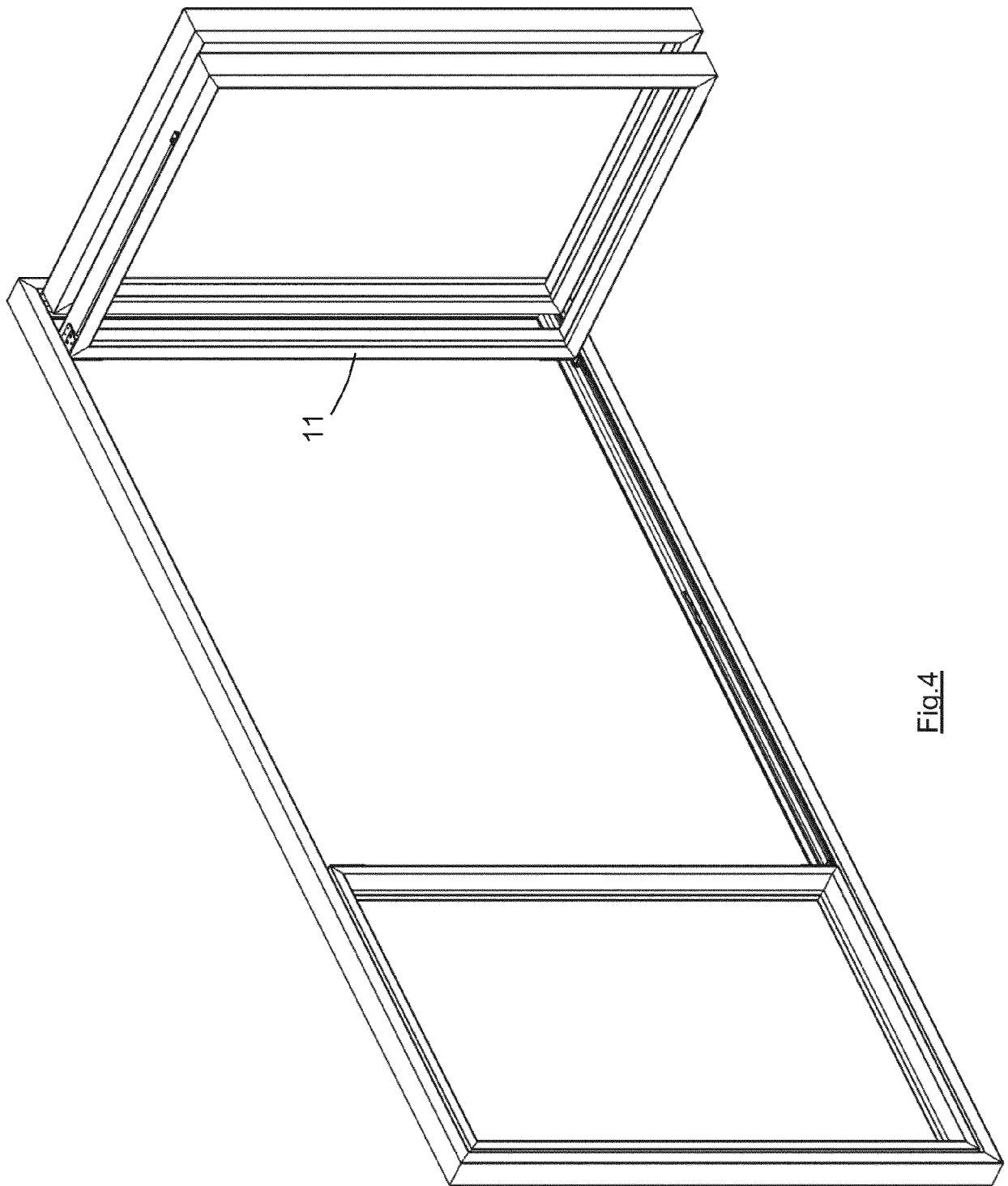


Fig. 4

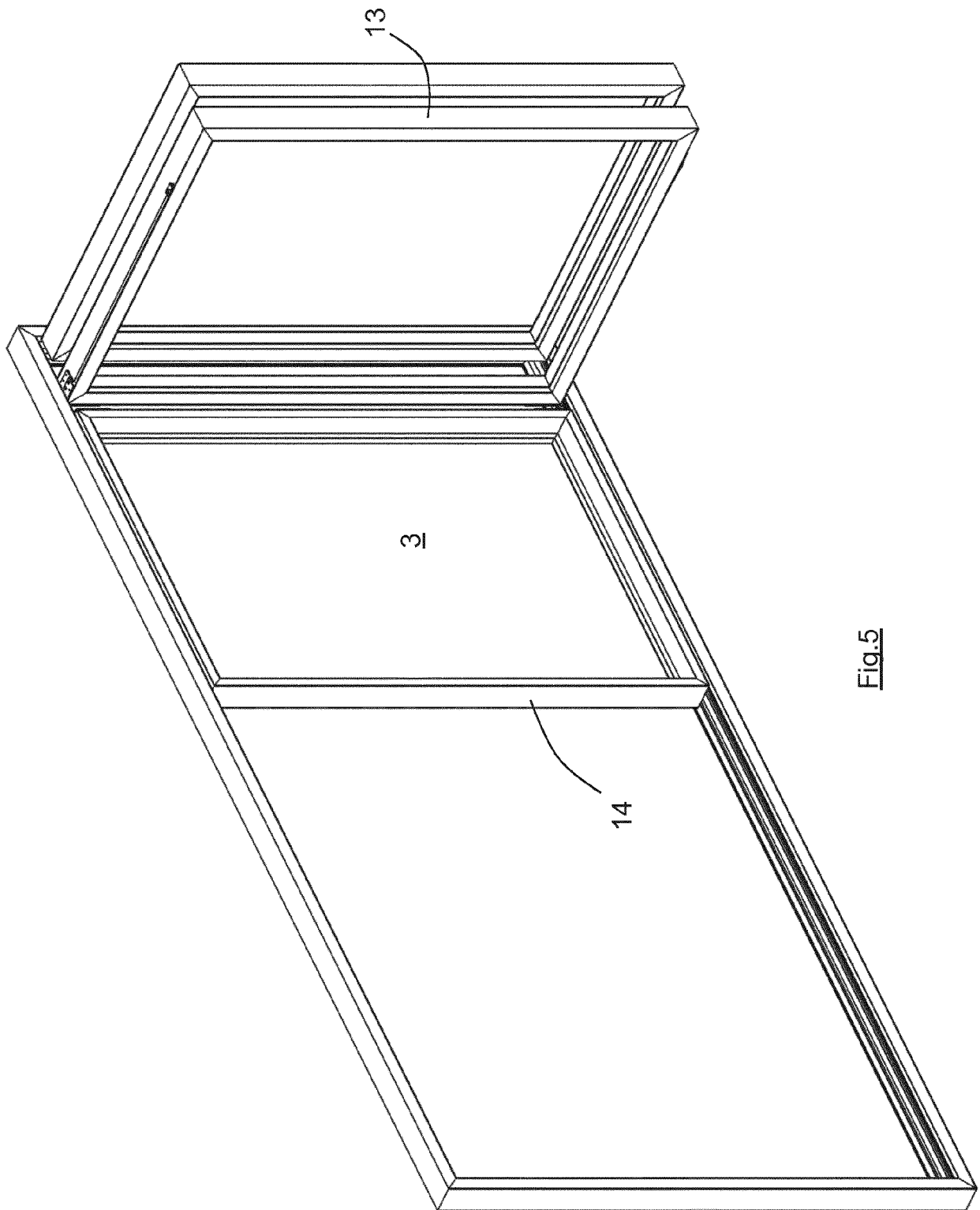
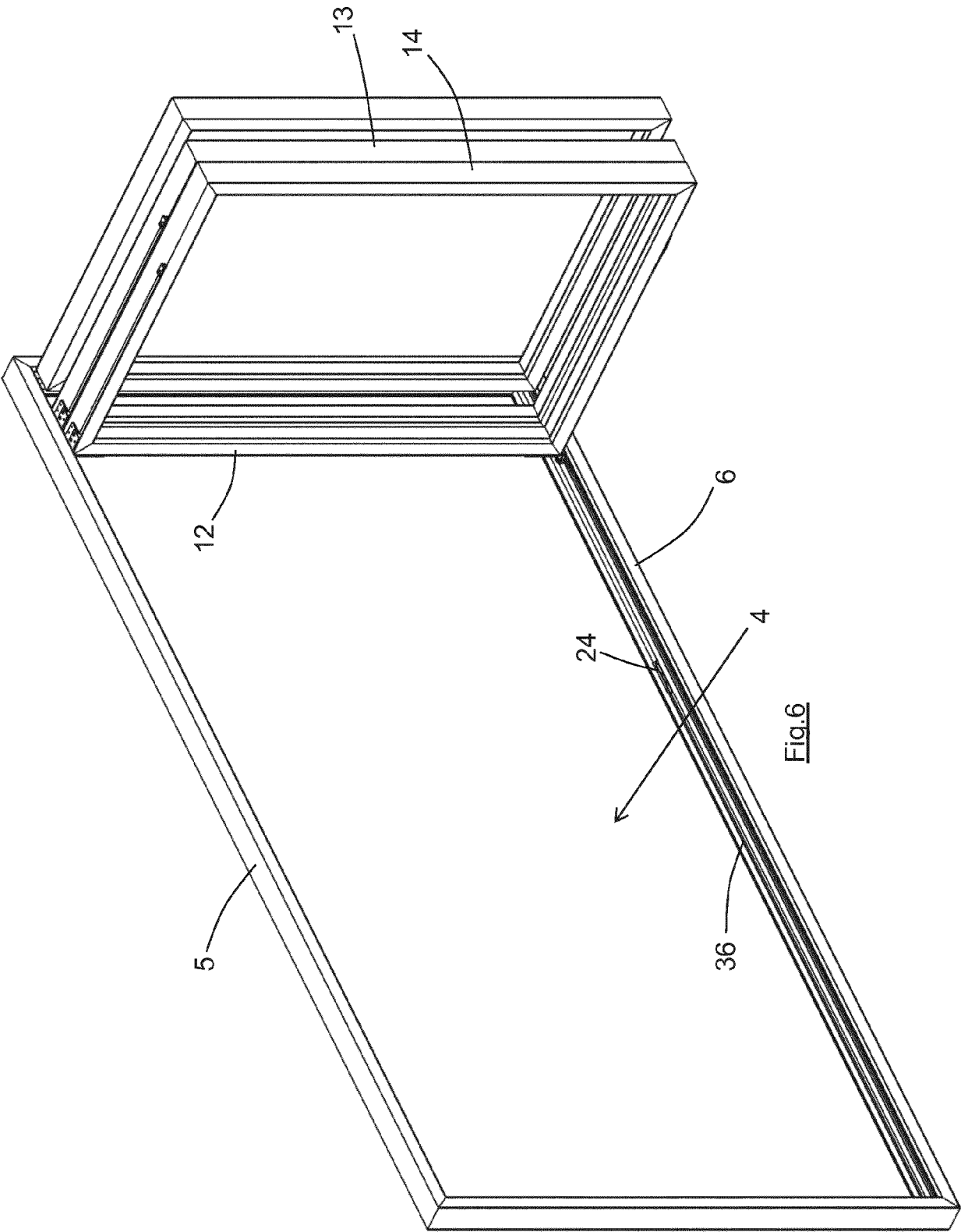


Fig.5



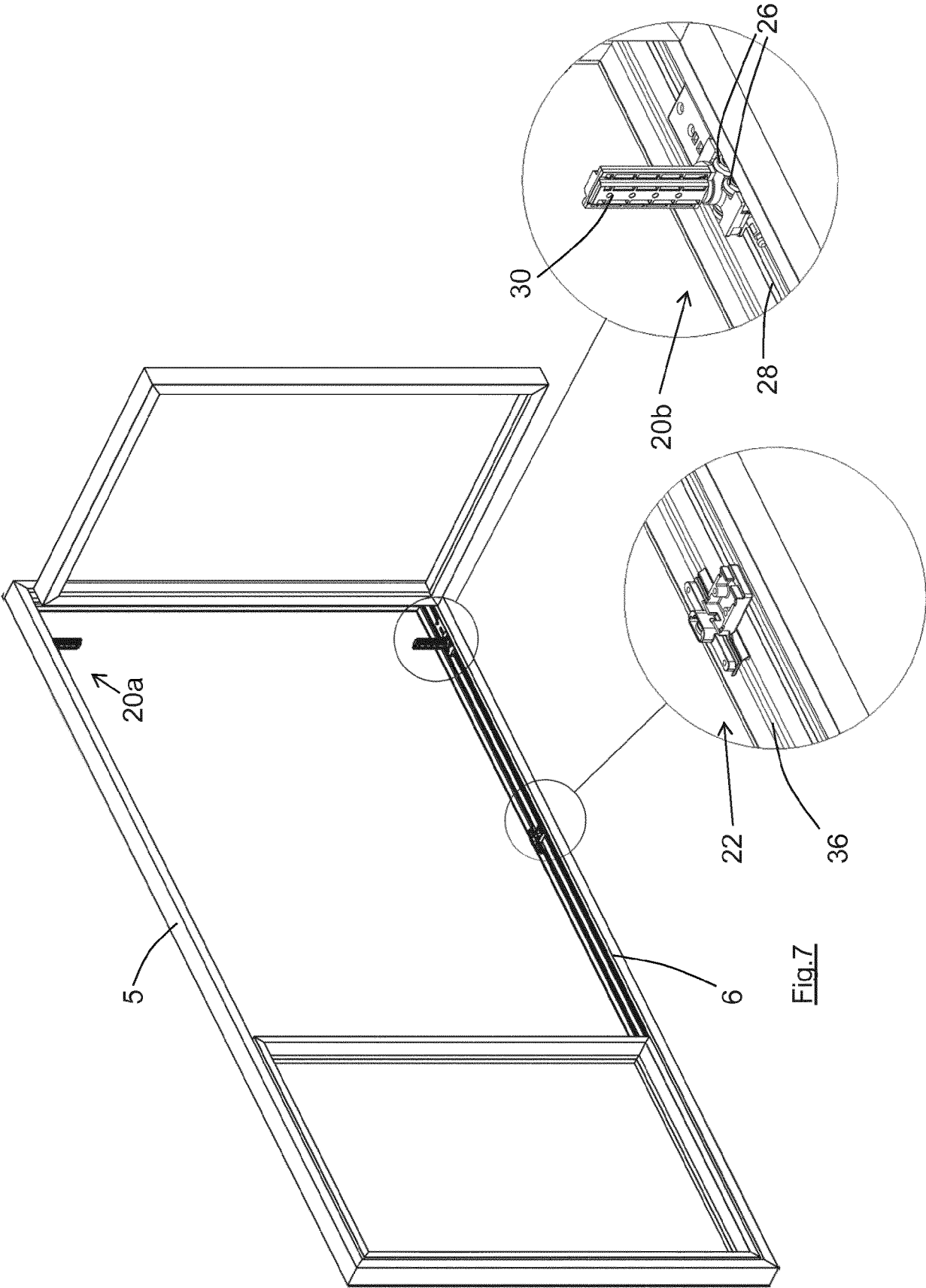


Fig.7

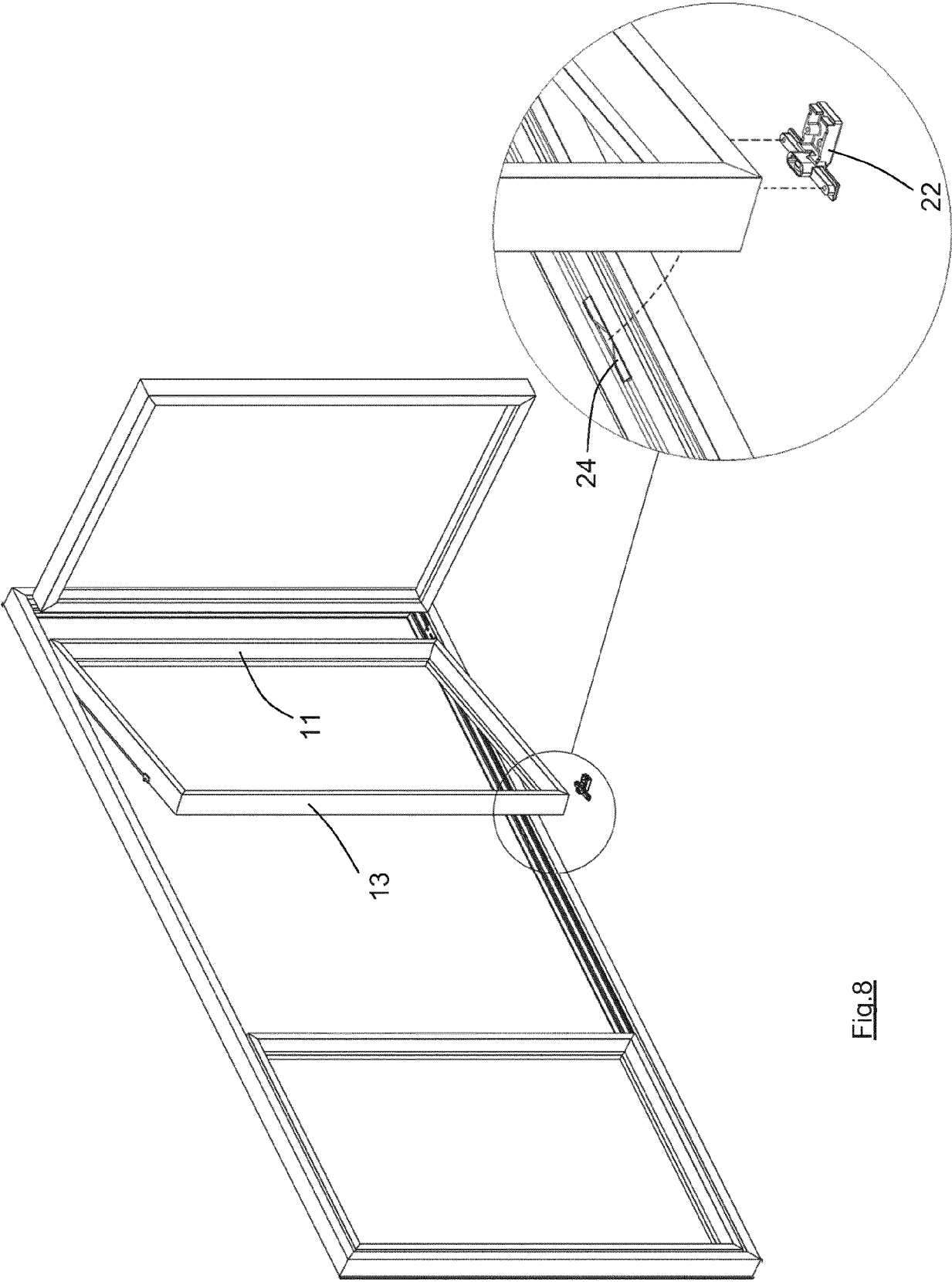


Fig.8

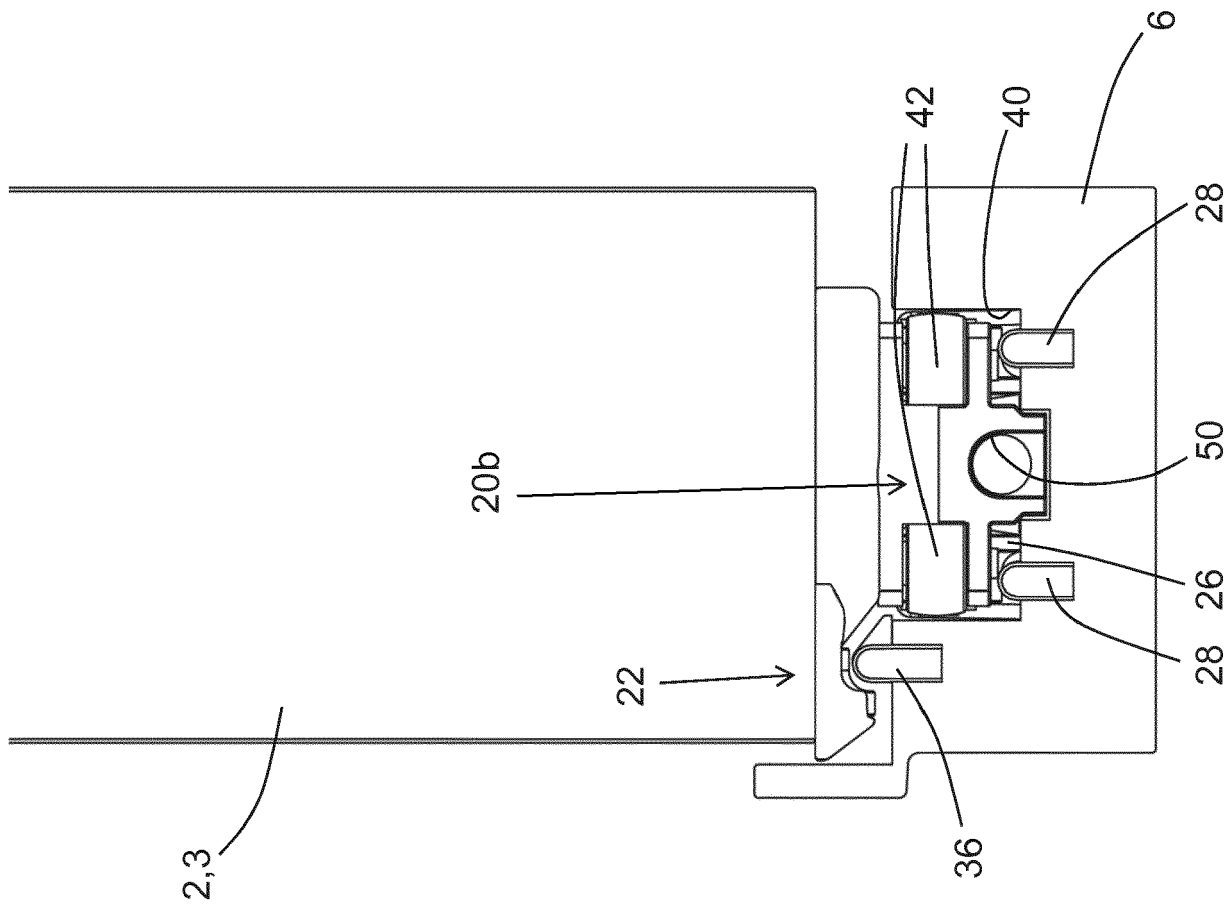


Fig.9

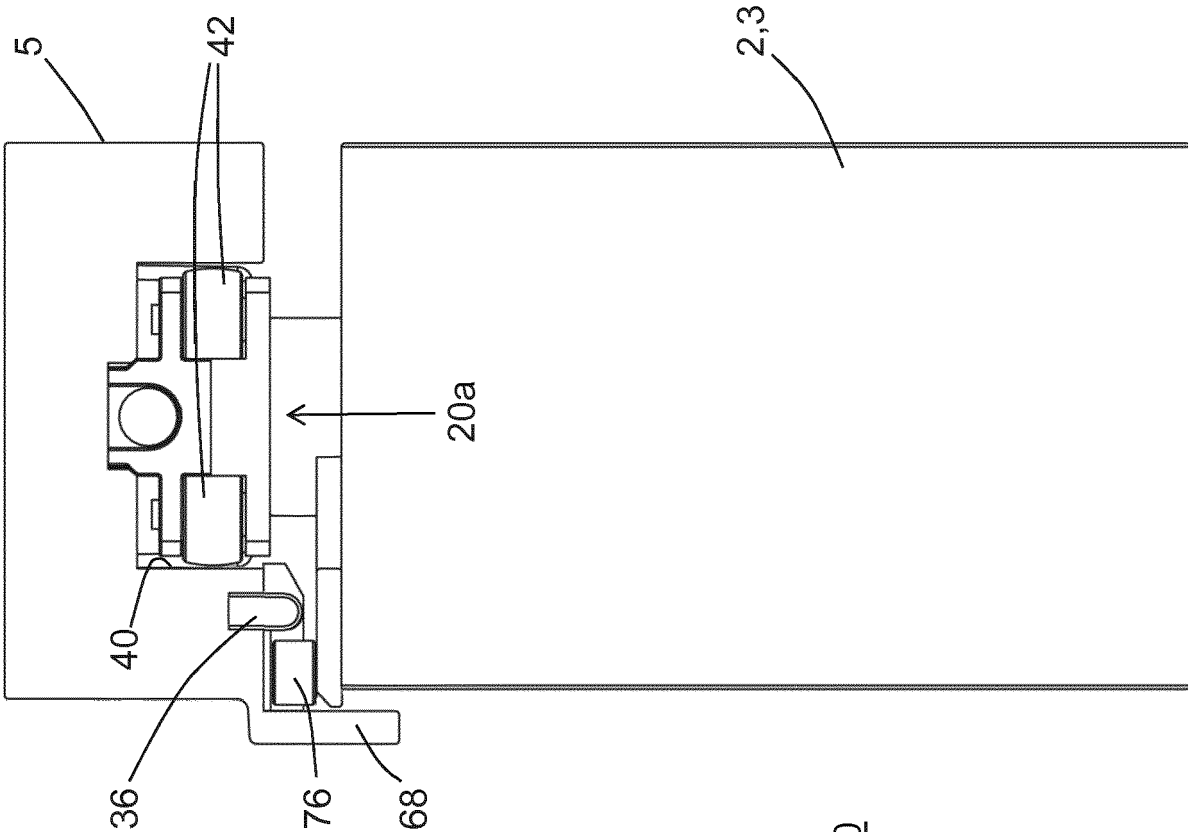
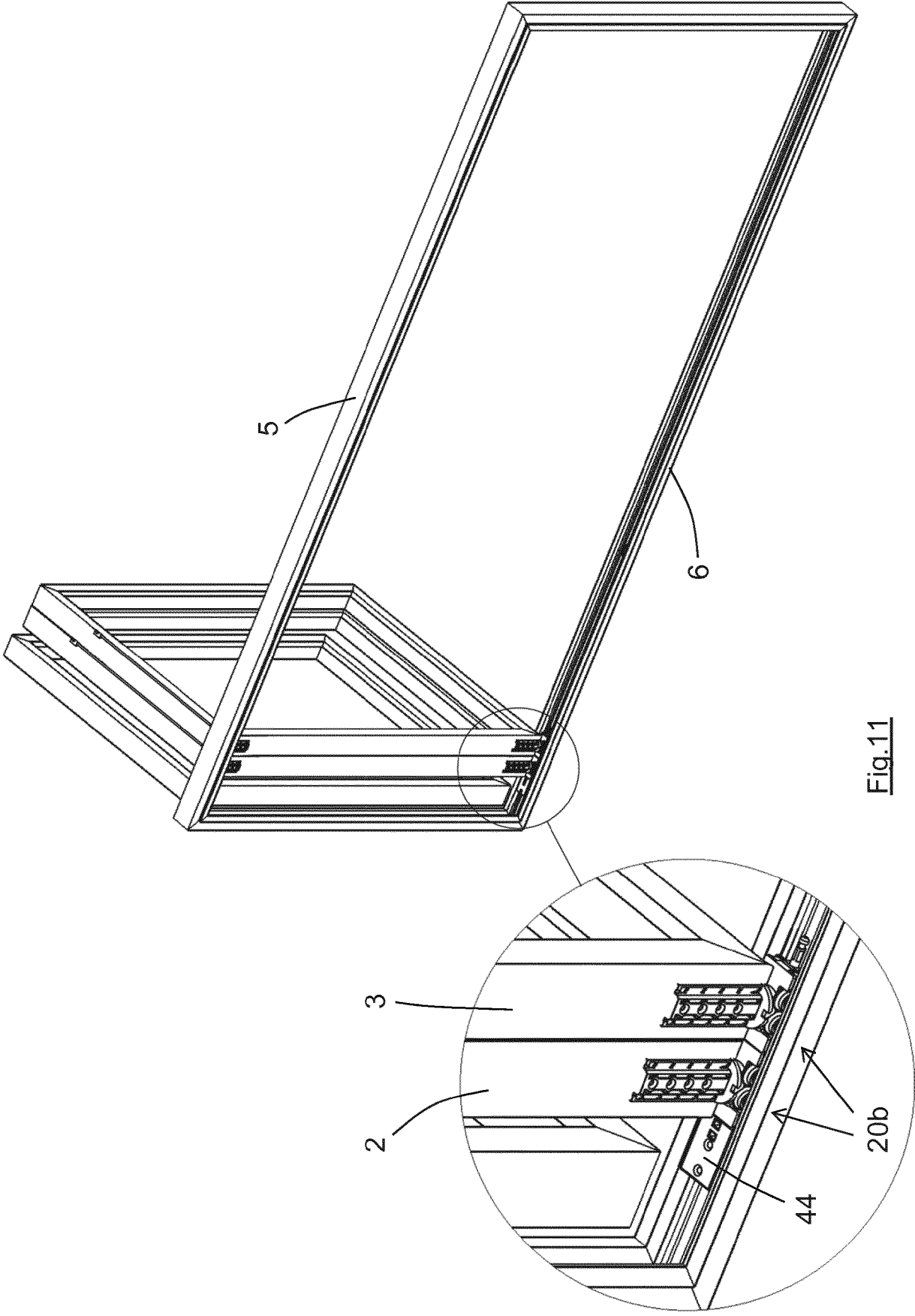


Fig.10



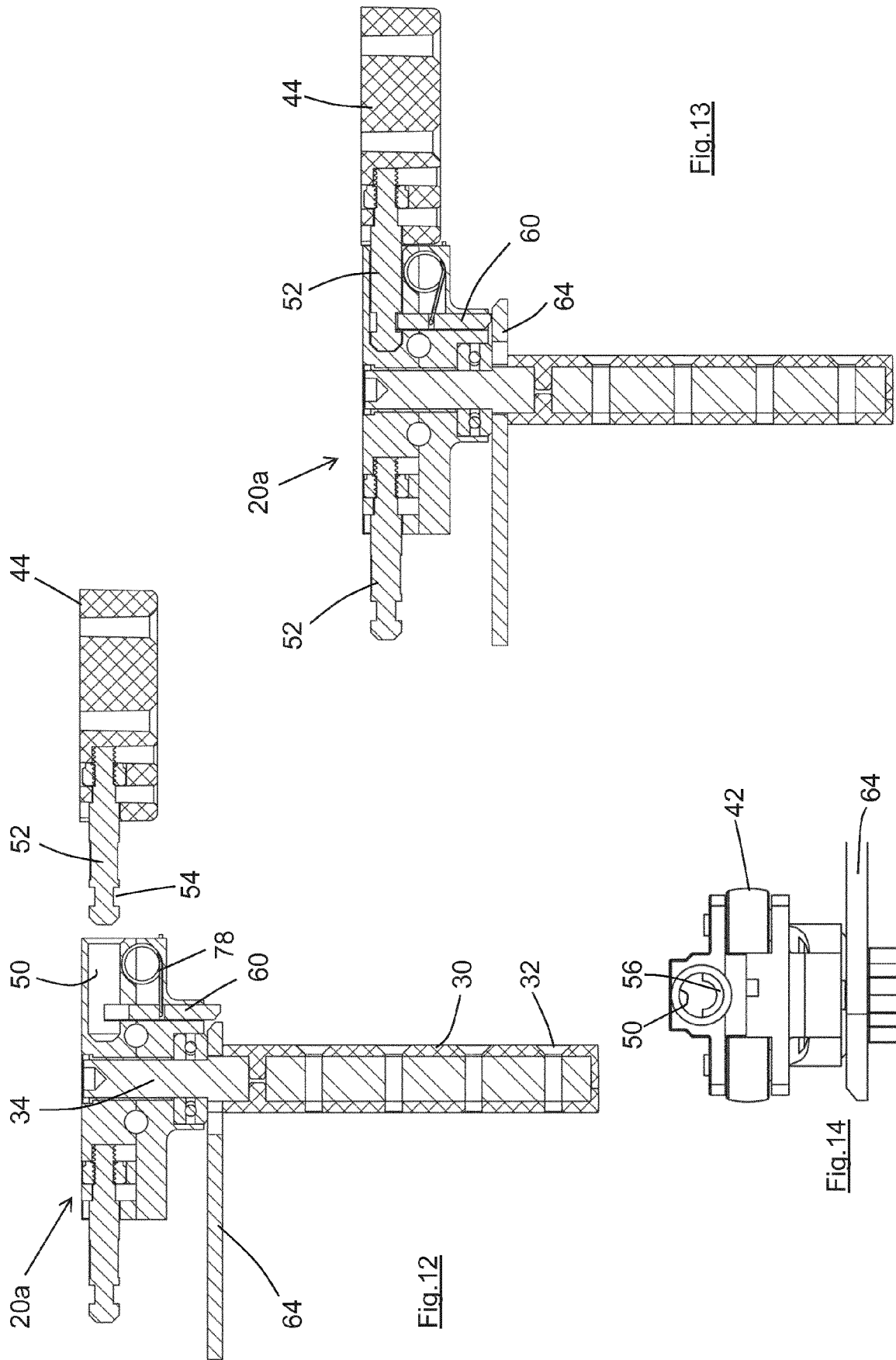
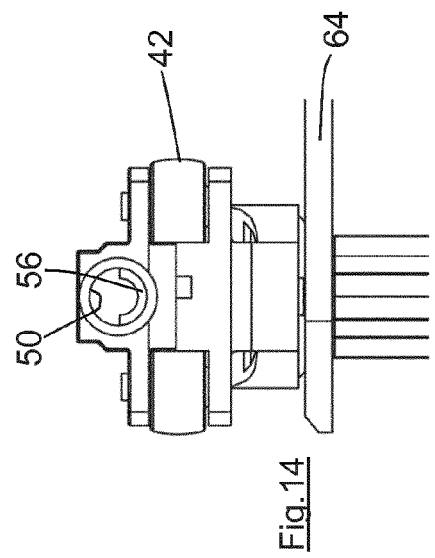


Fig. 13



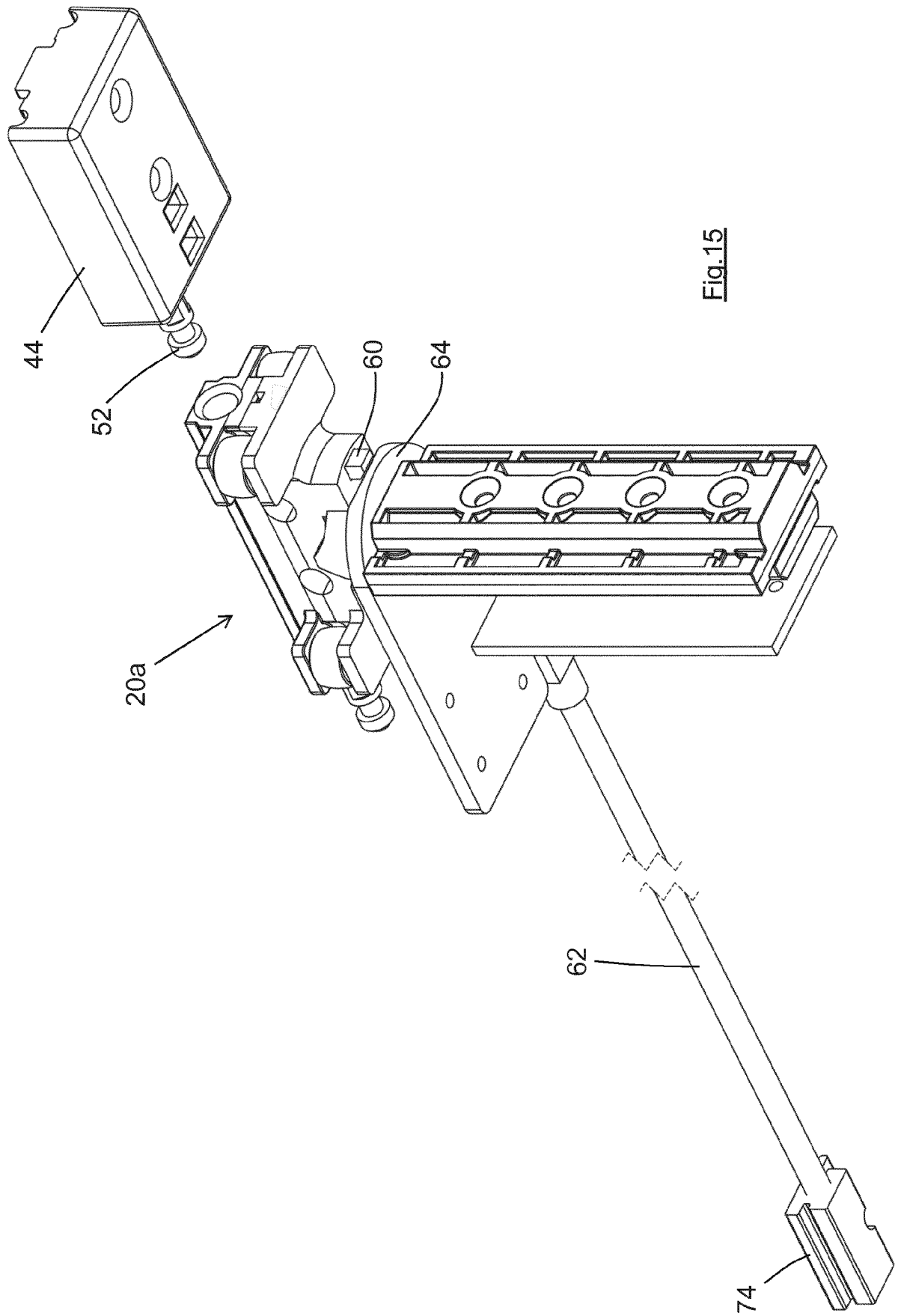
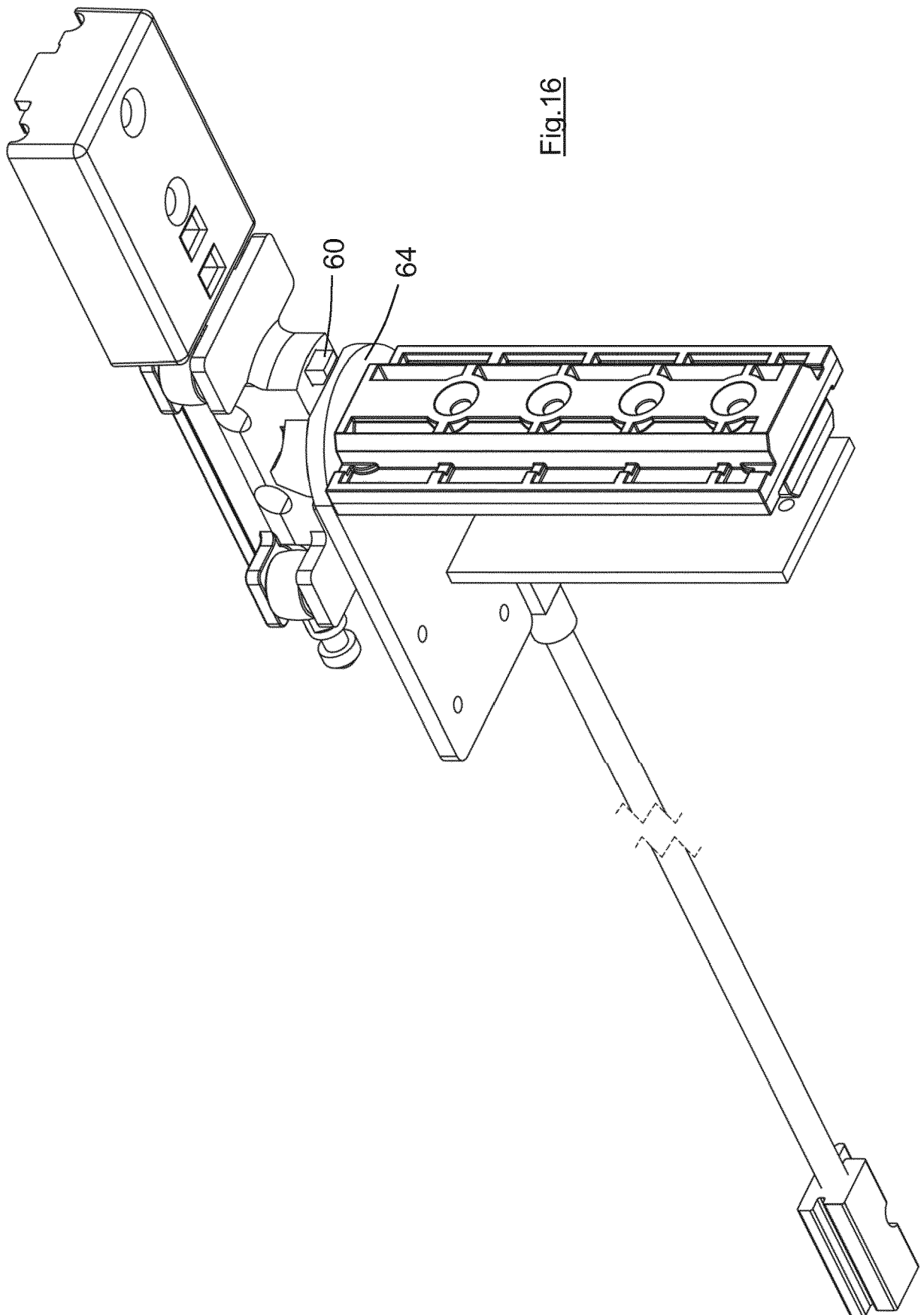
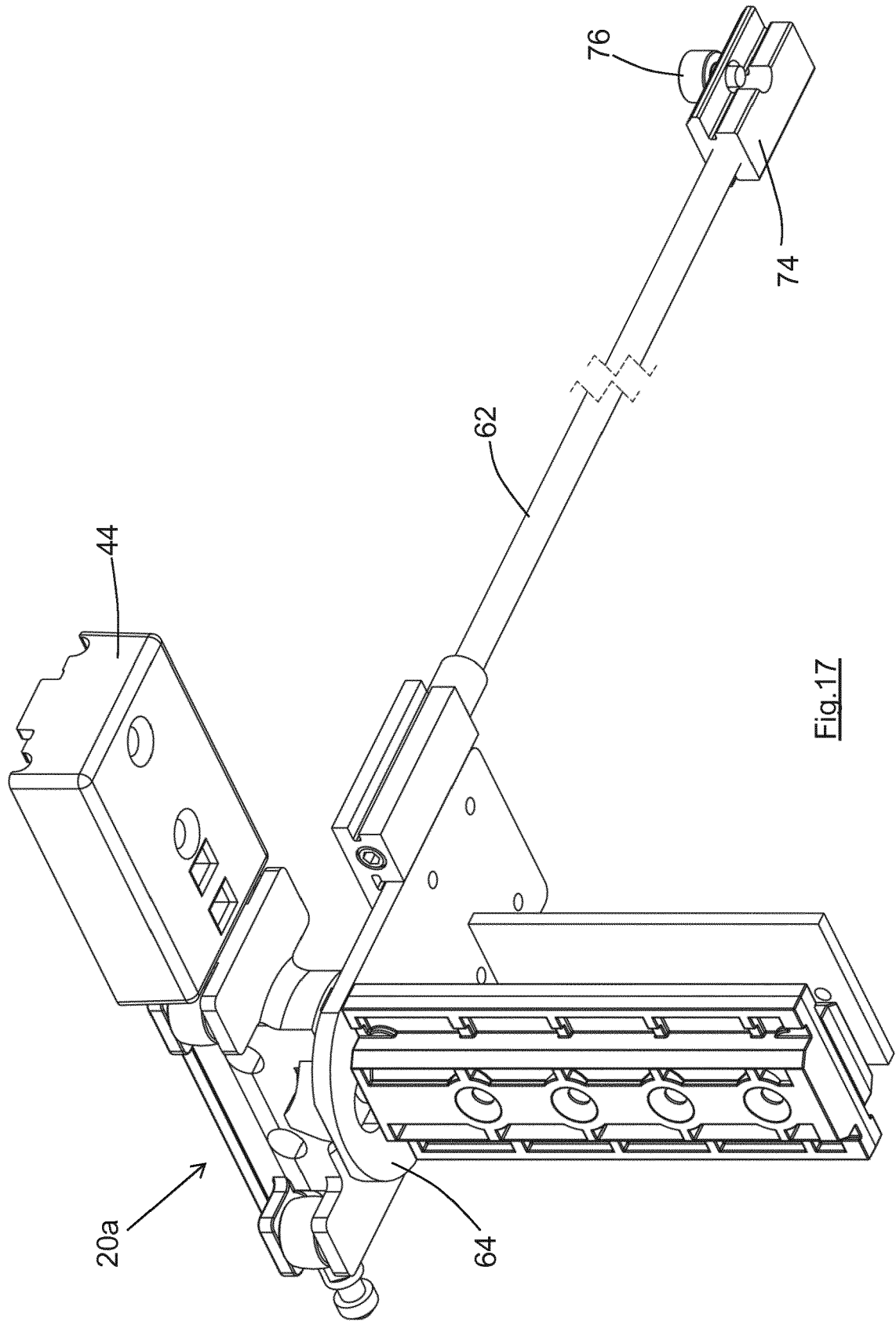
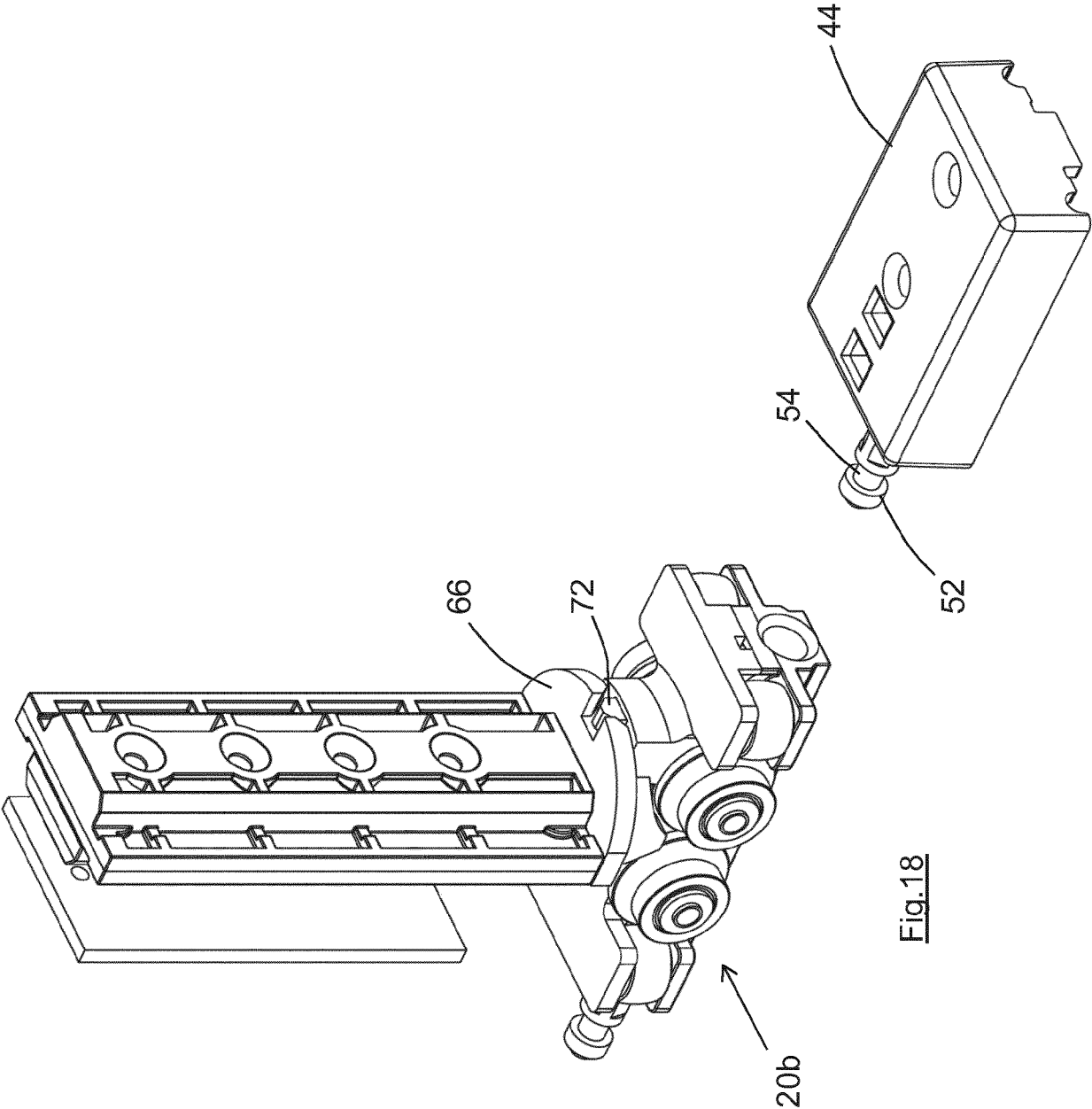
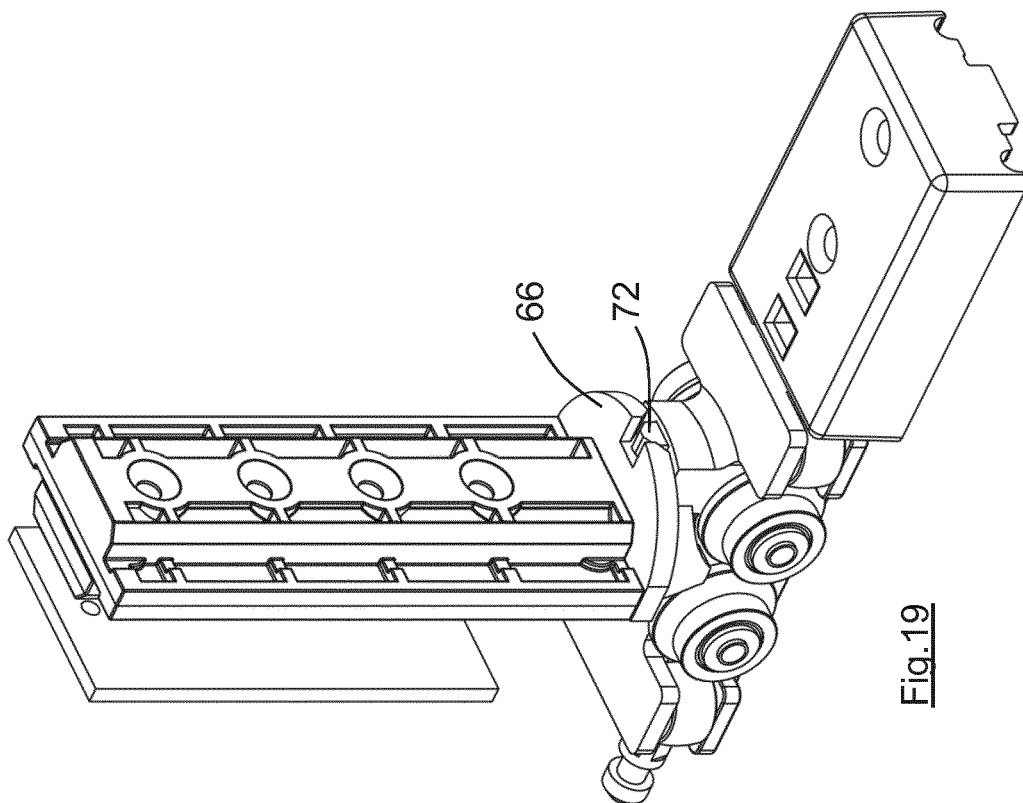
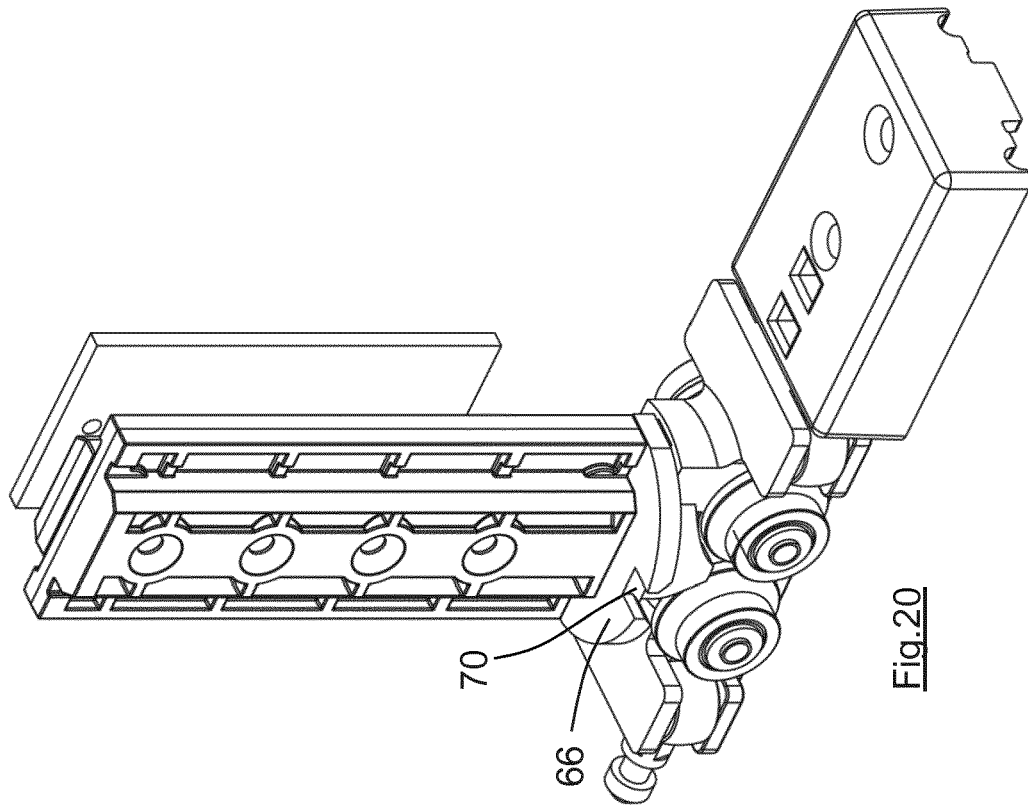


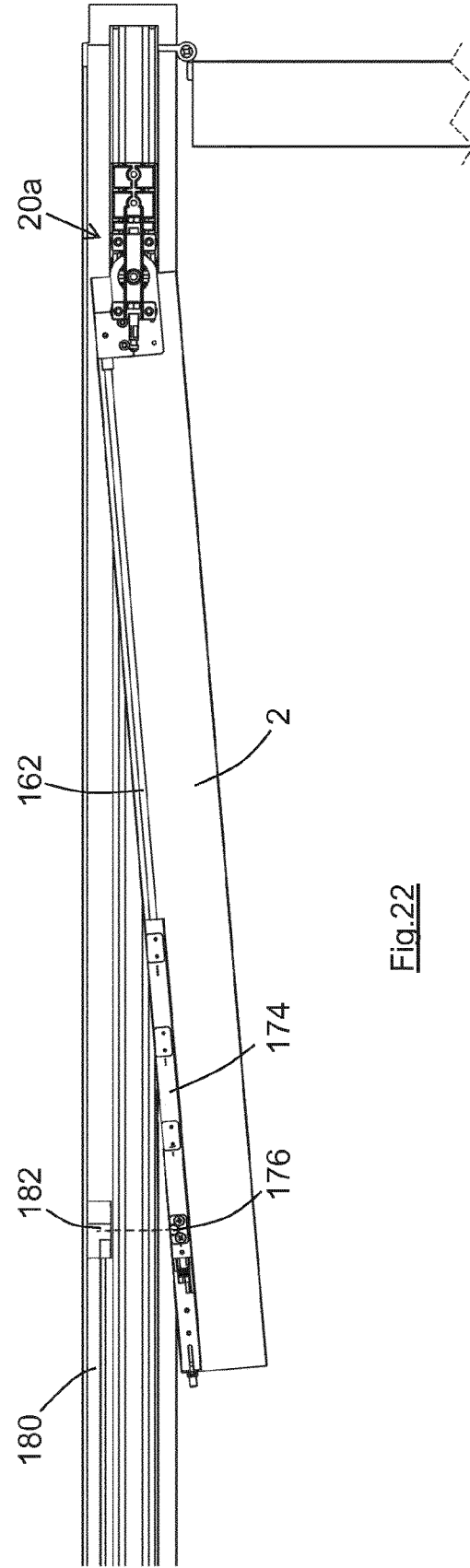
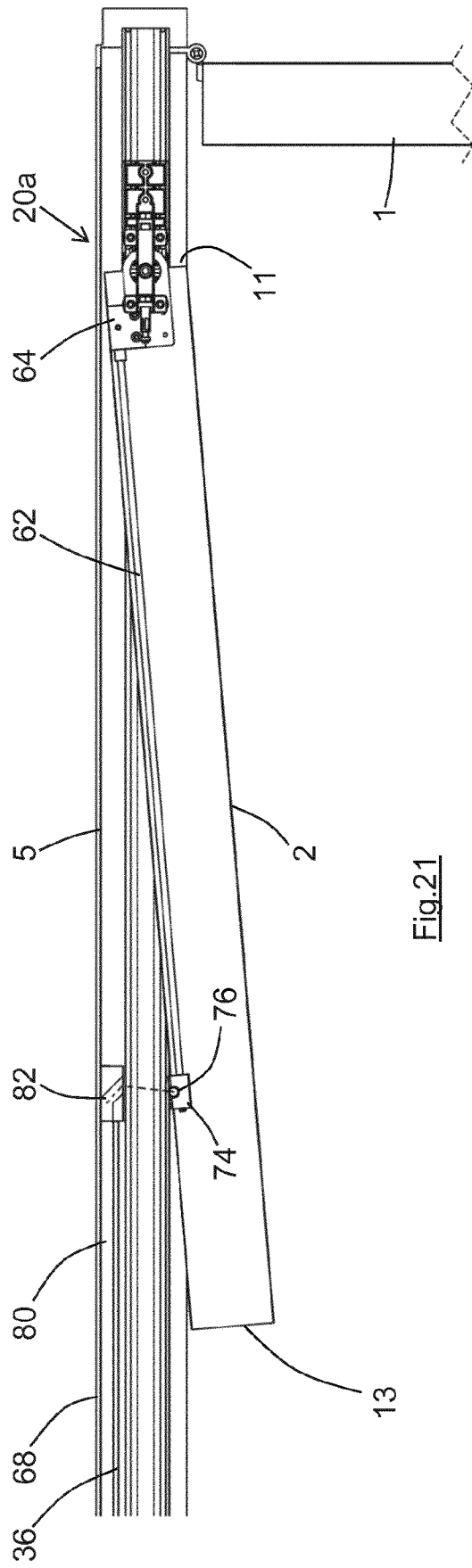
Fig.16











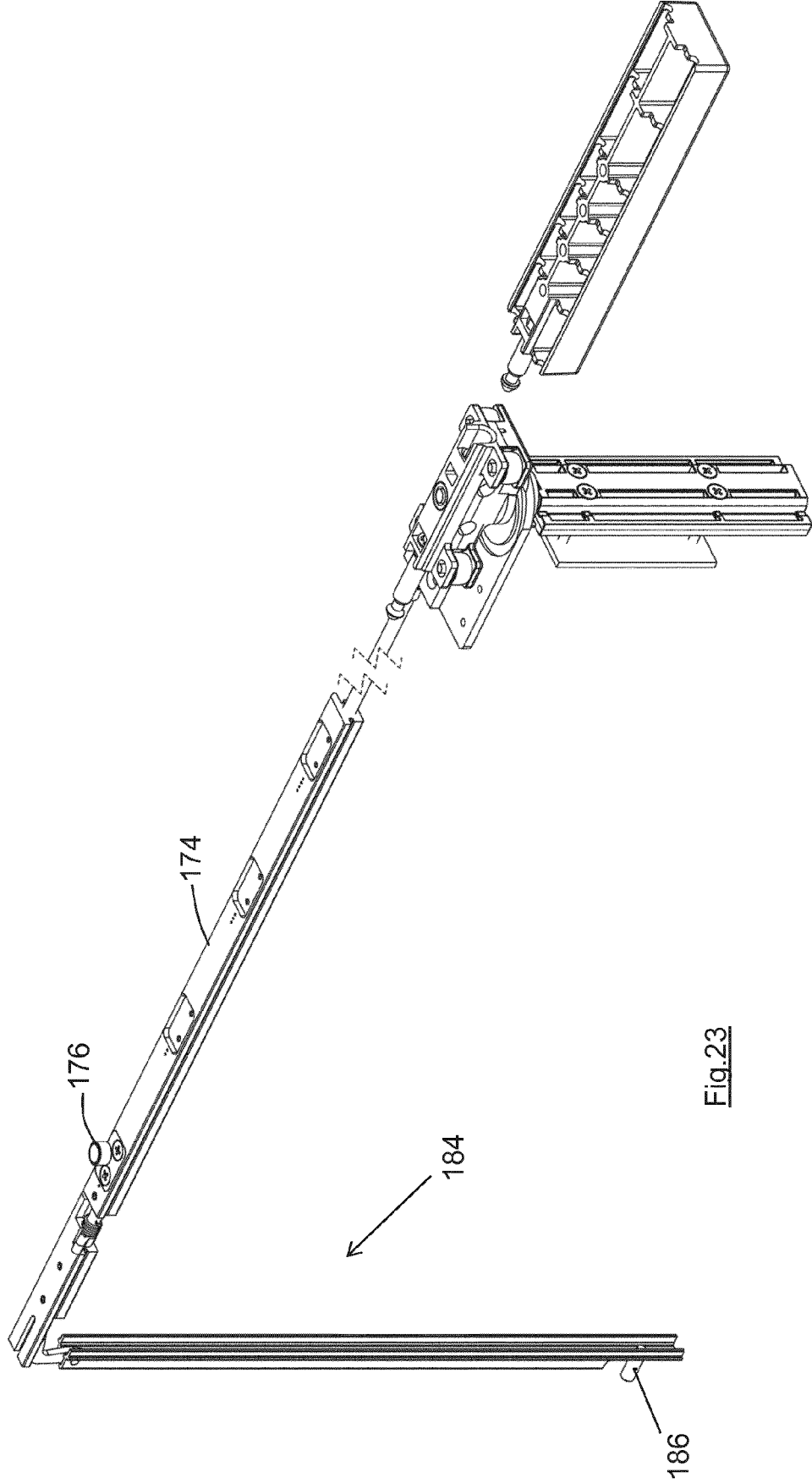


Fig.23

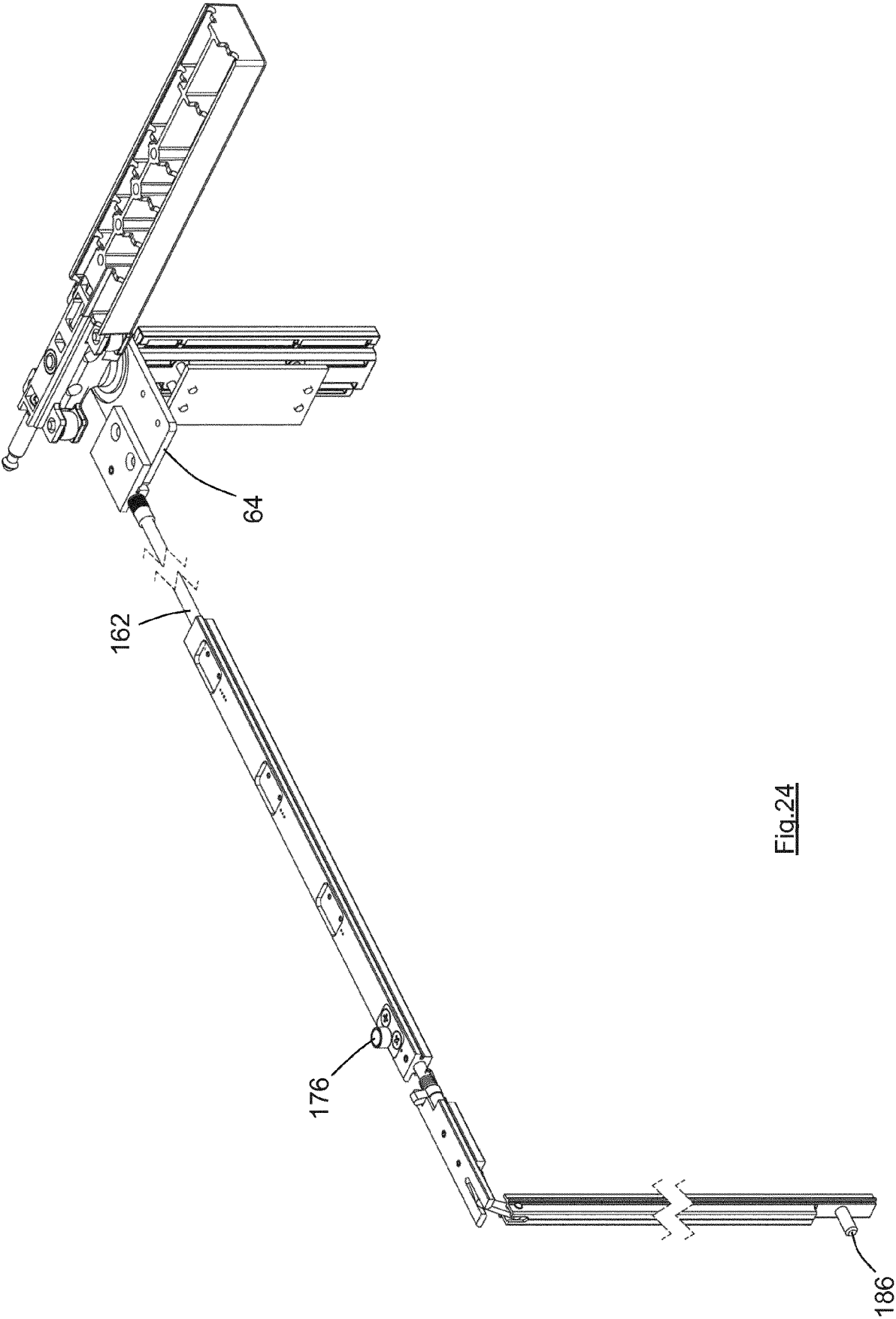


Fig.24

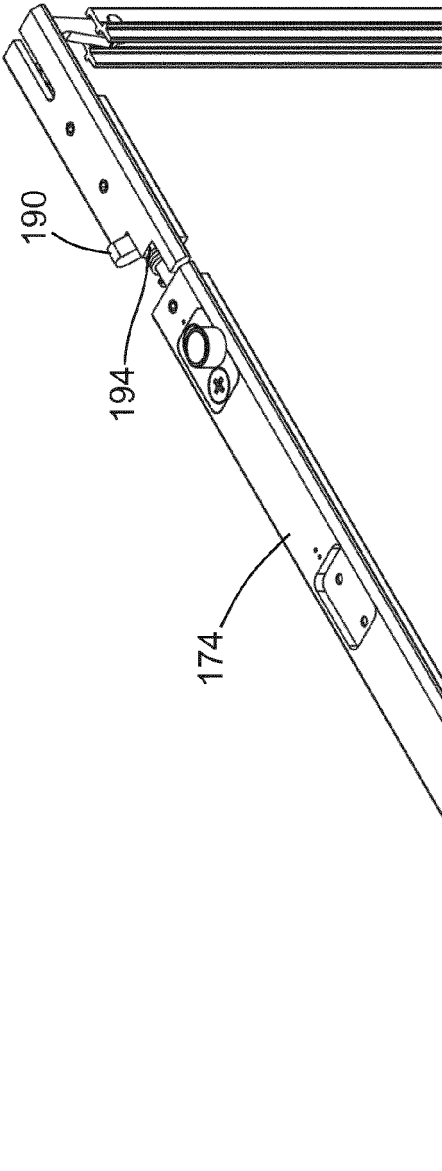


Fig. 25

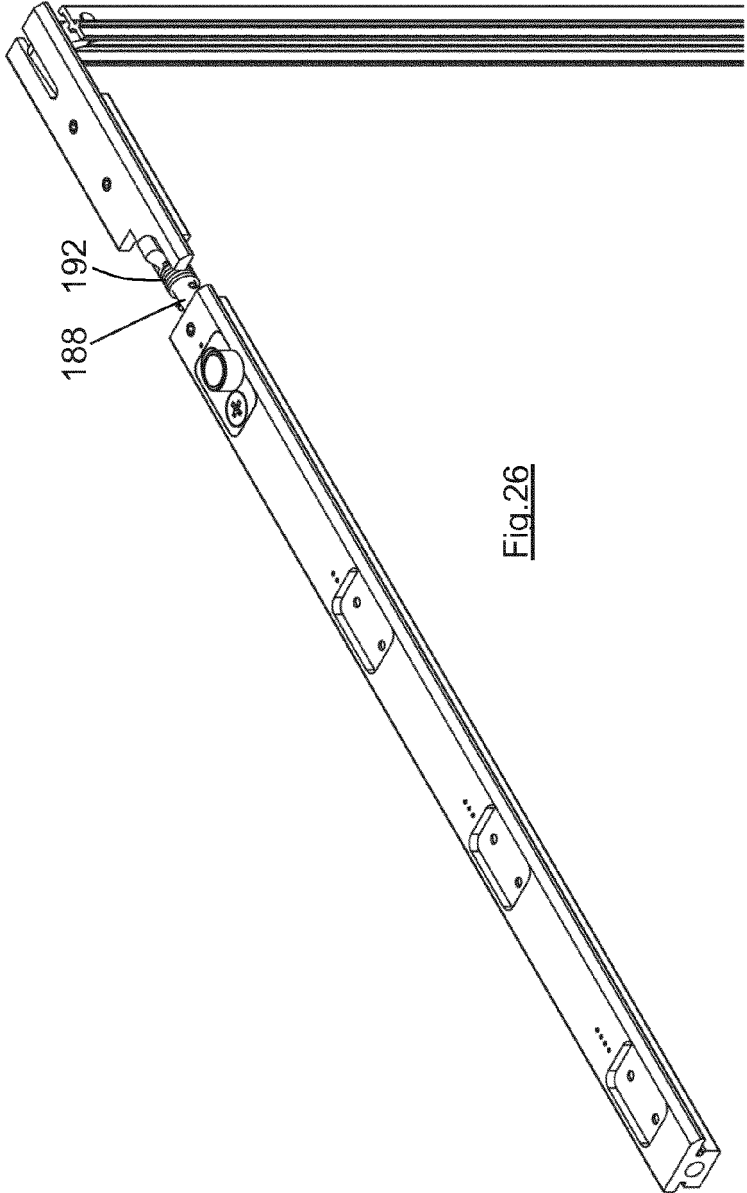
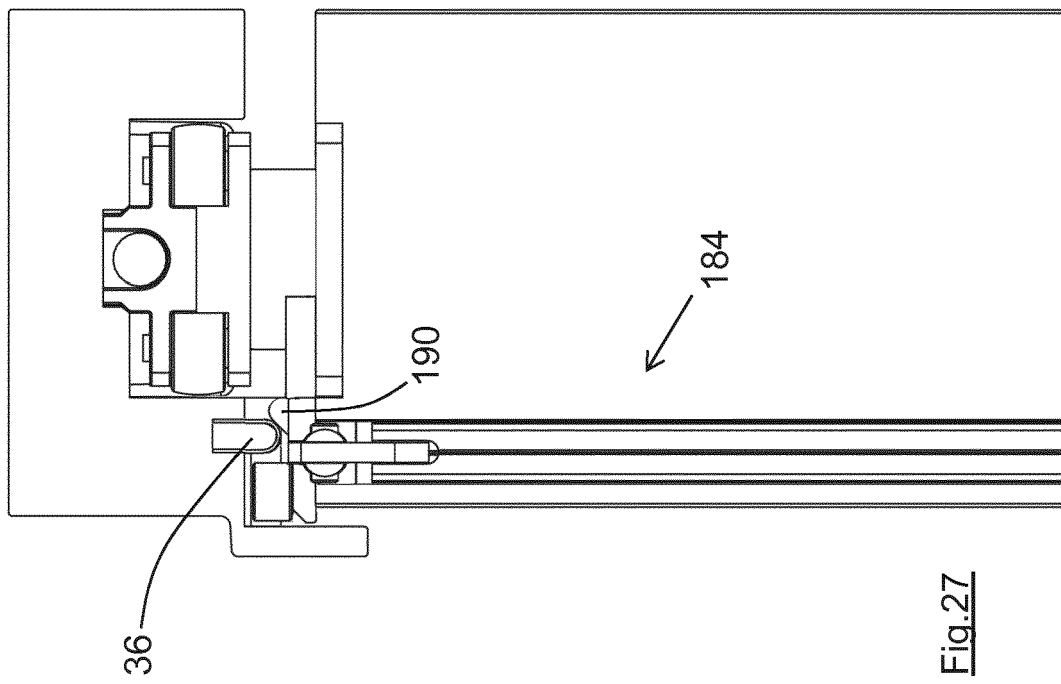
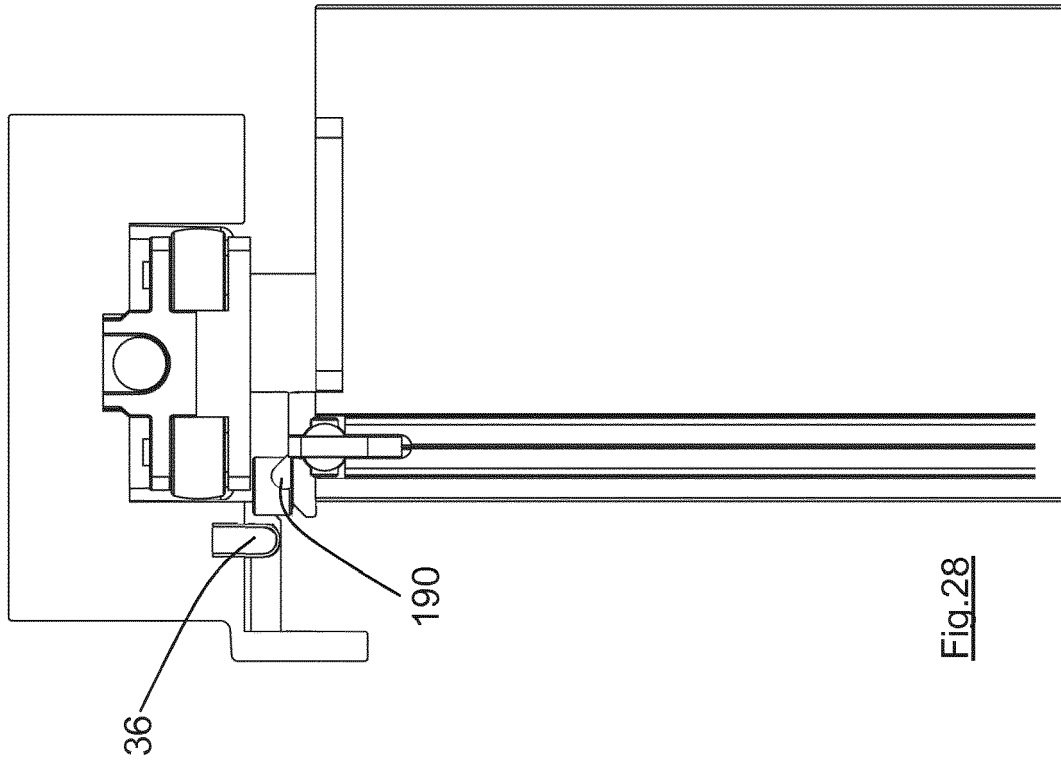
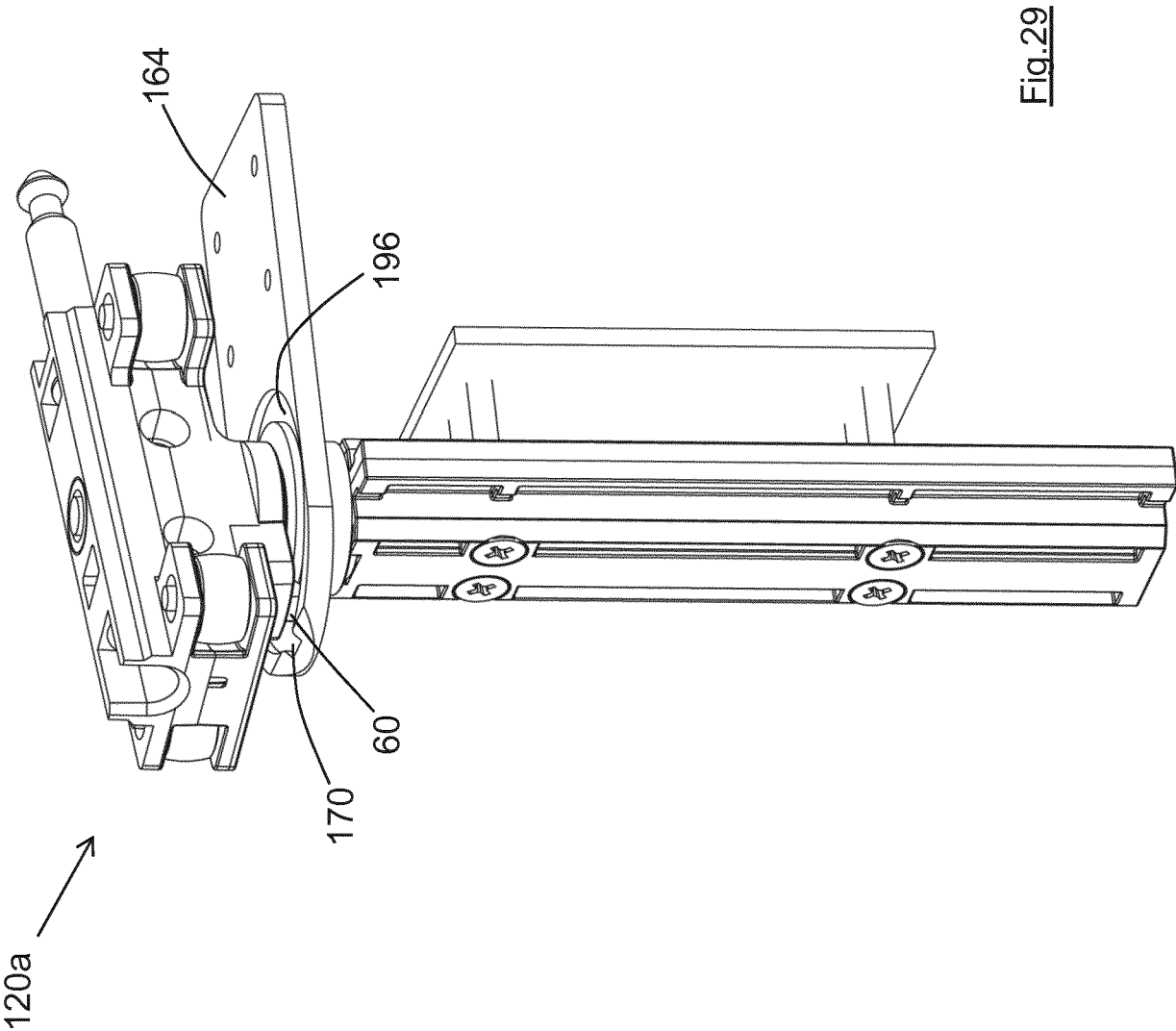


Fig. 26





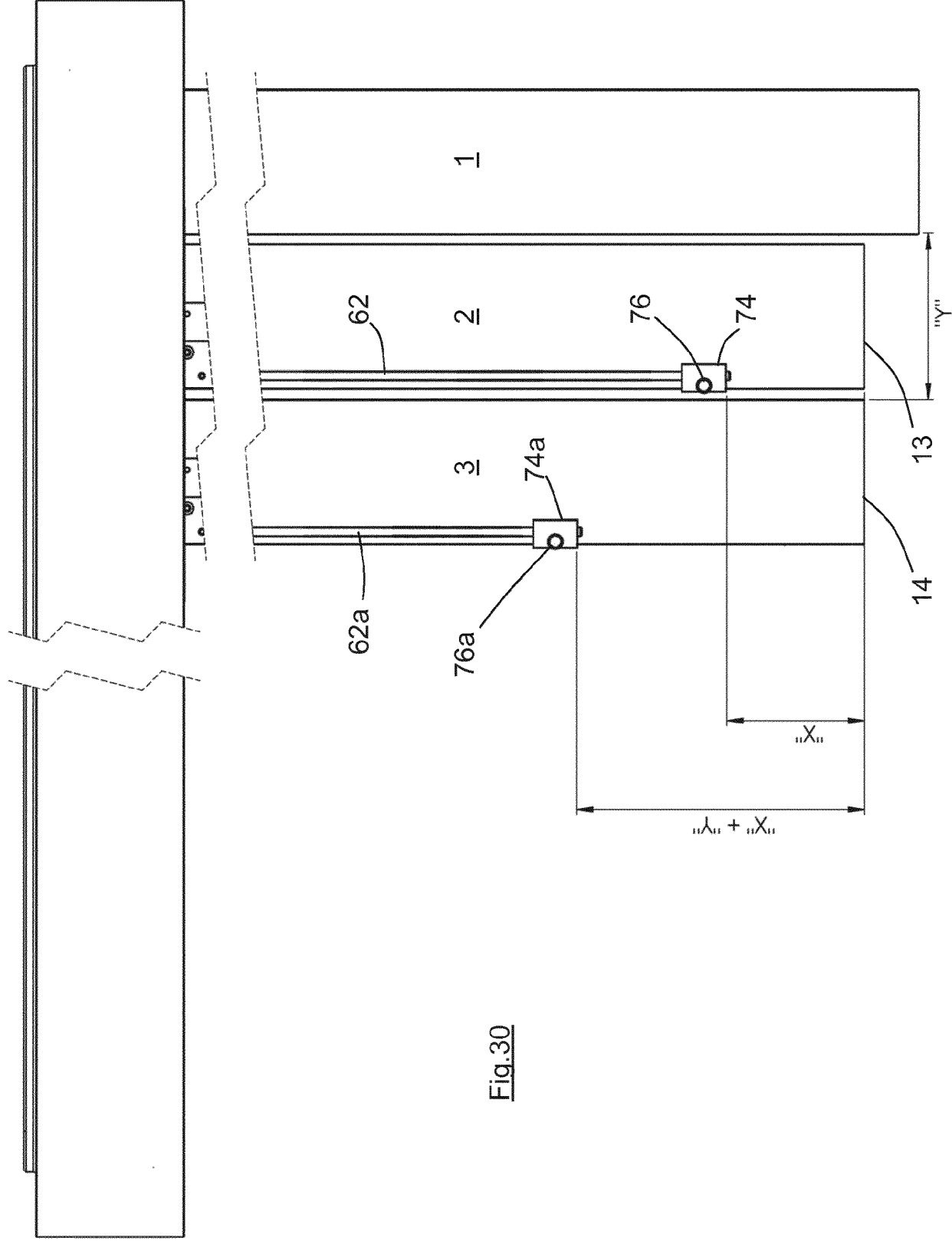


Fig.30

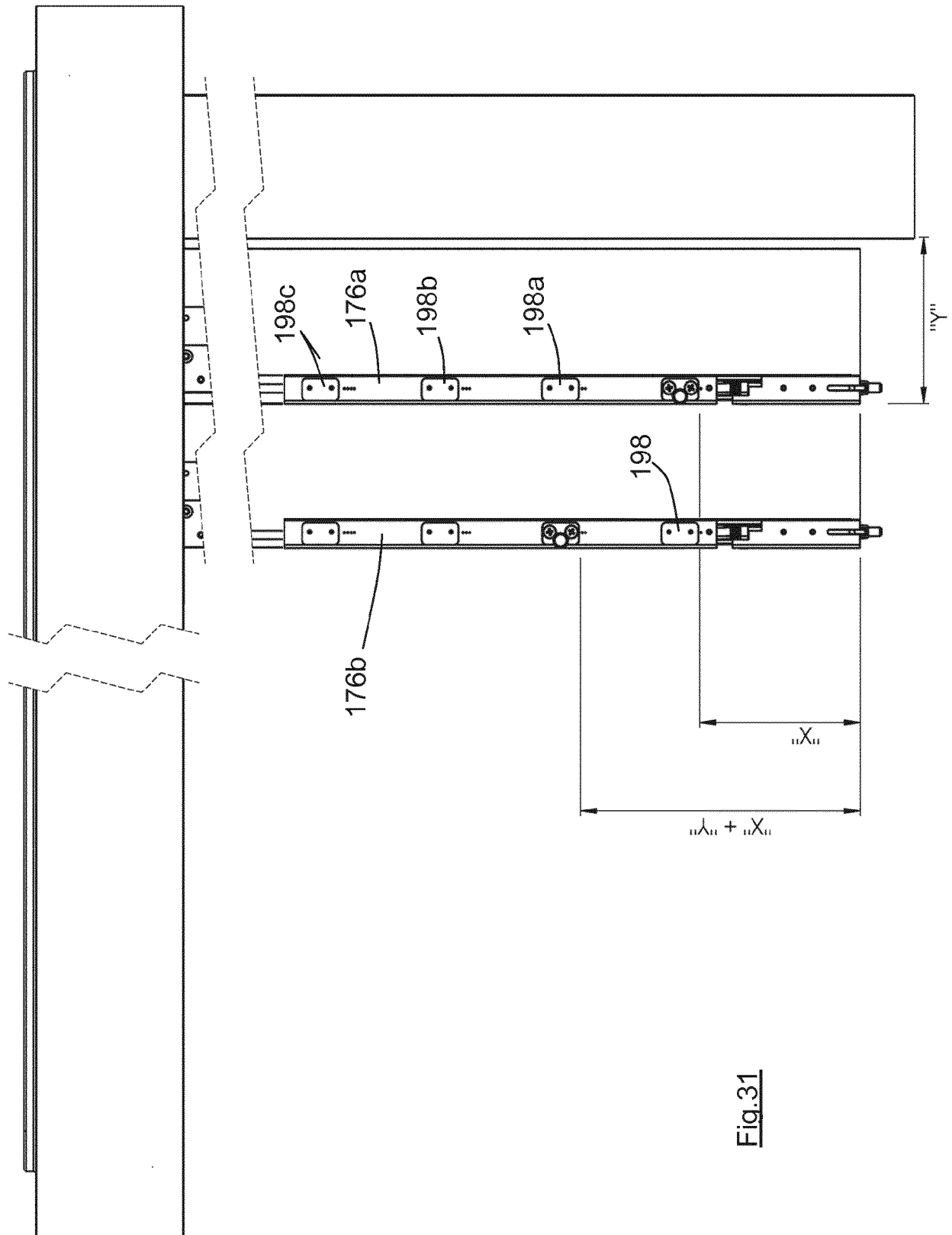


Fig.31



EUROPEAN SEARCH REPORT

Application Number
EP 17 19 8620

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	WO 2016/016801 A1 (METALGLAS BONOMI S R L [IT]) 4 February 2016 (2016-02-04) * paragraphs [0027], [0038], [0059] - [0068] * * figures 1,4,12A,12B,13A,13B,14 *	1-4,14 5-13,15	INV. E05D15/58
X Y A	DE 44 39 475 C1 (WEIKERT DAGMAR [DE]) 20 June 1996 (1996-06-20) * column 3, line 24 - column 4, line 25 * * figures 1,3,4 *	1,4,14,15 5-13 2,3	
X Y A	FR 2 960 015 A1 (COUDER PIERRE [FR]) 18 November 2011 (2011-11-18) * figures 1,3 * * page 2, line 1 - page 3, line 27 *	14,15 5-13 1-4	
A,D	EP 3 075 938 A1 (BANKS J & CO LTD [GB]) 5 October 2016 (2016-10-05) * abstract; figures 7-10 *	1-15	
A	WO 2004/022897 A1 (GLOBAL FINANCIAL ADVISORS LTD; SARNELL JOHAN [SE]; JOHANSSON AAKE [SE]) 18 March 2004 (2004-03-18) * abstract; figures 1,3a *	1-15	TECHNICAL FIELDS SEARCHED (IPC) E05D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 March 2018	Examiner Wagner, Andrea
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	

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 19 8620

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-03-2018

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016016801 A1	04-02-2016	EP 3175069 A1 WO 2016016801 A1	07-06-2017 04-02-2016
DE 4439475 C1	20-06-1996	NONE	
FR 2960015 A1	18-11-2011	NONE	
EP 3075938 A1	05-10-2016	NONE	
WO 2004022897 A1	18-03-2004	AT 321186 T AU 2003261688 A1 CN 1694995 A DE 60304219 T2 DK 1556574 T3 EP 1556574 A1 ES 2262013 T3 HK 1081248 A1 PT 1556574 E RU 2328585 C2 SE 0202668 A US 2005229512 A1 WO 2004022897 A1	15-04-2006 29-03-2004 09-11-2005 04-01-2007 31-07-2006 27-07-2005 16-11-2006 22-09-2006 31-08-2006 10-07-2008 07-03-2004 20-10-2005 18-03-2004

EPO FORM P0459

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

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

- US 2011009461 A **[0021]**
- WO 2009141494 A **[0022]**
- EP 3075938 A **[0023] [0051] [0053] [0054] [0057]**
- WO 2011135131 A **[0025]**
- DE 102010037604 **[0025]**