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## (54) LIFT AND SLIDE DOOR OR WINDOW AND REGULATING METHOD THEREOF

(57) An adjusting device (100) for a lift-and-slide door or window comprising a leaf (A) and a fixed frame (T) and in which the leaf (A) is slidably movable along an opening and closing direction (X) to come to abut mechanically on the fixed frame (T), said adjusting device (100) comprising a support element (10) inserted or insertable into a housing (T1, A1) made in one between the frame (T) and the leaf (A), said support element (10) presenting a first wall (11a) and a second wall (11b) substantially opposite said first wall (11a); a support seat (12) made in the first wall (11a) of the support element (10) and extending through the support element (10) to the second wall (11b); an adjustable pin (20) housed in said support seat (12) and comprising a head end (21a), protruding operationally from said support seat (12) and engageable in a guide (G) placed in a housing (T1, A1) obtained in the other said frame (T) or said leaf (A), and a bottom end (21b) inserted into said support seat (12), said adjustable pin (20) being movable along the support seat (12) to assume a plurality of stable positions comprised between a first maximum insertion position of the adjustable pin (20) in the support seat (12), and a second minimum insertion position of the adjustable pin (20) in the support seat (12); locking means (30) configured to lock the adjustable pin (20) in one of said stable positions in the support seat (12). Further, an adjusting method is disclosed for adjusting a lift-and-slide door or window, in particular to compensate for an anomalous distance ("air-gap") between the leaf and frame because of the out-of-plumb position.

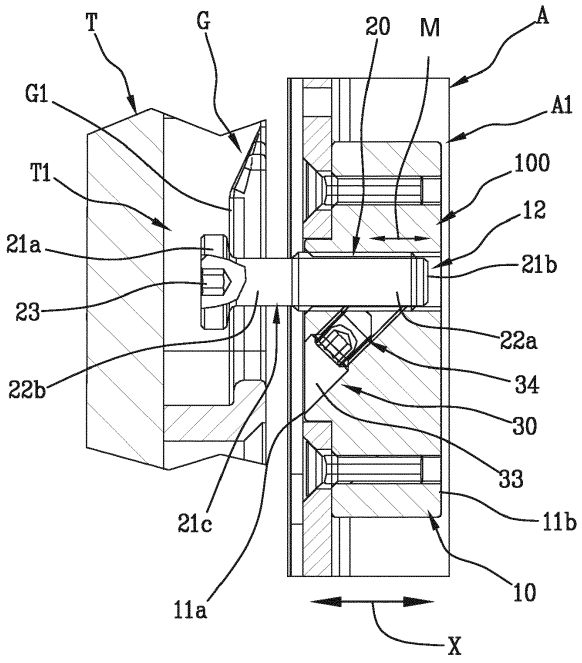


Fig.1A

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## Description

**[0001]** The object of this invention is a lift-and-slide door or window and an adjusting device that is used in the field of doors or windows, in particular lift-and-slide doors or windows.

**[0002]** Further, the present invention relates to a method for adjusting the so-called "airgap" between a fixed frame and a leaf of a lift-and-slide door or window. The term "airgap" means the space present between the leaf of the door or window in the closed position and the frame.

**[0003]** The term "lift-and-slide" means a door or window in which the leaf in the closed position is in a lowered position and rests on the lower base of the fixture of the door or window whereas, in order to slide from the closed position to the open position, the leaf is raised relative to the lower base of the fixture, which is generally called the "threshold".

**[0004]** In particular, the adjustment of the airgap of a lift-and-slide door or window is normally necessary to compensate for a possible "out of plumb" position of the leaf and/or of the frame, for example because of imperfections of the floor and/or of the masonry work in which the door or window is installed.

**[0005]** Sliding doors or windows, in particular for French windows, comprise a leaf made of a glass panel surrounded by a cornice.

**[0006]** This cornice comprises at least one upright configured to come into abutment with the frame, when the leaf is in the closed position. In particular, the upright of the cornice of the leaf has both a structural and housing-connection function for the necessary devices (so-called "hardware") for sliding the leaf and locking the leaf in the closed position.

**[0007]** Normally, to lock the leaf of the door or window in the closed position, fixed pins are used that are mounted on the frame or on the leaf and configured to be inserted into guides made, respectively, on the frame (if the pin is mounted on the leaf) or on the leaf (if the pin is mounted on the frame). In this situation, at the moment of closure of the door or window, each pin is inserted into the respective guide so as to ensure that the leaf is kept in the closed position.

**[0008]** More in detail, in known lift-and-slide doors or windows, the pins are mounted on a control rod positioned in the upright of the cornice of the leaf and movable by a handle. In this situation, by moving the handle, the control rod is moved along a vertical direction together with the pins. In particular, when the leaf is taken to the closed position and the pins are inserted into the respective guides, the rod is lowered so as to hold the pins within recesses of the guides, thus ensuring locking of the leaf in the closed position. On the contrary, in order to enable the leaf to be opened, the handle is activated in such a manner that the control rod is lifted to raise the pins, freeing the pins from the recesses of the guides and thus permitting opening of the leaf.

**[0009]** At the moment of installation of the lift-and-slide door or window, the frame or the leaf may be misaligned relative to one another. This misalignment is due to an out-of-plumb position like for example a wall on which the frame is mounted or a floor on which the leaf slides.

**[0010]** The term "out-of-plumb" means an off-axis position of a general surface on which the leaf and/or the frame rest relative to what is envisaged in the design step. Owing to this irregular position, the frame and the leaf assume anomalous inclinations that do not permit a complete mechanical abutment between the upright of the frame and that of the leaf, when the latter is in the closed position.

**[0011]** In this situation, at the moment of closure of the leaf, the vertical upright of the cornice of the leaf does not adhere precisely to the respective upright of the frame. Disadvantageously, the upright of the cornice and/or the upright of the frame are thus inclined with respect to the vertical direction and this prevents the reciprocal mechanical abutment and thus the correct closure of the door or window. In this situation, at the moment of closure of the leaf, the pins are unable to be inserted correctly into the respective guides and accordingly, when the control rod is moved, the pins are unable to engage the recesses to lock the leaf. Accordingly, the door or window loses efficiency because as it does not allow the leaf to be locked in the closed position, it lets draughts pass through at the points in which the uprights do not adhere to one another. Further, the door or window is less secure against break-ins.

**[0012]** One need that is particularly felt in the sector of doors or windows is thus that of being able to compensate for the out-of-plumb position of the leaf and frame by adjusting the airgap of the door or window.

**[0013]** In other words, a particularly felt need is that of permitting, also in the case of the presence of out-of-plumb positions, correct insertion and locking of the pins into the respective guides so as to ensure locking of the leaf in the closed position.

**[0014]** In general, the need to compensate for, also as far as neutralizing, an anomalous space ("airgap") between the leaf and the frame when the leaf is in the closed condition can arise also regardless of the out-of-plumb position. For example, the anomalous space can also be caused by the misalignment of the leaf, or of the frame or, also, by dimensional tolerances, like for example on the length of the leaf and/or of the pins. Currently, adjusting the airgap of the door or window by means of known mechanisms is difficult and expensive.

**[0015]** In particular, in known lift-and-slide doors or windows, in order to make such an adjustment, the pins can be so chosen as to have a length that is such as to balance possible out-of-plumb positions of the door or window. Accordingly, in this situation, the pins have to have a length that is such as to compensate for the inclination between the uprights and engage the respective recesses of the guides to close the leaf correctly. As these pins are fixed to the door or window, the airgap of the door or window can be adjusted only by replacing the

pins with others of a different size. Alternatively, in order to avoid replacing the pin, inserting an adjusting element is known, like for example a wedge or a block, between the pin and the upright on which it is fixed, so as to create a shim and thus "extend" the extension of the pin to permit correct insertion thereof into the recesses of the guide.

**[0016]** Both in the case of replacement of the pin and in the case of insertion of a shim element, the airgap adjustment operations are particularly long and complex because it is necessary to dismantle the pin to replace it with another one and/or to insert a shim.

**[0017]** Further, adjusting operations are hardly practical and also expensive, because there is a need to have a plurality of pins available of different sizes that are if necessary installable on the door or window and/or a plurality of shim elements.

**[0018]** Adjustable pins are further known (normally used for doors or windows with a wooden frame), i.e. pins that are able to be so positioned as to protrude more or less from a respective housing obtained on the leaf or on the frame, so as to adapt to the out-of-plumb position of the door or window and adjust the airgap thereof.

**[0019]** Also such pins are disadvantageous inasmuch as, whilst being able to be adjusted in such a manner as to protrude from the housing according to the extent of the out-of-plumb position to be compensated, adjustment is very imprecise.

**[0020]** Known adjustable pins are in fact rotatably adjustable every 180° and do not have the possibility of assuming intermediate positions. In this situation, there is the possibility that the pin protrudes exaggeratedly from the housing or that it does not protrude sufficiently, making adjustment imprecise and aesthetically displeasing to view.

**[0021]** The technical task of the present invention is to propose an adjusting device for adjusting the airgap between a fixed frame and a leaf of a lift-and-slide door or window, and a corresponding adjusting method, which are able to overcome the drawbacks that have emerged from the prior art. In particular, one of the objects of the present invention is to make an adjusting device that can be used to adjust the airgap of the door or window according to various needs.

**[0022]** A further object of the present invention is to propose an adjusting device that is simple and reliable.

**[0023]** A further object of the present invention is to make available a method that permits easy and precise adjustment of the airgap of the door or window, in particular to compensate for an out-of-plumb position between a fixed frame and a leaf of a lift-and-slide door or window.

**[0024]** The technical task and the specified objects are substantially achieved by a device and a method for adjusting a lift-and-slide door or window comprising the technical features set out in one or more of the appended claims. The dependent claims correspond to different possible embodiments of the invention.

**[0025]** Further characteristics and advantages of the present invention will become more apparent from the following indicative and thus non-limiting description of an embodiment of an adjusting device and a method for adjusting the airgap of a lift-and-slide door or window. This description will be set out below with reference to the appended drawings, which are provided solely for illustrative and therefore non-limiting purposes, in which:

- figures 1A and 1B show section views of an adjusting device in different operating positions;
- figures 2A and 2B show section views respectively of an adjusting device placed on a leaf in an open configuration and in a closed configuration;
- figures 3A-3C show section views of different embodiments of an adjusting device;
- figures 4A-4C show section views of adjusting devices of an adjusting device.

**[0026]** With reference to the accompanying figures, 100 indicates an adjusting device for a lift-and-slide door or window comprising a leaf "A", which is slidably movable along an opening and closing direction "X", and a fixed frame "T".

**[0027]** In the case of doors or windows, so-called out-of-plumb" positions can occur relative to a floor on which the leaf "A" slides and/or relative to a wall on which the frame "T" rests. In general, the term "out-of-plumb" means an off-axis position or an anomalous inclination of a structural element, typically relative to what was envisaged in the design step.

**[0028]** In this situation, at the moment of installation of the door or window, these out-of-plumb positions affect the leaf "A" and the fixed frame "T" of the door or window, causing difficulty in closing the latter. In particular, when an upright of the leaf "A" comes to abut on an upright of the fixed frame "T" (closed position of the leaf), reciprocal anomalous inclinations occur that do not permit correct mechanical abutment.

**[0029]** Owing to the presence of the out-of-plumb position, in fact, the upright of the leaf "A" is not able to abut on the upright of the frame "T" over the entire extent of the upright, thus causing points of airgap of the door or window that might not allow the leaf "A" to be locked in the closed position, thus preventing correct closing of the entire door or window.

**[0030]** The device 100 is accordingly configured to compensate for such anomalous inclinations due to the out-of-plumb positions, by adjusting the airgap of the door or window so as to ensure locking of the leaf "A" in a closed position, as will be disclosed in detail below.

**[0031]** In general, the adjusting device 100 and the relative method are applied whenever there is a need to compensate for, also as far as neutralizing, an anomalous space ("airgap") between the leaf and the frame when the leaf is in the closed condition, also regardless of the out-of-plumb position. For example, the anomalous space can also be caused by the misalignment of the leaf, or of the frame or, also, by dimensional tolerances,

like for example on the length of the leaf and/or of the pins.

**[0032]** With reference to figures 1A and 1B, the device 100 comprises a support element 10 that is inserted or insertable into a housing "T1," "A1" made in one between the frame "T" or the leaf "A" of the door or window.

**[0033]** The support element 10 has a first wall 11a and a second wall 11b that is parallel to and opposite the first wall 11a.

**[0034]** Preferably, the first wall 11a faces externally the housing "A1", "T1", whereas the second wall 11b is inserted inside the housing "A1", "T1".

**[0035]** In the preferred embodiment, the support element 10 is made of metal, for example zamak, and is substantially box-shaped. In this embodiment, the support element 10 has a substantially monolithic body provided with two side portions opposite a central portion. Preferably, the side portions have a lesser thickness than the thickness of the central portion.

**[0036]** With reference to figures 1A and 1B, seats that are adapted to receive fixing means, for example screws to connect the support element 10 to the leaf "A" or to the fixed frame "T", are obtained in the side portions. Further, a support seat 12 is obtained in the central portion. According to one aspect of the invention, the support seat 12 is made on the first wall 11a of the support element 10 and extends through the support element 10 towards the second wall 11b. Preferably, the support seat 12 has a circular section. Again with reference to figures 1A and 1B, the device 100 further comprises an adjustable pin 20 housed in the support seat 12. In particular, the pin 20 comprises a head end 21a protruding operationally from the support seat 12 and engageable with a guide "G" placed in a housing "T1", "A1" obtained in the other one between the frame "T" or the leaf "A". Further, the pin 20 comprises a bottom end 21b inserted into the support seat 12. In use, when the leaf "A" is in the closed position, the adjustable pin 20 protrudes from the support element 10 by a sufficient amount for the head end 21a to engage the guide "G", so as to lock the leaf "A" in the closed position. In greater detail (figures 1A and 1B), the head end 21a protrudes from the support element 10 so as to compensate for the distance present between the uprights of the leaf "A" and of the fixed frame "T" due to the out-of-plumb position, so as to be inserted equally into the guide "G". In this situation, the head end 21a engages a locking portion "G1" of the guide "G" preventing sliding of the leaf "A" along the opening and closing direction "X", as will be disclosed in detail below. In order to ensure that the head end 21a of the adjustable pin 20 engages the guide "G", the adjustable pin 20 is movable along the support seat 12 to assume a plurality of stable positions comprised between a first maximum insertion position of the adjustable pin 20 in the support seat 12, and a second minimum insertion position of the adjustable pin 20 in the support seat 12.

**[0037]** According to one aspect of the invention, the adjustable pin 20 is movable between the first and the second position and vice versa by a translation motion along the support seat 12 (arrow "M" in figures 1A-1B).

**[0038]** With particular reference to figure 4B, in a further embodiment the adjustable pin 20 is movable between the first and the second position and vice versa by a screwing motion along the support seat 12.

**[0039]** With reference again to figures 1A and 1B, the adjustable pin 20 comprises a main body 21c comprised between the head end 21a and the bottom end 21b. Preferably, the main body 21c has, in cross section, a diameter equal to the diameter of the bottom end 21b, whereas the head end 21a has, in cross section, a greater diameter. In this manner, the head end 21a abuts solidly on the locking portion "G1" of the guide "G", when the leaf "A" is locked in the closed position. Preferably, the head end 21a, the bottom end 21b and/or the main body 21c have a substantially cylindrical conformation. Advantageously, the head end 21a can define a radial expansion relative to the bottom end 21b and/or to the main body 21c so as to enable the head end 21a to engage the locking portion "G1" of the guide "G", preventing sliding of the leaf "A" along the opening and closing direction "X". In particular, this radial expansion can extend at least partially along a direction that is transverse, preferably perpendicular, to the aforesaid opening and closing direction "X" and/or to a direction of extension of the aforesaid guide "G". Preferably, the main body 21c comprises a first threaded portion 22a extending from the bottom end 21b and a second non-threaded portion 22b extending from the head end 21a. In particular, the first threaded portion 22a is configured to engage a respective threaded portion made within the support seat 12, such that the adjustable pin 20 can move between the first position and the second position and vice versa through a screwing/unscrewing motion. Preferably, the first threaded portion 22a has a length that is about the same as the length of the support seat 12 so that the second non-threaded portion 22b projects from the support seat 12 also when the adjustable pin 20 is in the first maximum insertion position. This aspect enables the device 100 to be used also if there is no pronounced misalignment between the fixed frame "T" and the leaf "A". In this situation in fact, the adjustable pin 20 protrudes from the support seat 12 only by an amount that is equal to the length of the first non-threaded portion 22b. This length has a so-called "nominal" value (for example "design" value), i.e. the value that the adjustable pin 20 would require to lock the leaf "A" in the closed position if there were no anomalous space (airgap) to compensate between the fixed frame "T" and leaf "A", for example in the absence of an out-of-plumb position.

**[0040]** In use, depending on the airgap present between the uprights of the fixed frame "T" and of the leaf "A", when the latter is in the closed position (and thus, in the presence of anomalous inclinations, depending on the out-of-plumb position to be compensated), the adjustable pin 20 is moved along the support seat 12 to assume a position in which it can engage the guide "G" and ensure locking of the leaf "A" in the closed position.

**[0041]** With reference to figure 1B, if the uprights of the leaf "A" and of the fixed frame "T" are particularly spaced apart when the leaf "A" is in the closed position, for example because of an out-of-plumb position between the leaf "A" and the fixed frame "T" that is particularly pronounced, the adjustable pin 20 will assume a particularly projecting position relative to the seat 12, such that the head end 21a of the adjustable pin 20 succeeds in engaging the guide "G" correctly and locking the leaf "A".

**[0042]** On the contrary, and with reference to figure 1A, if the respective uprights are not spaced widely apart, when the leaf "A" is in the closed position, for example due to the fact that the out-of-plumb position between the leaf "A" and the fixed frame "T" is almost inexistent, the adjustable pin 20 will assume a particularly recessed position in the seat (almost next to the maximum insertion position).

**[0043]** Advantageously, the possibility of adjusting the position of the adjustable pin 20 along the support seat 12 makes the device 100 adaptable to the airgap of the door or window, so as to compensate for abutment anomalies between the leaf and frame in closed conditions of the leaf that are for example caused by anomalous distances and/or inclinations, as in the presence of an out-of-plumb door or window.

**[0044]** Preferably, the position of the adjustable pin 20 along the support seat 12 is continuously adjustable between the first and the second position. In other words, the adjustable pin 20 can assume, during movement thereof along the support seat 12, any stable position comprised between the first and the second position. This aspect is particularly advantageous because it permits very precise and customizable adjustment of the adjustable pin 20. In fact, the possibility of adjusting the position of the continuously adjustable pin 20 permits a wide adjustment range of the airgap of the door or window so as to compensate for, also as far as neutralizing, the misalignments between the leaf "A" and the fixed frame "T" without inserting shims and/or replacing the pin with other pins of different length. This contributes to reducing the time and costs that are associated with the adjustment of the airgap of the door or window.

**[0045]** With reference to figures 1A-1B and 3A to 3C, the device 100 further comprises locking means 30 configured to lock the adjustable pin 20 in a set position that is stable between the aforesaid positions of maximum and minimum insertion. Advantageously, the locking means 30 hinders an accidental movement of the adjustable pin 20 in the support seat 12. In other words, once the position is established that the adjustable pin 20 has to assume within the support seat 12 to perform adjustment of the airgap of the door or window, the adjustable pin 20 is locked by the action of the locking means 30.

**[0046]** In one possible embodiment shown in figures 1A to 2B, the locking means 30 comprises a clamping seat 33 obtained in the support element 10 and extending transversely to the support seat 12, between an inlet section thereof placed on the first wall 11a of the support element 10 and an outlet section leading into the support seat 12. In this embodiment, the locking means 30 comprises a locking grub screw 34 that is movable along the clamping seat 33 between an operating position, in which the locking grub screw 34 is placed near the outlet section to engage the adjustable pin 20 and prevent movement thereof, and a release position in which the locking grub screw 34 is distal from the outlet section to permit the adjustable pin 20 to move along the support seat 12. Preferably, the locking grub screw 34 has an outer side surface provided with a thread configured to engage a respective counter-thread made between the clamping seat 33; further, the locking grub screw 34 has a substantially frustoconical head surface configured to impose pressure on a respective portion of the side surface of the adjustable pin 20, so as to avoid movement thereof, when the locking grub screw 34 is in the operating position. Still more preferably, the locking grub screw 34 comprises, on an outer surface accessible from the clamping seat 33, a shaped recess for receiving an adjusting means configured to move the locking grub screw 34 between the operating position and the release position along the clamping seat 33.

**[0047]** As visible in figures 4A and 4C, the inclination of the clamping seat 33 relative to the adjustable pin 20 enables the adjustable pin 20 to be locked in an advantageously practical and simple manner.

**[0048]** In one alternative embodiment shown in figure 3A, the locking means 30 comprises a clamping seat 33 obtained in the support element 10 and extending parallel to the support seat 12, and an auxiliary seat 35 that is transverse, preferably perpendicular, to the support seat 12 and to the clamping seat 33. According to one aspect of the invention, the auxiliary seat can be made continuously with the clamping seat 33. In this embodiment, the locking means 30 further comprises a wedge element 36 that is slidably inserted into the transverse auxiliary seat 35 and movable between an operating position, in which it is in contact with the adjustable pin 20 to impose a locking pressure, and a rest position, in which said wedge element 36 is moved away from the adjustable pin 20 to permit movement thereof. In this embodiment, the locking means 30 further comprises a locking grub screw 34 inserted within the clamping seat 33 and suitable for exerting a thrust on the wedge element 36. Preferably, the locking grub screw 34 exerts this thrust on an inclined portion of the wedge element 36, which faces the locking grub screw 34 itself. Again with reference to the embodiment shown in figure 3A, the locking grub screw 34 is movable between an operating position in which it abuts on the wedge element 36 (corresponding to the operating position of the wedge element 36), and a rest position in which the locking grub screw 34 is distal from the wedge element 36 (corresponding to the rest position of the wedge element 36).

**[0049]** As in the case of the embodiment shown in figures 1A to 2B, the locking grub screw 34 has a shaped recess for receiving an adjusting means configured to

move the locking grub screw 34 between the operating position and the rest position along the clamping seat 33, so as to place the wedge element 36, respectively, in the operating position or in the rest position.

**[0050]** In an alternative embodiment and shown in figure 3C, the locking means 30 comprises a threadlocker 31 fitted to the adjustable pin 30. Preferably, the threadlocker 31 is of the mechanical or chemical type. Still more preferably, the threadlocker 31 extends over the entire length of the support seat 12 and acts on the first threaded portion 22a of the main body 21c of the adjustable pin 20 inserted inside the support seat 12.

**[0051]** Figure 3B illustrates a further embodiment in which the locking means 30 comprises an o-ring 32 fitted on the adjustable pin 20. In this embodiment, the adjustable pin 20 is provided with a circumferential recess for housing the o-ring 32. Alternatively, the circumferential recess is made on the inner wall of the support seat 12.

**[0052]** In use, in order to adjust the airgap between the leaf "A" and the frame "T" when the leaf is in the closed position, like for example to compensate for anomalous distances and/or inclinations caused by an out-of-plumb position of the door or window, at least one device 100 is installed on one between the leaf "A" and the fixed frame "T", whereas a respective guide "G" is installed on the other one between the leaf "A" or the fixed frame "T".

**[0053]** In the embodiment shown in the accompanying figures, the device 100 is fixed to the housing "A1" obtained on the leaf "A", whereas the guide "G" is inserted inside the housing "T1" obtained on the fixed frame "T". More in detail, the device 100 is fixed to a control rod of the leaf "A" inserted into the cornice of the leaf "A".

**[0054]** The control rod is movable in translation along a vertical direction, and in particular perpendicular to the opening and closing direction "X". In particular, the control rod is movable between a raised position, to permit movement of the leaf "A" along the opening and closing direction "X", and a lowered position, to permit locking of the leaf "A" in the closed position. With particular reference to figure 4A, subsequent to the arrangement of the device 100, the locking means 30 is loosened to permit adjustment of the adjustable pin 20. In this situation, the adjustable pin 20 is moved inside the support seat 12, so as to be arranged in a position that is suitable for compensating the reciprocal distance between the leaf "A" and the fixed frame "T", for example caused by an out-of-plumb position. With particular reference to figure 4B, the head end 21a of the adjustable pin 20 comprises a shaped housing 23 configured to receive an adjusting tool, for example a screwdriver or an Allen key, adapted to perform a movement of the adjustable pin 20 between the first and the second position.

**[0055]** With reference to figure 4C, once the position of the adjustable pin 20 is identified along the support seat 12, the locking means 30 is clamped again to prevent further movement of the adjustable pin 20.

**[0056]** At the moment of closure of the leaf "A", the head end 21a of the adjustable pin 20 is inserted inside an insertion portion "G2" of the guide "G" (figure 2A). Afterwards, the control rod of the leaf "A" is moved in translation together with the device 100 towards the lowered position. In this situation, the adjustable pin 20 protrudes from the support seat 12 by an amount that is such that the head end 21a slides inside the guide "G" until it engages the locking portion "G1" of the guide "G". Preferably, the locking portion "G1" is shaped and has a substantially trapezoidal shape so as to convey the head end 21a of the adjustable pin 20 progressively nearer a bottom wall of the guide "G" and thus so as to lock the leaf "A" in a closed position. In this situation in fact, despite the incomplete adhesion of the uprights of leaf "A" and fixed frame "T" given, for example, by the out-of-plumb position, the head end 21a protrudes from the support seat 12 to be correctly constrained on the guide "G" and thus prevent the adjustable pin 20, and thus the entire leaf "A" from moving along the opening and closing direction "X", locking the leaf "A" in the closed position (figure 2B).

**[0057]** Even if a user tried to force the leaf "A" to translate along the opening and closing direction "X" without activating the control rod, the head end 21a would be constrained inside the locking portion "G1" of the guide "G", the entire adjustable pin 20 being locked within the support seat 12 owing to the fixing means 30. In this situation, in fact, the adjustable pin 20 would be prevented from sliding within the support seat 12 and could thus not detach from the support seat 12 or allow the head end 21a to be released from the guide "G", permitting opening of the leaf "A". In other words, once the adjustable pin 20 is locked in a set position within the support seat 12 and once the head end 21a is constrained within the locking portion "G1" of the guide "G", the leaf "A" is locked correctly in the closed position, regardless of the presence of an anomalous distance between the leaf and the frame, for example caused by the out-of-plumb position. Advantageously, the anomalous distance has been compensated for by the adjustment of the position of the adjustable pin 20 within the support seat 12.

**[0058]** At the moment of opening of the leaf "A", the control rod is again moved in translation together with the device 100 towards the raised position, such that the head end 21a is moved towards the insertion portion "G2" of the guide "G". In greater detail, the head end 21a of the adjustable pin 20 slides along the locking portion "G1" of the guide "G", releasing itself therefrom until it reaches the insertion portion "G2". Once the insertion portion "G2" of the guide "G" is reached, the leaf "A" is free to slide along the opening and closing direction "X" to perform opening of the door or window.

**[0059]** In a further possible embodiment (which is not illustrated), the device 100 is fixed to the housing "T1" obtained within the fixed frame "T", whereas the guide "G" is inserted inside the housing "A1" obtained in the leaf "A", and more in particular within the control rod of the leaf "A" inside the cornice of the leaf. In this situation, it is the guide "G" that moves along the vertical direction,

so as to slide to offer the adjustable pin 20 respectively the insertion portion "G2" and the locking portion "G1". In each case, moving the adjustable pin 20 and the other features disclosed above remain substantially unchanged, only the installation of the device 100 between the leaf and frame being reversed.

**[0060]** A lift-and-slide door or window, comprising a fixed frame "T" that is mountable at a perimeter of a gap in masonry and having a vertical upright on which at least one housing "T1" is made is also an object of this invention. The door or window further comprises a leaf "A" having a glass panel and a cornice for the glass panel, said cornice having a vertical upright on which at least one housing "A1" is made.

**[0061]** The leaf "A" is slidable along an opening and closing direction "X" between a closed position, in which the vertical upright of the cornice abuts on the vertical upright of the fixed frame "T" to close the gap in the masonry, and an open position, in which the vertical upright of the cornice is moved away from the vertical upright of the fixed frame "T" to permit access to the gap in the masonry.

**[0062]** The door or window further comprises at least one adjusting device 100 according to what has been disclosed and mounted in a housing "T1", "A1" of one between the leaf "A" and the fixed frame "T".

**[0063]** The door or window further comprises at least one guide "G" mounted in the housing "T1", "A1" of the other one between leaf "A" and fixed frame "T" and configured to engage the head end 21a of the adjustable pin 20, when the leaf "A" is in the closed position.

**[0064]** In one possible embodiment, the door or window comprises two devices 100, one of which is arranged near a floor on which the leaf "A" slides and one is arranged near an upper cross member of the door or window. The devices 100 are adjustable independently of one another so as to make an adjustment of the airgap of the door or window more precise. If for example, because of being out-of-plumb, the upright of the leaf "A" and the upright of the fixed frame "T" diverge from one another upwards, the device 100 near the floor will have an adjustable pin 20 projecting minimally from the respective support seat 12 relative to the adjustable pin 20 of the device 100 placed near the upper cross member of the door or window, which will on the other hand project more from the seat 12. The adjustable pin 20 placed in the device 100 near the upper cross member of the door or window will have to in fact protrude further from the support seat 12, because it has to compensate for a greater space present between the uprights of the leaf "A" and of the fixed frame "T" to be able to engage the respective guide "G" correctly.

**[0065]** Advantageously, through the adjustment of the position of the adjustable pins 20 of the respective devices 100, it is possible to adjust with precision the airgap of the door or window, ensuring at the same time locking of the leaf "A" in the closed position even in the event of anomalous distances/inclinations, as for example in the presence of an out-of-plumb position.

**[0066]** An object of the present invention is moreover a method for compensating for an out-of-plumb position between a fixed frame "T" and a leaf "A" of a lift-and-slide door or window "S" comprising a step of acting directly on the adjustable pin 20 to move it between the first maximum insertion position and the second minimum insertion position in order to position the adjustable pin 20 in a compensation position comprised between said plurality of stable positions.

**[0067]** According to a further aspect of the invention and with particular reference to the embodiment of figure 4A, there is moreover a step of loosening the locking means 30 of the adjusting device 100 to enable the adjustable pin 20 to be moved within the support seat 12.

**[0068]** In this situation, with reference to the embodiment of figure 4A, an adjusting means, like for example Allen keys, screwdrivers or the like, is inserted within the clamping seat 33 to take the locking grub screw 34 from an operating position, in which it imposes a locking force on the adjustable pin 20, to the release position in which it enables the adjustable pin 20 to be moved.

**[0069]** After loosening the locking means 30, the method comprises a step of moving the adjustable pin 20 between the first maximum insertion position and the second minimum insertion position to place the adjustable pin 20 in a compensation position comprised between the plurality of discrete positions (figure 4B).

**[0070]** In particular, in order to move the adjustable pin 20, the head end 21a is engaged, via the shaped housing 23, by an adjusting means, like for example an Allen key, a screwdriver and the like.

**[0071]** In the case of the embodiment of figures 4A-4B, the adjustable pin 20 is movable between the first position and the second position by a screwing motion impressed by the adjusting means.

**[0072]** Subsequently, as shown in figure 4C, the method can comprise a step of clamping the locking means 30 to lock the adjustable pin 20 in the compensation position.

**[0073]** Advantageously, the method enables the airgap of the door or window to be adjusted easily and fast. Further, the method enables the time and costs to be reduced that are associated with the adjustment of the airgap of the door or window.

**[0074]** The present invention achieves the proposed objects by eliminating the drawbacks that have emerged from the prior art and achieving important advantages.

**[0075]** In fact, the possibility of adjusting continuously the position of the adjustable pin and of locking this pin in the desired portion by the locking means advantageously enables wide adjustment of the airgap of the door or window and thus precise compensation for the out-of-plumb position.

**[0076]** In a further advantageous mode, the possibility of continuously adjusting the position of the adjustable pin and of locking this pin in the desired portion enables the time and the costs to be decreased that are associ-

ated with adjusting the airgap of the door or window to compensate for an out-of-plumb position, because there is no longer any need to have pins available that have different measurements and/or shim elements. Advantageously, the device 100 facilitates adjustment of the door or window by a skilled person even a considerable time after mounting.

## Claims

**1.** A lift-and-slide door or window, comprising:

- a fixed frame (T) mountable at a perimeter of a gap in the masonry and comprising a vertical upright on which at least one housing (T1) is made;
- a leaf (A) comprising a glass panel and a cornice for said glass panel, said cornice having a vertical upright on which said at least one housing (A1) is made; said leaf (A) being slidable along an opening and closing direction (X) between a closed position, in which said vertical upright of the cornice abuts on the vertical upright of the fixed frame (T) to close the gap in the masonry, and an open position, in which the vertical upright of said cornice is moved away from said vertical upright of the frame (T) to permit access to said gap in the masonry;
- at least one adjusting device (100) for a lift-and-slide door or window mounted in a housing (T1, A1) of one between said leaf (A) and said fixed frame (T), said device (100) comprising:

  - a support element (10) inserted into a housing (T1, A1) made in one between the frame (T) and the leaf (A), said support element (10) having a first wall (11a) and a second wall (11b) that is substantially opposite said first wall (11a);
  - a support seat (12) made on the first wall (11a) of the support element (10) and extending through the support element (10) towards the second wall (11b);
  - an adjustable pin (20) housed in said support seat (12) and comprising a head end (21a), protruding operationally from said support seat (12) and engageable in a guide (G) placed in a housing (T1, A1) obtained in the other one between said frame (T) and said other leaf (A) so as to lock said leaf (A) in said closed position, and a bottom end (21b) inserted into said support seat (12), said adjustable pin (20) being movable along the support seat (12) to assume a plurality of stable positions comprised between a first maximum insertion position of the adjustable pin (20) in the support seat (12), and a second minimum insertion position of the adjustable pin (20) in the support seat (12);
  - locking means (30) configured to lock the adjustable pin (20) in one of said stable positions in the support seat (12);

  - at least one guide (G) mounted in the housing (T1, A1) of the other leaf (A) or other fixed frame (T) and configured to engage said head end (21a) of the adjustable pin (20) when said leaf (A) is in the closed position.

**2.** The door or window according to claim 1, wherein the position of said adjustable pin (20) along the support seat (12) is continuously adjustable between said first position and said second position.

**3.** The door or window according to claim 1 or 2, wherein said adjustable pin (20) is movable between said first position and said second position and vice versa by a translation motion.

**4.** The door or window according to claim 1 or 2, wherein said adjustable pin (20) is movable between said first position and said second position and vice versa by a screwing motion.

**5.** The door or window according to claim 4, wherein said adjustable pin (20) comprises a main body (21c) comprised between said head end (21a) and said bottom end (21b), the main body (21c) having a first threaded portion (22a) extending from said bottom end (21b) and a second non-threaded portion (22b) extending from said head end (21a).

**6.** The door or window according to claim 5, wherein said first threaded portion (22a) has a length that is about the same as the length of the support seat (12) so that said second non-threaded portion (22b) projects from the support seat (12) also when the adjustable pin (20) is in said first maximum insertion position of the adjustable pin (20) in the support seat (12).

**7.** The door or window according to claim 5 or 6, wherein said locking means (30) comprises a threadlocker (31) fitted on said adjustable pin (30), said threadlocker (31) being of the mechanical or chemical type.

**8.** The door or window according to claim 5 or 6 wherein said locking means (30) comprises an o-ring (32) fitted on said adjustable pin (20), said adjustable pin (20) being provided with a circumferential recess for housing said o-ring (32).

**9.** The door or window according to any one of the preceding claims 1 to 6, wherein said locking means

(30) comprises:

- a clamping seat (33) obtained in said support element (10) and extending transversely to said support seat (12) between an inlet section placed on the first wall (11a) of the support element (10) and an outlet section leading into the support seat (12);
- a locking grub screw (34) that is movable along said clamping seat (33) between an operating position, wherein said locking grub screw (34) is placed near the outlet section to engage the adjustable pin (20) and prevent movement thereof, and a release position, wherein said locking grub screw (34) is distal from the outlet section to enable a movement of the adjustable pin (20).

**10.** The door or window according to any one of the preceding claims 1 to 6, wherein said locking means (30) comprises:

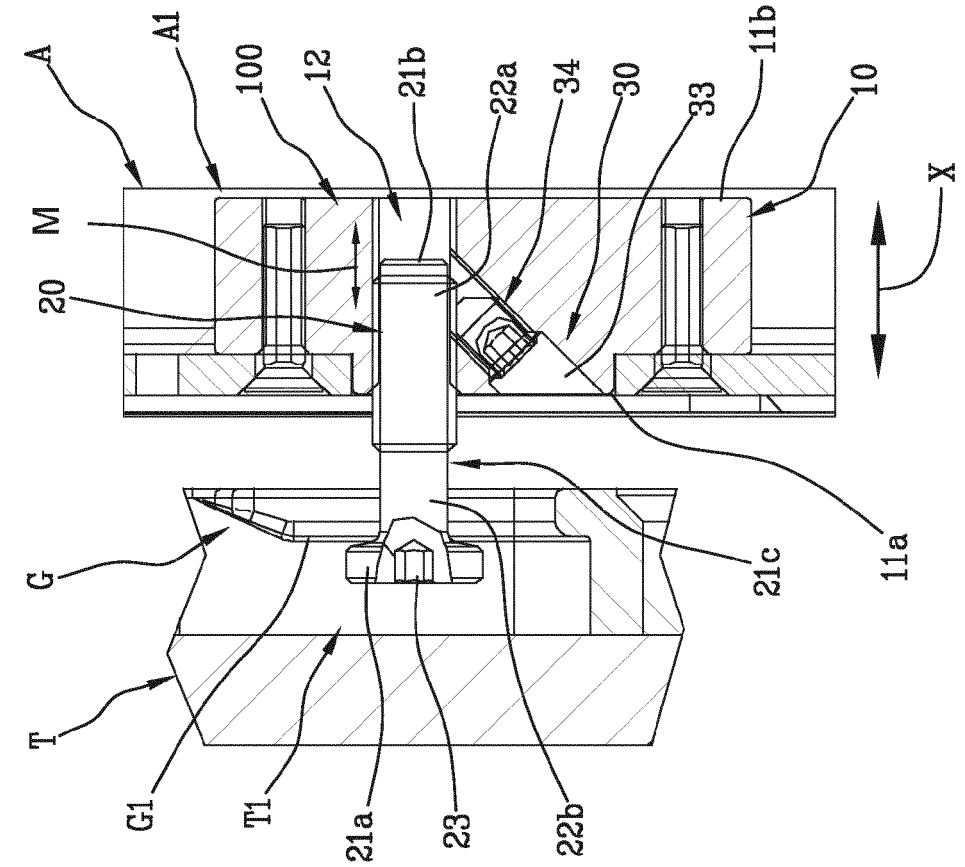
- a clamping seat (33) obtained in said support element (10) and extending parallel to said support seat (12);
- an auxiliary seat (35), that is transverse, preferably perpendicular, to the support seat (12) and to said clamping seat (33);
- a wedge element (36) slidably inserted into said transverse auxiliary seat (35) and movable between an operating position, in which it is in contact with said adjustable pin (20) to impose locking pressure on the adjustable pin (20), and a rest position, in which it is moved away from the adjustable pin (20) to permit movement thereof;
- a locking grub screw (34) inserted inside said clamping seat (33) and suitable for exerting a thrust on said wedge element (36); the locking grub screw (34) being movable between an operating position corresponding to the operating position of the wedge element (36) and in which said locking grub screw (34) abuts on said wedge element (36), and a rest position corresponding to the rest position of the wedge element (36) and in which said locking grub screw (34) is distal from the wedge element (36).

**11.** The door or window according to any one of the preceding claims, wherein said adjustable pin (20) comprises on the head end (21a) a shaped housing (23) configured to receive an adjusting tool adapted to make the adjustable pin (20) move between said first and second position.

**12.** A method for adjusting a lift-and-slide door or window according to any one of claims 1 to 11, said method comprising the step of: acting directly on said adjustable pin (20) to move it between the first maximum insertion position and the second minimum insertion position to position said adjustable pin (20) in a compensation position comprised between said plurality of stable positions.

**13.** The method according to claim 12, further comprising the steps of:

- loosening the locking means (30) for locking the adjusting device (100) before the step of acting on the adjustable pin (20);
- clamping the locking means (30) after the step of acting on the adjustable pin (20) to lock it in said compensating position.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21b
22a
34
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X
M
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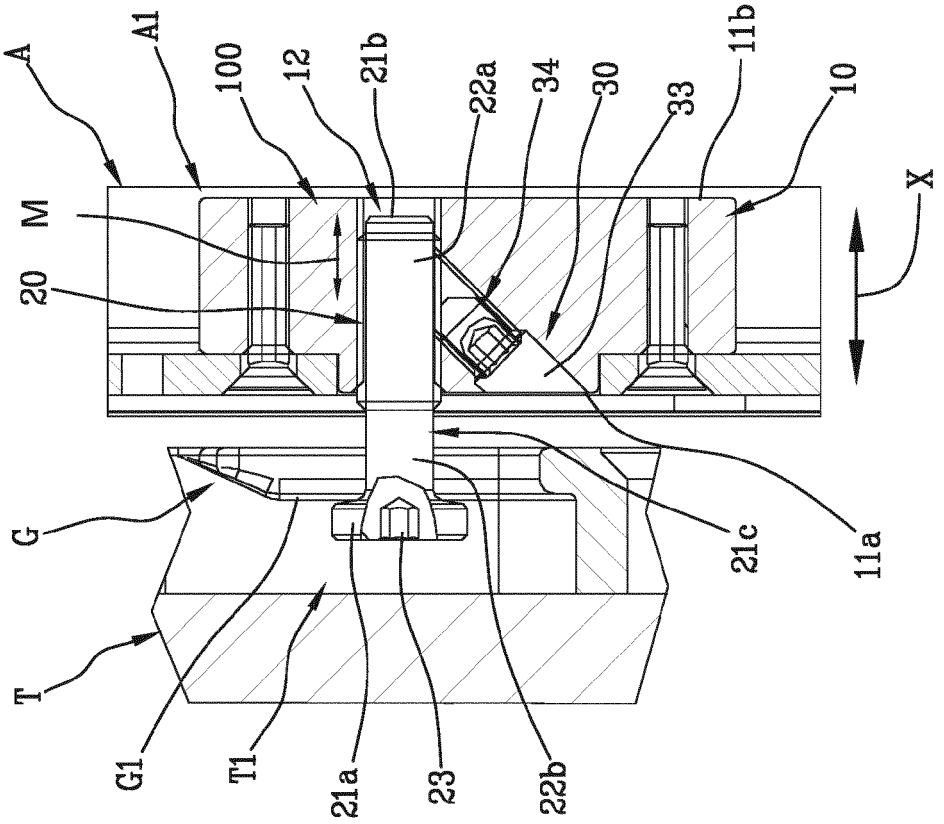
G
T
G1
T1
21a
23
22b
21c
11a

Fig.1B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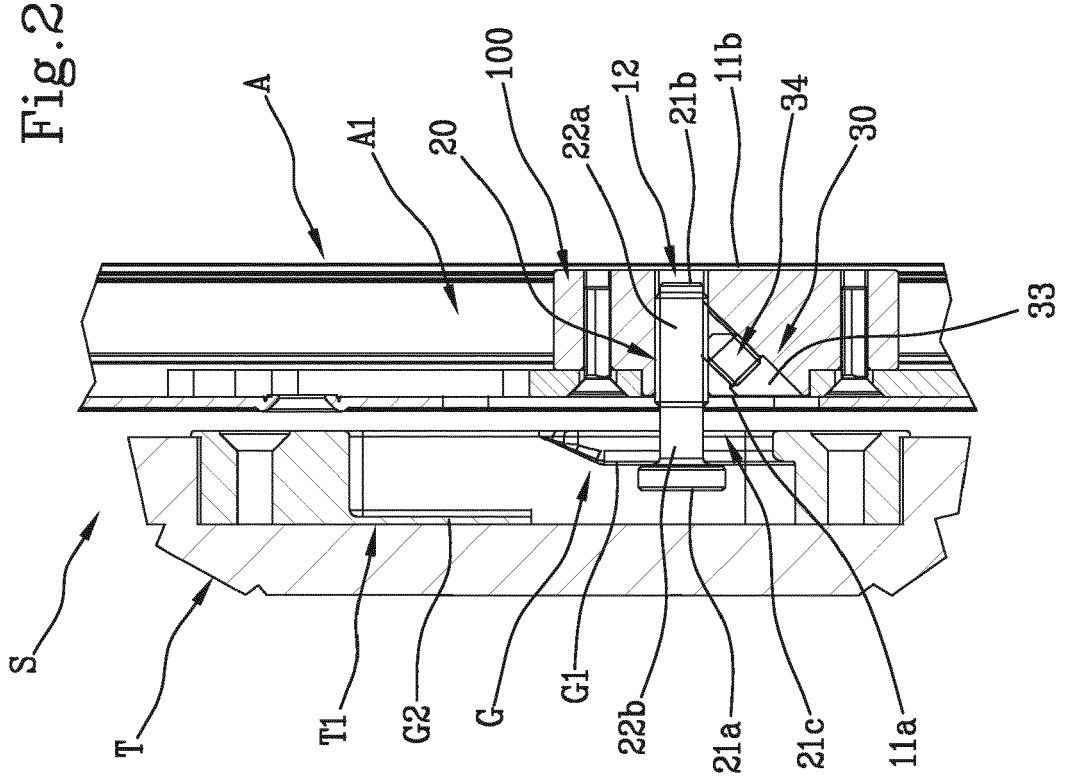
11a

Fig.1A

Fig.2B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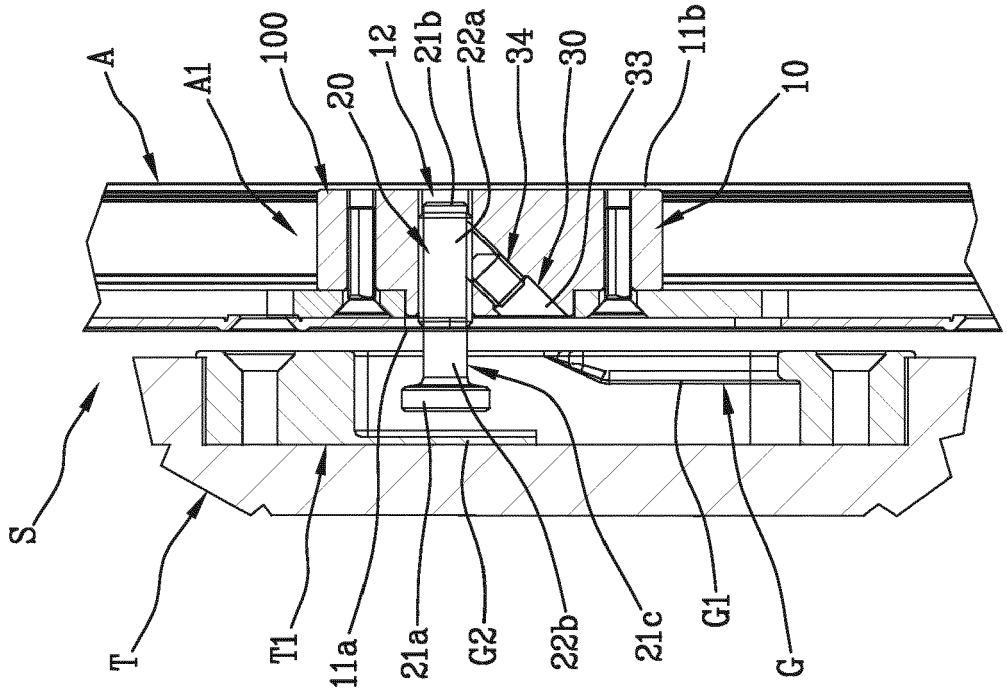
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G

Fig.2A

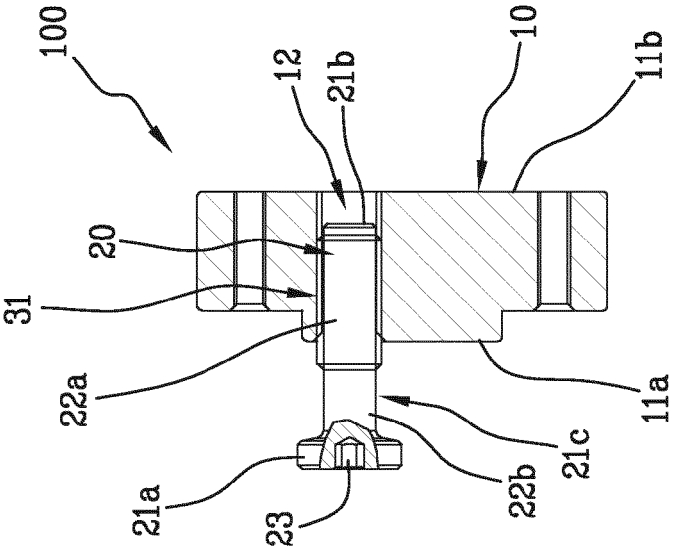


Fig.3C

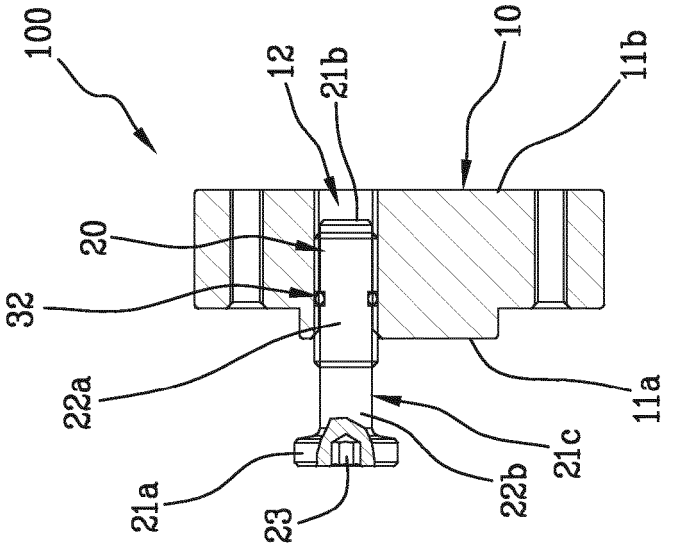


Fig.3B

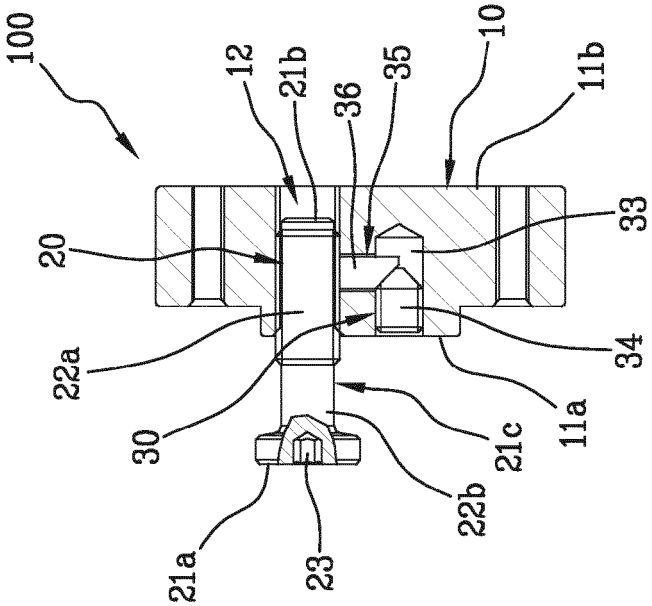


Fig.3A

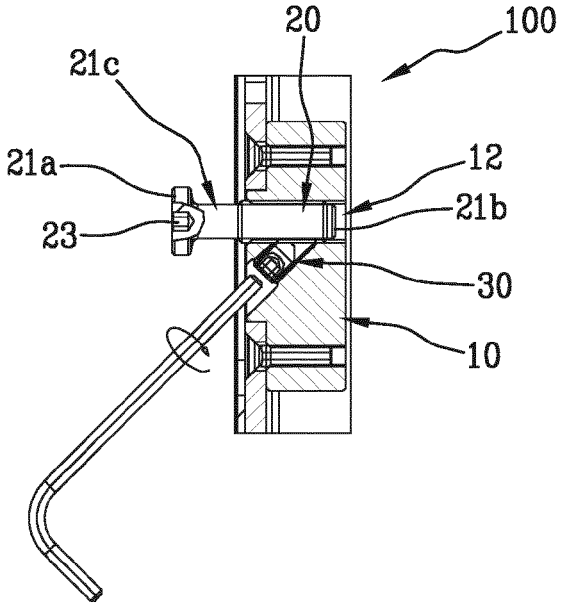


Fig.4A

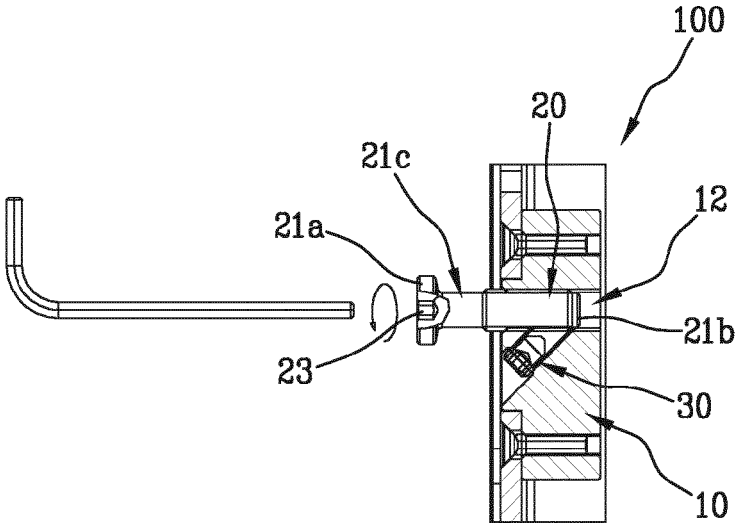


Fig.4B

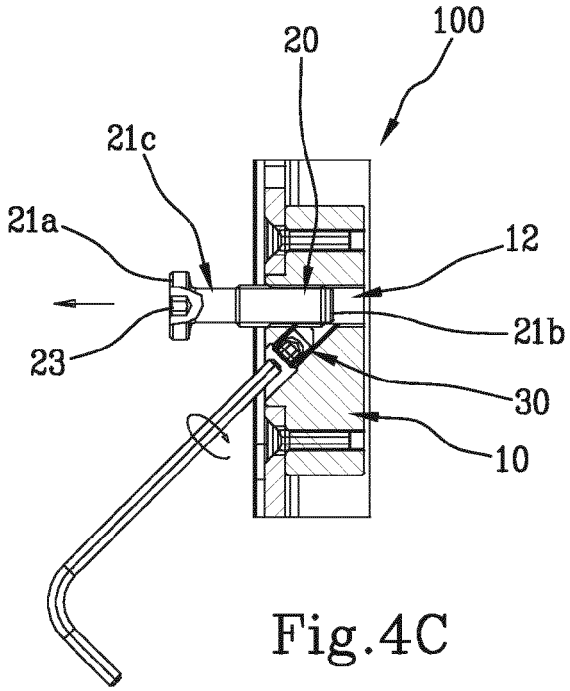


Fig.4C

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# EUROPEAN SEARCH REPORT

Application Number
EP 22 16 2793

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 7 July 2022 | Witasse-Moreau, C |

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