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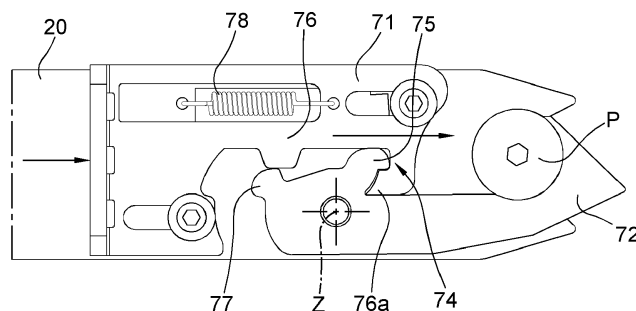
(54) **AN ACTUATION DEVICE FOR A WINDOW**

(57) An actuation device for a window comprises a frame, a runner, a first arm which is rotatably connected to the runner and to the window, a second arm which is rotatably connected to the frame and which is slidingly connected to the first arm and an actuator for actuating the runner.

The first arm comprises a coupling mechanism which is configured to be coupled/uncoupled to/from a closure pin of the window and which comprises a blocking ele-

ment and an actuator element.

The actuator element is movable between a first position, in which the rotation of the blocking element is prevented, and a second position, in which the blocking element is free to rotate in an independent manner with respect to the actuator element. The closure pin can be disengaged only following a manual stress which is obtained by means of a movement of the closure pin itself.



*Fig.4*

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## Description

**[0001]** The present invention relates to an actuation device for windows of the type comprising a scissor type mechanism and a linear actuator.

**[0002]** In the scope of the technical field for automation of windows, there are known various solutions for opening windows by means of motorized mechanisms. In particular, it is known to provide mechanisms which are capable of causing a window to carry out an opening and closing folding movement.

**[0003]** An example of such mechanisms is described in the European patent application EP 1801340, which describes a mechanism which is formed by a lever system which is actuated by means of an actuator.

**[0004]** One of the lever arms is connected to the frame of the window and to the window itself at opposite ends. The other arm is also connected to the frame and to the first arm in an intermediate position between the ends thereof. The actuator acts on the end of the first lever arm, moving this end so as to cause the rotation of the two arms and to obtain the opening of the window.

**[0005]** The end of the arm connected to the window is further provided with a release mechanism, by means of which the blocking pin of the window is automatically released when the window is in a closed position. The same mechanism further allows the pin of the window to be automatically engaged in a first movement step of the actuator of the lever arm. However, this known system, similarly to others with similar characteristics, has a number of disadvantages in terms of versatility and practicality of use.

**[0006]** A first disadvantage results particularly from the above-described release mechanism which, in the case of inaccurate installation of the opening device, can make opening of the window difficult or in any case not very fluid with turning movement. In fact, it may be the case that the mechanism does not completely release the pin, thereby bringing about an interference between the pin of the window and the mechanism during the turning opening action thereof.

**[0007]** Another disadvantage results from the fact that the above-mentioned mechanism is not found to be very suitable for windows with mean dimensions and even not recommended in the case of openable fanlights, not being very usable for many applications and generally it is subjected to a state of tension on the lever arm which supports the window when it is in an open position.

**[0008]** During the inclination movement of the window, in fact, the two ends of the arm are vertically misaligned with a misalignment which becomes greater with greater opening of the window and with a smaller height dimension thereof.

**[0009]** A third disadvantage results from the fact that the device described in EP 1 801 340 requires a design and relevant components which are specific for the different installation requirements, particularly in terms of right/left opening of the window and dimensions thereof.

**[0010]** However, it would be desirable to make available a solution which is highly versatile and in which common components can be adapted to different installation requirements.

**[0011]** Therefore, the problem addressed by the present invention is to provide an actuation device for windows which is structurally and functionally configured to at least partially overcome one or more of the disadvantages set out with reference to the cited prior art.

**[0012]** According to a first aspect of the invention, a solution to this problem is provided by an actuation device for windows, preferably including a closure pin, comprising:

- a frame;
- a runner which can slide in a longitudinal direction of the frame;
- a first arm which is preferably rotatably connected to the runner which can slide along the frame, preferably at a first end thereof, and to the window, preferably at a second end thereof;
- a second arm which is preferably rotatably connected to the frame and which is preferably slidingly connected to the first arm, preferably at an intermediate zone thereof between the ends thereof;
- an actuator for actuating the runner in the longitudinal direction.

**[0013]** The first arm preferably comprises a coupling mechanism which is configured to be coupled/uncoupled to/from a closure pin of the window.

**[0014]** The coupling mechanism preferably comprises an actuator element which is preferably slidingly connected to a main member of the first arm and a blocking element which is rotatably connected to the main member and which is configured so as to close a housing recess for the closure pin which is formed at the second end of the first arm.

**[0015]** The actuator element is preferably movable between a first position, in which the rotation of the blocking element is prevented, and a second position, in which the blocking element is preferably free to rotate with respect to the main member and preferably in an independent manner with respect to the actuator element.

**[0016]** The blocking element preferably comprises a contact surface which is configured so as to rotate the blocking element following contact with the closure pin so as to open the housing recess and to disengage the closure pin only following a manual stress which is obtained by means of a movement of the closure pin or another actuation element which is not part of the actuator device.

**[0017]** In some embodiments, the actuator element is configured so as to allow/prevent the rotation of the blocking element in accordance with the position thereof and is preferably further configured so as to interact with an abutment member which is connected to the frame following the movement of the runner in the longitudinal

direction so as to slide with respect to the main member of the arm.

**[0018]** It will be appreciated that the actuation device for windows according to this first aspect of the present invention provides for the presence of a coupling mechanism which is not automatically opened but instead is only unblocked by means of the motorized actuator of the device. In this manner, the opening of the coupling mechanism has to be carried out manually following the unblocking thereof by acting on the handle of the window.

**[0019]** In this manner, the manual action may allow the effective release of the pin and, consequently, a correct opening with turning movement of the window.

**[0020]** Therefore, it will be appreciated that in this aspect the invention refers to embodiments in which the first arm can actively act in order to bring about the closure of the blocking element while the opening thereof and the resultant removal of the pin can be carried out only by operating manually.

**[0021]** Without a manual action, it is not possible to carry out the separation of the pin from the actuation mechanism.

**[0022]** However, the prior art uses automatic actuations both for the connection and for the separation of the pin to/from the actuation mechanism.

**[0023]** In a second aspect, the invention also relates to an actuation device for windows comprising:

- a frame;
- a runner which can slide in a longitudinal direction of the frame;
- a first arm which is rotatably connected to the runner which can slide along the frame at a first end thereof and to the window at a second end thereof, the first arm being connected to the frame by means of a first rotary joint;
- a second arm which is rotatably connected to the frame by means of a second rotary joint and which is slidably connected to the first arm at an intermediate zone between the first end and the second end;
- an actuator for actuating the runner in the longitudinal direction.

**[0024]** The first arm preferably comprises a coupling mechanism which is configured to couple and uncouple a closure pin of the window. The first rotary joint which connects the first arm to the runner and the second rotary joint which connects the frame and the second arm are spherical joints.

**[0025]** In fact, it will be appreciated that the spherical joint advantageously allows a misalignment in a vertical direction between the ends of the arm, thereby allowing an effective opening of the window without excessive stresses for the structure.

**[0026]** The specific arrangement of the joint further allows the structure to be made readily usable at the frame of the window without affecting the correct operation of the actuator.

**[0027]** On the basis of a third aspect, the invention further relates to an actuation device for windows comprising:

- a frame;
- a runner which can slide in a longitudinal direction of the frame;
- a first arm which is rotatably connected to the runner at a first end thereof and to the window at a second end thereof, the first arm preferably being connected to the runner which can slide along the frame by means of a rotary joint;
- a second arm which is rotatably connected to the frame by means of a rotary joint, the second arm being slidably connected to the first arm at an intermediate zone between the first end and the second end;
- an actuator for actuating the runner in the longitudinal direction.

**[0028]** The first arm preferably comprises a coupling mechanism which is configured to couple and uncouple a closure pin of the window.

**[0029]** On the basis of the present aspect, the first arm comprises a main member which includes an initial portion which defines the first end, an end portion which defines the second end and an intermediate portion which connects the initial portion and the end portion and in the region of which there is defined the intermediate zone at which the second arm is connected.

**[0030]** The initial portion, end portion and intermediate portion are provided with a plurality of connection elements which are configured so as to connect the initial portion, end portion and intermediate portion in different longitudinal positions in a development direction of the first arm and/or in accordance with a different orientation of the intermediate portion with respect to the first and second portions.

**[0031]** Preferably, the connection elements comprise a plurality of seats by means of which the portions can be fixed by means of corresponding threaded elements, for example, screws.

**[0032]** It will be appreciated that the subdivision of the arm into a plurality of portions, which can be connected in accordance with different configurations, advantageously allows the features of the device to be adapted to the different installation requirements.

**[0033]** The length of the arm can in fact be varied by acting on the longitudinal connection position, increasing or decreasing the overall extension thereof.

**[0034]** The possibility of adopting different orientations for the intermediate portion, at which the second arm is joined to the first arm, further allows the production of a configuration which is adapted to both right-hand opening windows and windows having left-hand opening.

**[0035]** According to additional aspects of the invention, two or more of the above-mentioned aspects can be combined with each other, defining preferred embodiments

of the present invention.

**[0036]** One or more of the above-mentioned aspects may further have one or more of the following preferred features.

**[0037]** Preferably, the actuator element and the blocking element comprise respective abutment extensions or other abutment surfaces, the abutment extensions or abutment surfaces being configured so as to be one in contact with the other when the actuator element is in the engagement position and separated from each other when the actuator element is in the disengagement position.

**[0038]** Preferably, the actuator element has a flat shape.

**[0039]** Preferably, the actuator element comprises an abutment which is configured so as to abut a corresponding first portion of the joint which defines the abutment member and to urge the actuator element into the second position.

**[0040]** Preferred characteristics of the invention are further more generally defined by the dependent claims which can be used in each of the above-mentioned aspects.

**[0041]** The features and advantages of the invention will be better appreciated from the detailed description of a number of embodiments thereof which are illustrated by way of nonlimiting example with reference to the appended drawings, in which:

Figure 1 is a perspective view of the actuation device according to the present invention which is installed in an openable folding window;

Figure 2 is another perspective view of a detail relating to a coupling mechanism of the actuation device of Figure 1;

Figure 3 is another perspective view which illustrates the coupling mechanism of Figure 2 which is coupled to a relevant pin of a window, the window not being illustrated for greater clarity of the illustration;

Figure 4 is a plan view of the coupling mechanism of Figure 2;

Figure 5 is another perspective view of the coupling mechanism of Figure 2 and a runner of the actuation device of the present invention;

Figures 6 to 9 are perspective views which illustrate different operating steps of the coupling device of Figure 2;

Figures 10 and 11 are a perspective view and a side view which illustrate the actuation device of the present invention with the window in the closed and open position, respectively;

Figures 12 and 13 are perspective views which illustrate a spherical joint of the device of the present invention with the window in the closed and open position, respectively;

Figures 14 and 15 are two perspective views of the device of the present invention, in which an intermediate portion of the first arm is positioned in a position

suitable for windows opening on the right and windows for opening on the left.

**[0042]** Initially with reference to Figure 1, an actuation device for windows according to the present invention is generally designated 100.

**[0043]** In the embodiment illustrated in the Figures and described in detail below, the actuation device 100 is used to bring about the opening and closing of a window I with folding movement. In any case, it will be appreciated that the device of the present invention can also be used in the various aspects thereof in windows of different types, such as, for example, bay windows or centre pivoting windows.

**[0044]** The actuation device 100 comprises a frame 1 which can be fixed to the frame of the window I and a lever mechanism which acts on the window in order to bring about the opening movement.

**[0045]** The actuation of the lever mechanism is advantageously brought about by means of an actuator 5, for example, which is constructed by means of an endless screw mechanism 50, which acts on a runner 3 which is illustrated in Figures 12 and 13, in order to cause it to slide in the longitudinal direction X which is defined by the frame 1, as schematically illustrated in Figure 10.

**[0046]** The lever mechanism further comprises a first arm 2 which is rotatably connected to the runner 3 at a first end 21 thereof and to the window I at a second end 22 thereof.

**[0047]** As may be observed in the Figures, the first arm is connected to the window I at one of the closure pins P thereof, that is to say, one of the pins which are typically used in the window for blocking it on the frame when it is in the closed position.

**[0048]** The first arm 2 is connected to the pin P by means of a relevant coupling mechanism 7 which, as will be seen below, advantageously allows it to be coupled to/uncoupled from the pin P in accordance with the different operating requirements. In particular, the mechanism 7 will couple the pin during the movement of the window by means of the actuation device 100. Vice versa, if it is desirable to carry out manual opening, for example, by acting on the handle of the window, the mechanism 7 will release the pin, in accordance with methods described in greater detail below with reference to preferred embodiments.

**[0049]** The mechanism 7 is further configured in such a manner that, in the absence of any manual action, the pin P remains coupled to the mechanism 7 itself. In other words, until the operator manually acts thereon, for example, by acting on the handle of the window, the first arm 2 remains connected to the pin P by means of the coupling mechanism 7, no automatic action directed towards disconnecting the closure pin P from the coupling mechanism 7 being provided.

**[0050]** This closure pin P is included in the closure system, with which the window is provided for being blocked in the closed position. Typically, the pin is moved by act-

ing on the handle of the window so as to move it into a disengagement position.

**[0051]** Preferably, the connection between the first arm 2 and the runner 3 is brought about by means of a rotary joint 6 which, in some embodiments, is constructed in the form of a spherical joint, as may be observed in particular in Figures 10 to 13.

**[0052]** In some embodiments, as illustrated, for example, in Figure 12, the rotary joint 6 comprises a first portion 61 which is connected to the frame 1 and a second portion 62 which is connected to the first end 21 of the first arm 2.

**[0053]** These first and second portions define respective abutment surfaces 64, 65 which are in the form of spherical caps and which are advantageously kept in contact with each other by means of a pin 63 which retains the two portions with respect to each other. In this manner, the two surfaces can slide one on the other and also allow the joint 6, in addition to allowing a rotation about an axis which is defined by the pin 63 itself, to carry out rotational movements about two axes which are perpendicular to the one defined by the pin 63.

**[0054]** In this manner, the first arm will be able not only to rotate with respect to the runner and therefore the frame 1, but also to be inclined with respect thereto, as may be observed in Figures 10 and 11.

**[0055]** Again with reference to Figures 12 and 13, it may be observed how in some embodiments there may be provision for the first portion 61 to define an additional abutment surface 66 and the first arm 2 also to comprise a respective abutment surface 26.

**[0056]** The two surfaces 66 and 26 can also be of spherical cap-like form and can slide one on the other. Advantageously, these surfaces have sphericity with a centre arranged in the same position of the surfaces 64 and 65 described above.

**[0057]** In this manner, the first portion 61 can be closed in a sandwich-like manner between the first arm 21 and the second portion 62 by means of the pin 63, allowing the structure to be assembled in a simple manner and, at the same time, ensuring a high level of structural robustness.

**[0058]** Again with reference to Figure 1, the lever mechanism is further formed by a second arm 4 which is rotatably connected to the frame 1. The connection to the frame 1 can advantageously be carried out by means of a second rotary joint 6' which preferably has one or more of the features set out in relation to the first rotary joint 6.

**[0059]** The second arm 4 is further slidably connected to the first arm 2 at an intermediate zone between the first end 21 and the second end 22 of the first arm 2.

**[0060]** This sliding connection may be carried out, for example, by providing a guide which is formed on the first and/or second arm and in which a relevant pin which connects the two arms slides. In the preferred embodiment illustrated in Figure 1, the guides are designated 24 and 42, respectively. In this manner, it is possible to obtain relative sliding between the two arms until reach-

ing the end of the guide in such a manner that, in this position, the pin defines a rotation fulcrum between the arms. In other words, this configuration allows combination of a translational movement in a first movement step of the mechanism and a rotational movement in a second step, thereby optimizing the opening movement of the window.

**[0061]** As schematically illustrated in Figure 10, the movement of the runner is advantageously brought about by means of an actuator 5 which is constructed, for example, by means of an endless screw mechanism which allows the runner 3 to be actuated in the longitudinal direction X defined by the frame.

**[0062]** Now with reference to Figures 2 to 5, there will be illustrated below preferred embodiments of the coupling mechanism 7.

**[0063]** As may be observed in the Figures, in some embodiments there may be provision for the coupling mechanism 7 to comprise an actuator element 71 which can slide with respect to the arm 2, particularly with respect to a main member 20 which forms the structure thereof.

**[0064]** The mechanism 7 may further comprise a blocking element 72 which is rotatably connected to the arm 2 and which allows a housing recess 23 which is intended to receive the closure pin P of the window to be closed or opened. In other words, the blocking element 72 allows the pin P to be retained or released with respect to the arm 2 in accordance with the position thereof. For example, Figure 4 illustrates the blocking element 72 in such a position as to retain the pin P while Figure 7 illustrates the position thereof in which the release is brought about. As may be appreciated, this variation is brought about by means of rotation of the blocking element 72 about a relevant axis Z, this axis Z being illustrated in Figure 4.

**[0065]** Preferably, the axis Z is parallel with a longitudinal development axis of the pin P.

**[0066]** The actuator element 71 in turn has the function of allowing/preventing the rotation of the blocking element 72.

**[0067]** In fact, as may be observed in Figure 4, the actuator element 71 and the blocking element 72 are preferably capable of mutual engagement.

**[0068]** Advantageously, the actuator element 71 is movable between a first position, which is illustrated in Figure 4 and in which the actuator element 71 and the blocking element 72 are mutually engaged and in which the rotation of the blocking element 72 is prevented, and a second position, which is illustrated in Figures 6 and 7 and in which the rotation of the blocking element 72 is allowed.

**[0069]** In other words, therefore, the actuator element 71 blocks the rotation of the blocking element in accordance with the position of the first pin on the main member 20.

**[0070]** Therefore, the actuator element 71 is advantageously movable between a first position, in which the rotation of the blocking element 72 is prevented, and a

second position, in which the blocking element 72 is free to rotate with respect to the main member 20 and in a manner independent of the actuator element 71.

**[0071]** Preferably, the actuator element 71 and the blocking element 72 comprise a recess 74 and a corresponding shaped portion 75 having a shape which complements the recess 74, which allow the two elements to engage with each other so as to prevent the rotation of the blocking element 72.

**[0072]** As may be observed in the Figures, the recess 74 and the shaped portion 75 are formed on the actuator element 71 and the blocking element 72, respectively, but it will be understood that the opposite arrangement may also be provided.

**[0073]** In order to bring about the movement of the actuator element 71, it is configured so as to be able to interact with an abutment member 9 which is connected to the frame 1 and which is preferably defined by the second rotary joint 6', for example, by the respective first portion thereof. The abutment member 9 may in fact be configured so as to abut the actuator element while it is sliding along the frame 1.

**[0074]** In some embodiments, there may be provision for the actuator element 71 to have a flat shape and to comprise an abutment 73, at which the contact with the abutment member 9 occurs and by means of which the actuator element 71 is urged into the disengagement position of Figures 6 and 7.

**[0075]** Preferably, the coupling mechanism 7 further comprises a resilient element 78 which is configured so as to urge the actuator element 71 into the engagement position when the abutment member 9 does not act on the actuator element 71.

**[0076]** In this manner, during the opening steps of the window, the pin P can be efficiently retained by the coupling mechanism 7.

**[0077]** Preferably, the actuator element 71 and the blocking element 72 can further comprise respective abutment extensions 76, 77 which are configured so as to be one in contact with the other when the actuator element 71 is in the engagement position and separated from each other when the actuator element 71 is in the disengagement position. As may be observed in Figure 4, the abutment extensions also contribute to preventing the rotation of the blocking element 72.

**[0078]** Vice versa, when the actuator element 71 is in the disengagement position, the blocking element is free to rotate, as may be noted from Figures 6 and 7.

**[0079]** In this case, however, the pin P is not automatically released but advantageously it is necessary to act on the handle of the window in order to obtain the rotation of the blocking element 72 and to release the pin P. To this end, there may be provision for the blocking element 72 to have, with respect to the pin, a contact surface which has an inclined or curved shape and which is configured in such a manner that the contact between the pin P and contact surfaces 72A urges the blocking element 72 to rotate, thereby bringing about the opening of

the recess 23, illustrated, for example, in Figure 7.

**[0080]** Therefore, the contact surface 72A is advantageously configured so as to urge the blocking element 72 to rotate following contact with the closure pin P so as to open the housing recess 23 and to disengage the closure pin P only following manual stress.

**[0081]** In a conceptually similar manner, when the window is closed, by acting on the handle the pin P returns to the position inside the recess 23.

**[0082]** The rotation of the blocking element 72 is carried out following the movement of the actuator element 71, which is in turn generated by the movement of the runner 3 which allows the first arm 2 to be moved in such a manner that the actuator element 71 is or is not in contact with the abutment element 9.

**[0083]** Preferably, the blocking element is urged again to rotate by means of the contact between the extensions 76 and/or 77 and/or by means of the contact between an additional extension 76a and the shaped portion 75 which can therefore have both the function of preventing the rotation of the blocking element 72 when the actuator element 71 is in the engagement position and the function of generating the rotation thereof when the actuator element 71 is in the disengagement position.

**[0084]** In any case, it will be appreciated that alternatively such functions may also be performed by means of different elements.

**[0085]** Once the mechanism 7 has been moved back into the position illustrated in Figure 9, that is to say, with the actuator element 71 in the engagement position, the opening mechanism can be taken up again by the actuator 5 and the relevant arms 2 and 4.

**[0086]** An additional aspect of the present invention will be illustrated below in Figures 14 and 15.

**[0087]** In these preferred embodiments, the main member 20 of the first arm 2 includes an initial portion 201 which defines the first end 21, an end portion 202 which defines the second end 22 and an intermediate portion 203 which connects the initial portion 201 and the end portion 202.

**[0088]** This intermediate portion 203 further defines the intermediate zone at which the second arm 4 is connected to the first arm 2.

**[0089]** Therefore, the intermediate portion 203 can advantageously include the guide 24, in which the pin which joins the first arm and second arm slides.

**[0090]** In some embodiments, the initial portion 201, end portion 202 and intermediate portion 203 can be provided with a plurality of connection elements 8 which are configured so as to connect the initial portion 201, end portion 202 and intermediate portion 203 in different positions.

**[0091]** These different positions may include different longitudinal positions, that is to say, so as to vary the overall length of the first arm 2.

**[0092]** Alternatively or additionally, the different positions may also include a different orientation of the intermediate portion 203.

**[0093]** As may be observed in Figures 14 and 15, for example, the intermediate portion 203 is orientated in opposite manners in one case and the other, thereby advantageously making the window suitable for opening on the right rather than opening on the left.

**[0094]** The connection elements 8 can be constructed in various manners, but in a simpler embodiment thereof they may comprise a plurality of seats 80, by means of which the initial portion, end portion and intermediate portion can be fixed by means of corresponding screws 81 or other similar threaded elements.

**[0095]** Therefore, an actuation device according to the invention is readily adaptable to different configurations, having a structure which is readily adaptable by means of different assembly of the components thereof.

**[0096]** Furthermore, the provision of the spherical joint allows a solution which is also suitable for windows of mean dimensions to be provided.

**[0097]** Finally, the coupling mechanism provided by the present invention also allows effective operation in the different configurations of the window, reducing the risks of malfunction including in the case of imperfect installations.

## Claims

1. An actuation device (100) for a window (I) comprising a closure pin (P) comprising:

- a frame (1);
- a runner (3) which can slide in a longitudinal direction (X) of the frame (1);
- a first arm (2) which is rotatably connected to the runner (3) at a first end (21) thereof and to the window (I) at a second end (22) thereof, the first arm (2) being connected to the runner (3) by means of a first rotary joint (6);
- a second arm (4) which is rotatably connected to the frame (1) and which is slidably connected to the first arm (2) at an intermediate zone between the first end (21) and the second end (22);
- an actuator (5) for actuating the runner (3) in the longitudinal direction (X);
- wherein the first arm (2) comprises a coupling mechanism (7) which is configured to be coupled/uncoupled to/from a closure pin (P) of the window (I), wherein the coupling mechanism (7) comprises a blocking element (72) which is rotatably connected to a main member (20) of the first arm (2) and which is configured so as to close a housing recess (23) for the closure pin (P) which is formed at the second end (22) of the first arm (2) and an actuator element (71), **characterized in that** the actuator element (71) is movable between a first position, in which the rotation of the blocking element (72) is prevented, and a second position, in which the blocking

element (72) is free to rotate with respect to the main member (20) and in an independent manner with respect to the actuator element (71), wherein the blocking element (72) comprises a contact surface (72A) which is configured so as to rotate the blocking element (72) following contact with the closure pin (P) so as to open the housing recess (23) and to disengage the closure pin (P) only following a manual stress which is obtained by means of a movement of the closure pin (P).

2. An actuation device (100) according to claim 1, wherein the actuator element (71) is configured so as to interact with an abutment member (9) which is connected to the frame (1) following the movement of the runner (3) in the longitudinal direction (X) so as to slide with respect to the main member (20).

3. An actuation device (100) according to claim 1 or 2, wherein the actuator element (71) is configured so as to rotate the blocking element (72) so as to couple the closure pin (P) when the actuator element (71) is moved from the second position to the first position and to unblock the blocking element (72), allowing the free rotation thereof but without rotating it when the actuator element (71) is moved from the first position to the second position.

4. An actuation device (100) according to any one of the preceding claims, wherein the coupling mechanism (7) comprises a resilient element (78) which is configured so as to urge the actuator element (71) into the first position.

5. An actuation device (100) according to any one of the preceding claims, wherein the actuator element (71) and the blocking element (72) are capable of mutual engagement, the actuator element (71) and the blocking element (72) being mutually engaged in the first position.

6. An actuation device (100) according to claim 4 or 5, wherein the actuator element (71) and the blocking element (72) comprise a recess (74) and a corresponding shaped portion (75) having a shape which is complementary with the recess (74), the recess (74) and the shaped portion (75) being formed on the actuator element (71) and the blocking element (72), respectively, or vice versa, and being capable of mutual engagement so as to prevent the rotation of the blocking element (72).

7. An actuation device (100) according to any one of claims 4 to 6, wherein the actuator element (71) and the blocking element (72) comprise respective abutment extensions (76, 77) which are configured so as to be one in contact with the other when the actuator



element (71) is in the engagement position and separated from each other when the actuator element (71) is in the disengagement position.

8. An actuation device (100) according to any one of the preceding claims when dependent on claim 2, wherein the actuator element (71) has a flat shape and comprises an abutment (73) which is configured so as to abut a corresponding first portion of the joint (6') which defines the abutment member (9) and to urge the actuator element (71) into the second position. 5
9. An actuation device (100) according to any one of the preceding claims, wherein the second arm (4) is connected to the frame (1) by means of a second rotary joint, wherein the first rotary joint (6) and the second rotary joint (6') are spherical joints. 10
10. An actuation device (100) according to claim 9, wherein the first joint comprises a first portion (61) which is connected to the runner (3) and a second portion (62) which is connected to the first end (21) of the first arm (2) and/or the second rotary joint (6') comprises a first portion (61') which is connected to the frame (1) and a second portion which is connected to the second arm (4), the first and second portions of the first joint and/or second joint defining respective abutment surfaces (64, 65) which are formed in the manner of spherical caps and which are able to slide one on the other. 15
11. An actuation device (100) according to claim 9 or 10, wherein the first portion (61) defines an additional abutment surface (66) and the first arm (2) comprises a respective abutment surface (26), the additional abutment surface (66) and the respective surface (26) being formed in the manner of spherical caps and being able to slide one on the other. 20
12. An actuation device (100) according to any one of the preceding claims, wherein the main member of the first arm (2) includes an initial portion (201) which defines the first end (21), an end portion (202) which defines the second end (22) and an intermediate portion (203) which connects the initial portion (201) and an end portion (202) and which defines the intermediate zone at which the second arm (4) is connected to the first arm (2), the initial portion (201), end portion (202) and intermediate portion (203) being provided with a plurality of connection elements (8) which are configured so as to connect the initial portion (201), end portion (202) and intermediate portion (203) in different longitudinal positions in a development direction of the first arm (2) and/or in accordance with a different orientation of the intermediate portion (203) with respect to the first and second portions. 25

13. An actuation device (100) according to claim 12, wherein the connection elements (8) comprise a plurality of seats (80) by means of which the initial portion, end portion and intermediate portion can be fixed by means of corresponding threaded elements (81). 30

14. An actuation device (100) according to any one of the preceding claims, wherein the actuator element (71) is configured so as to be movable in translation with respect to the main member (20) between the first position and the second position. 35

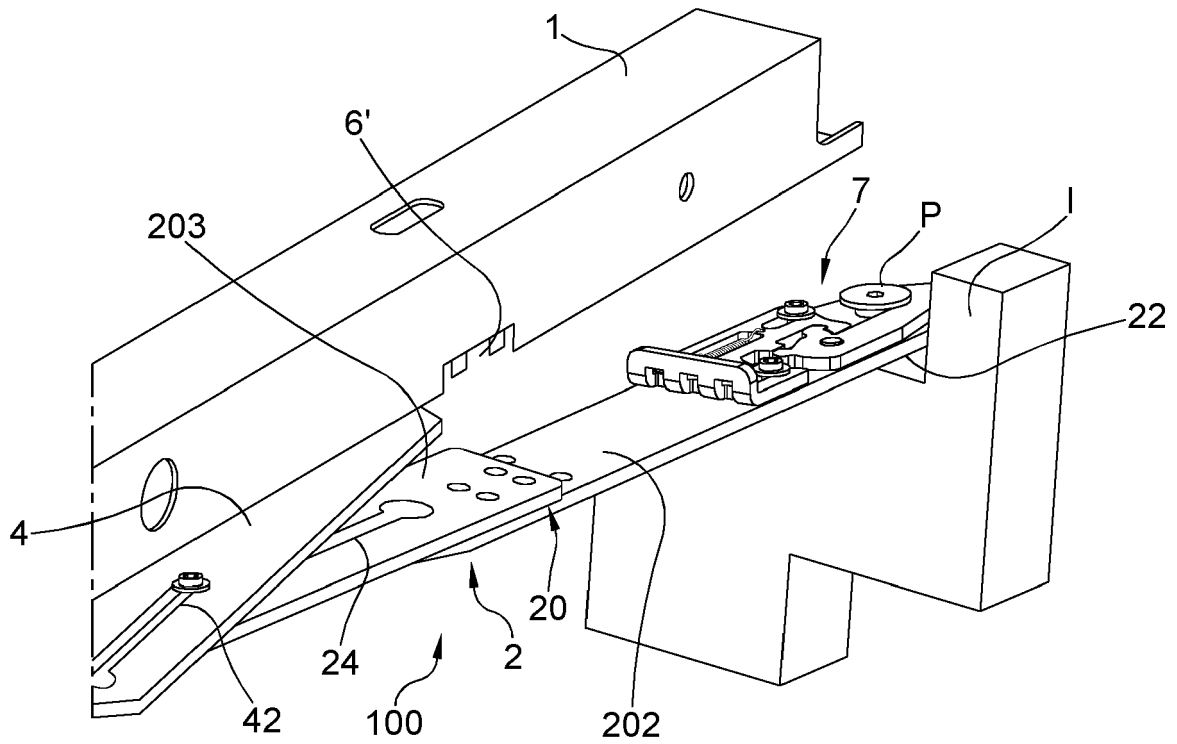


Fig. 1

Fig.2

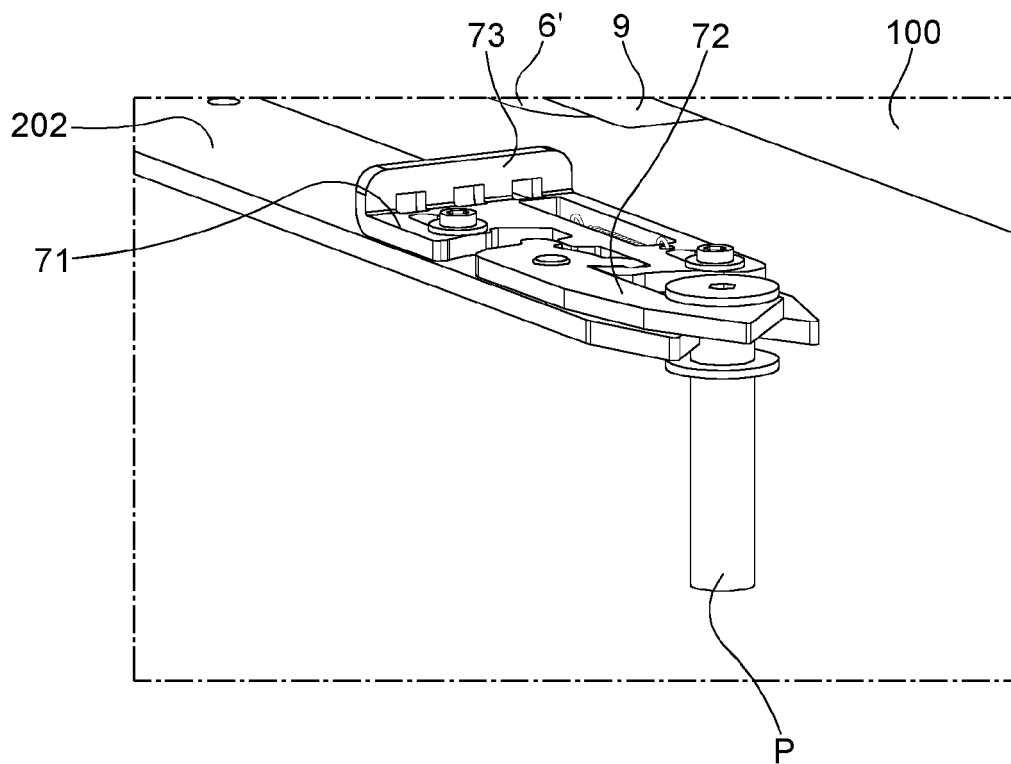
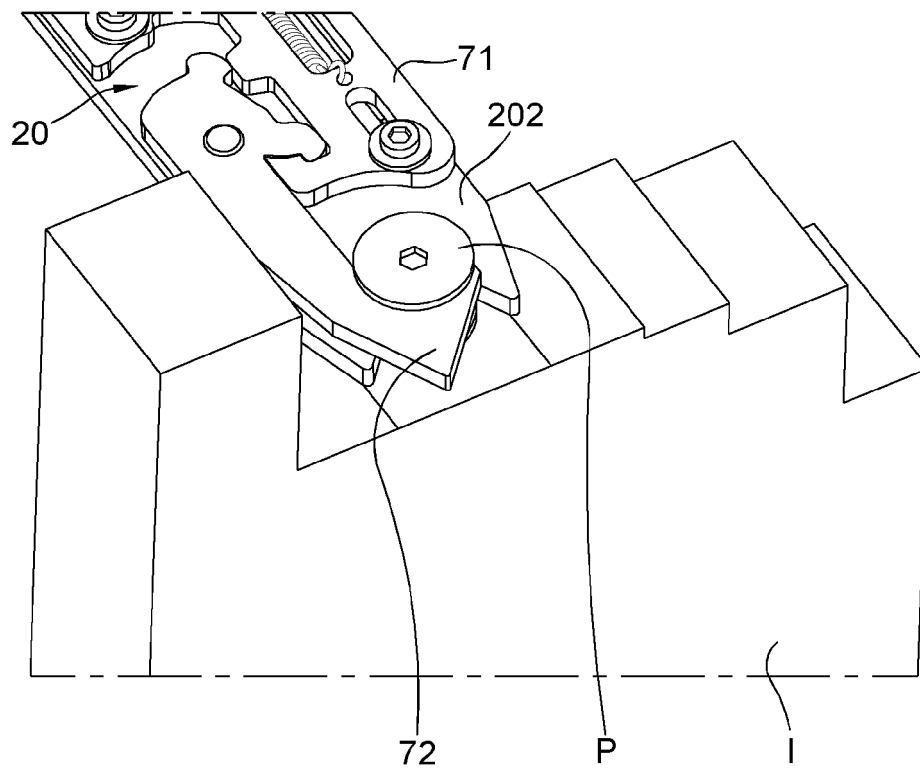


Fig.3

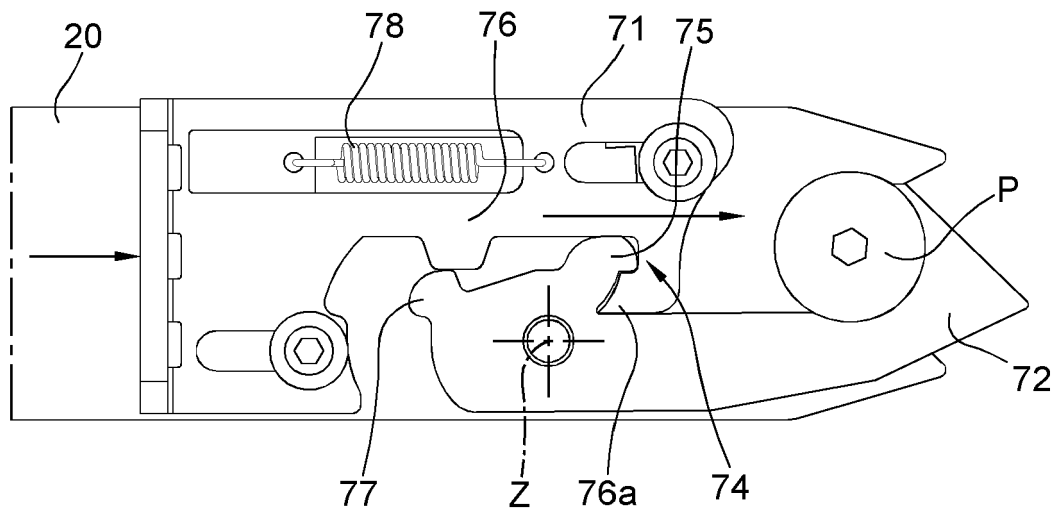


Fig. 4

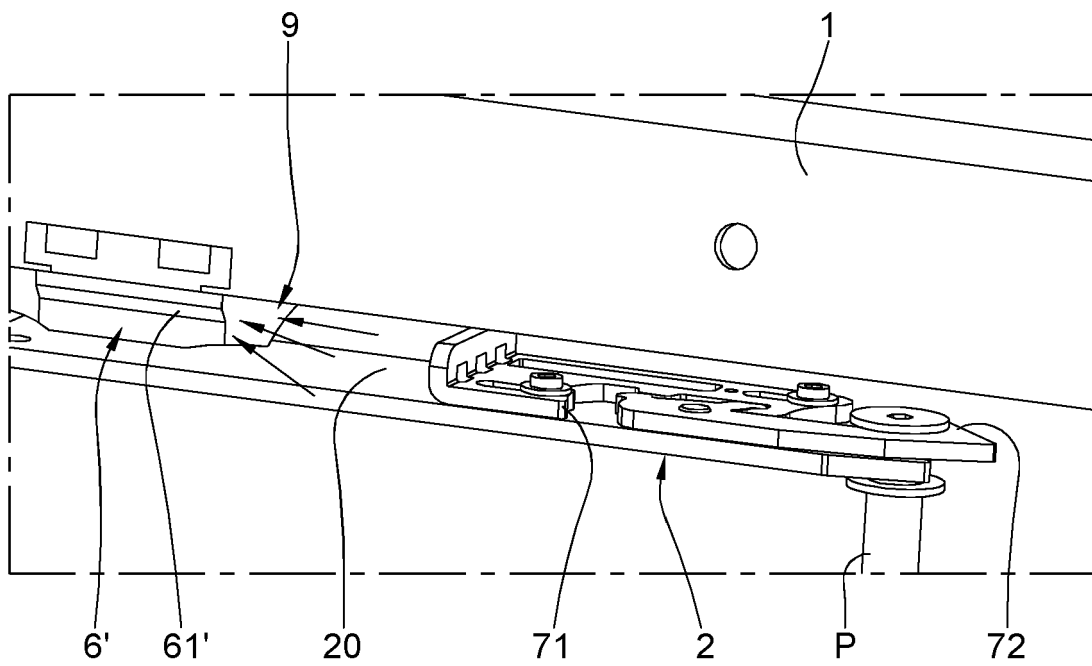


Fig. 5

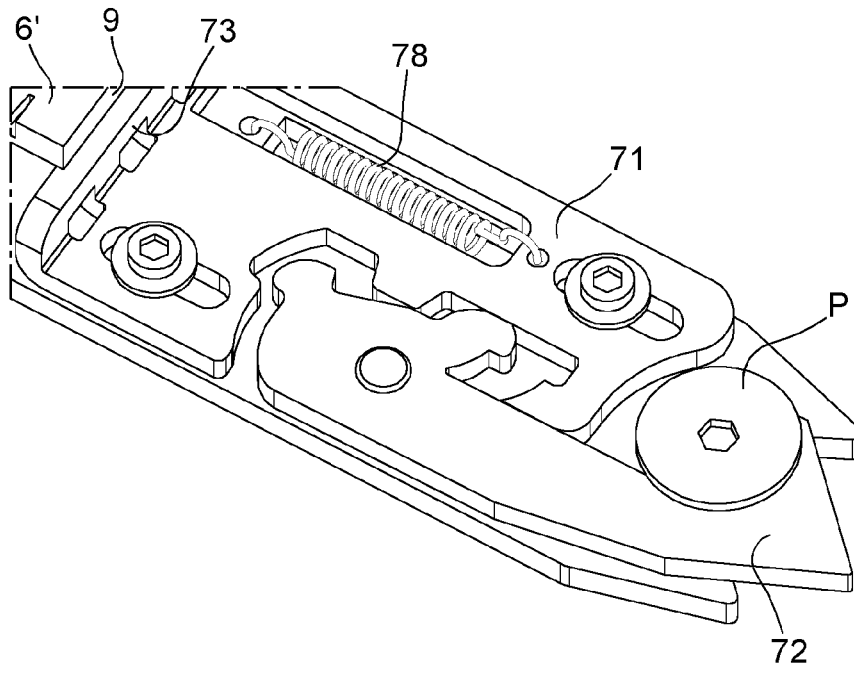


Fig. 6

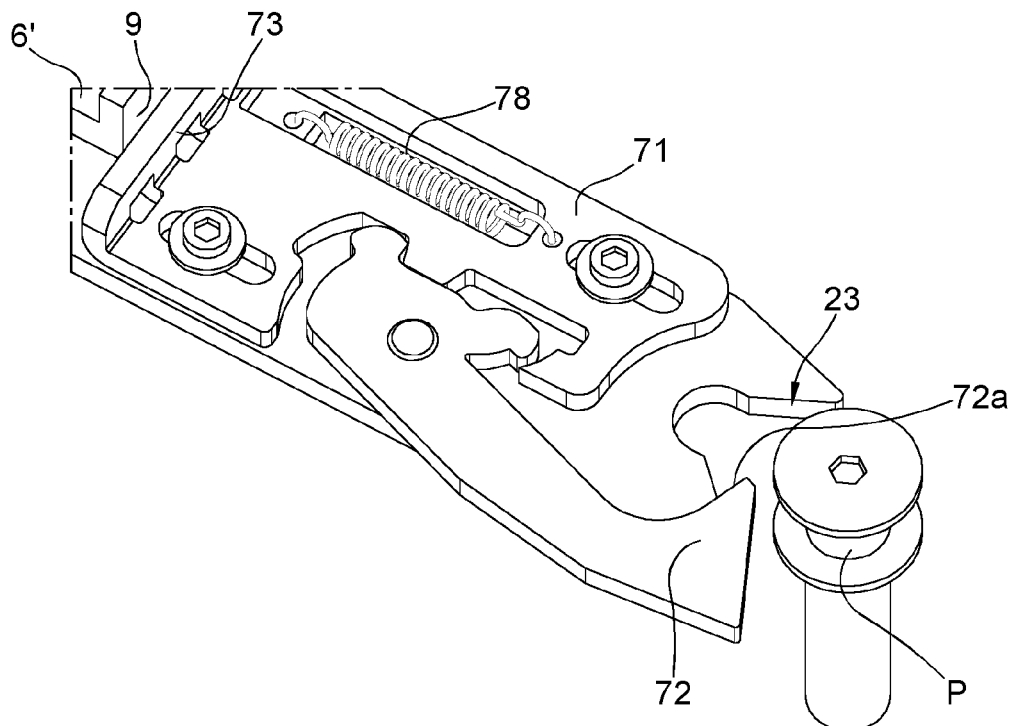
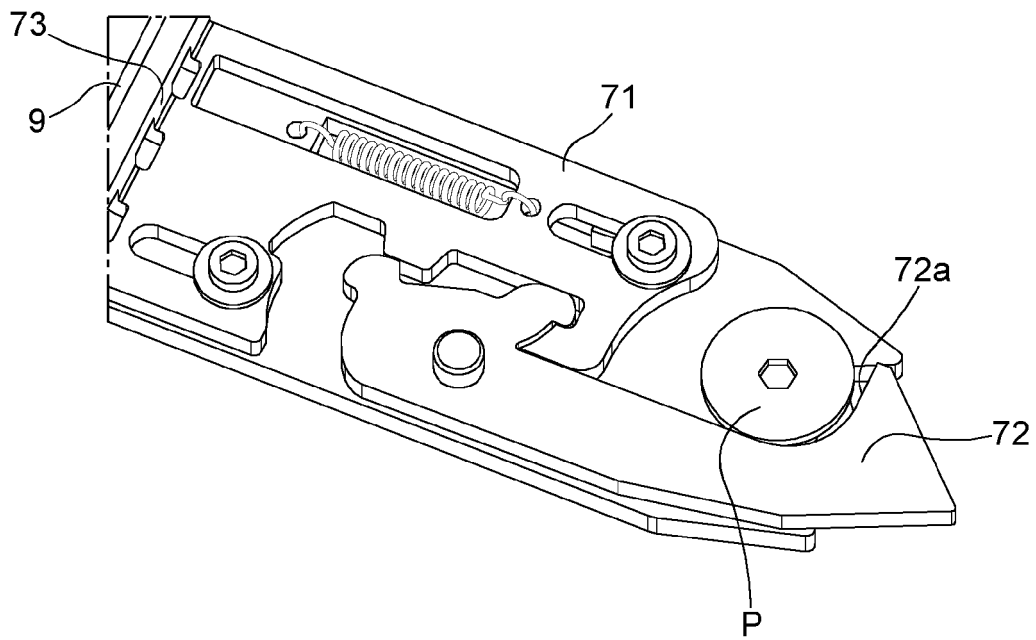
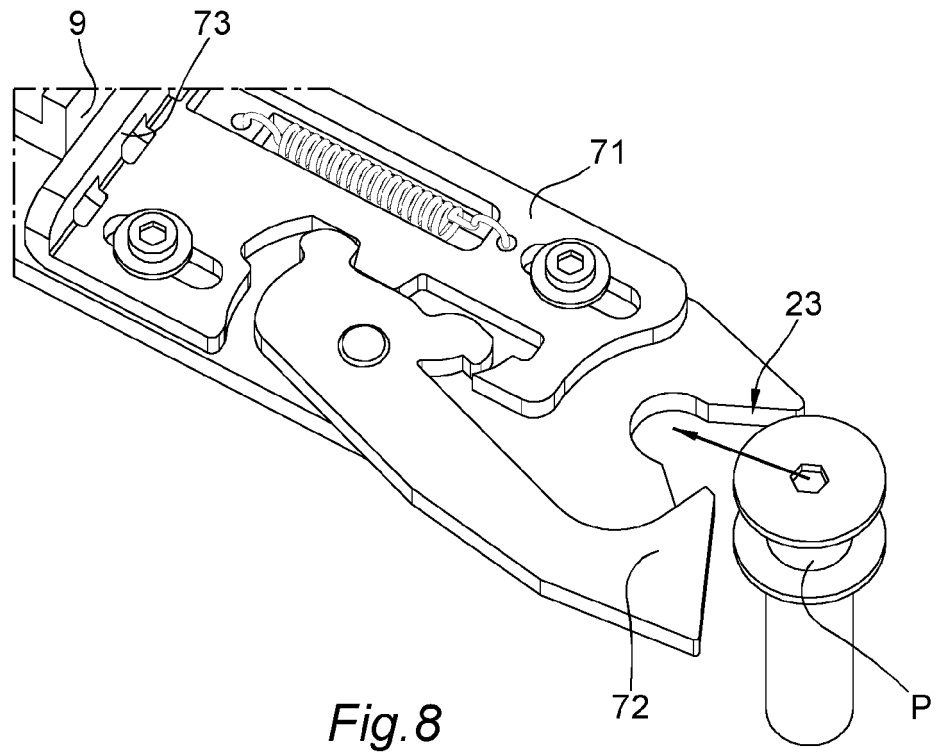


Fig. 7



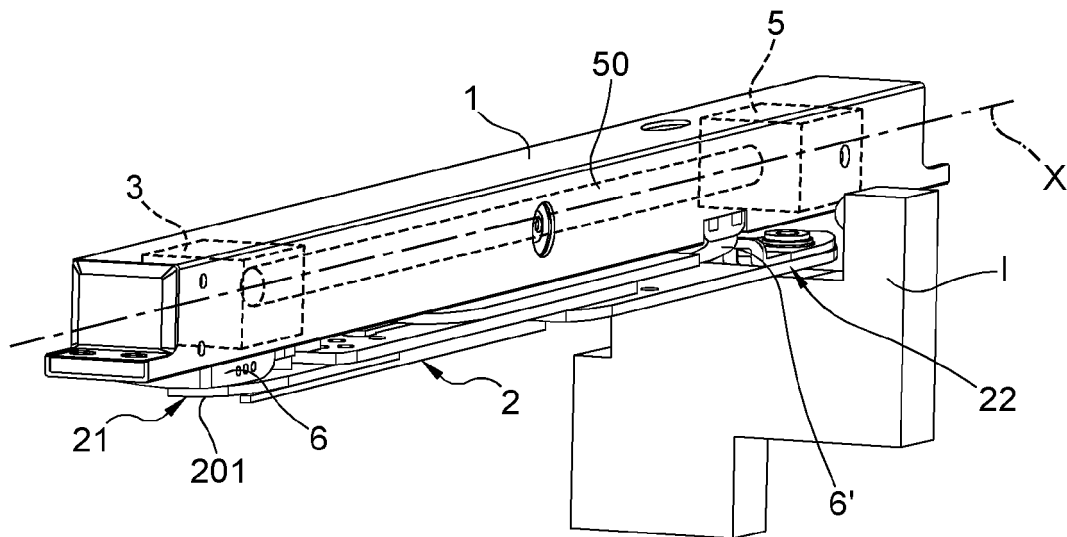


Fig. 10

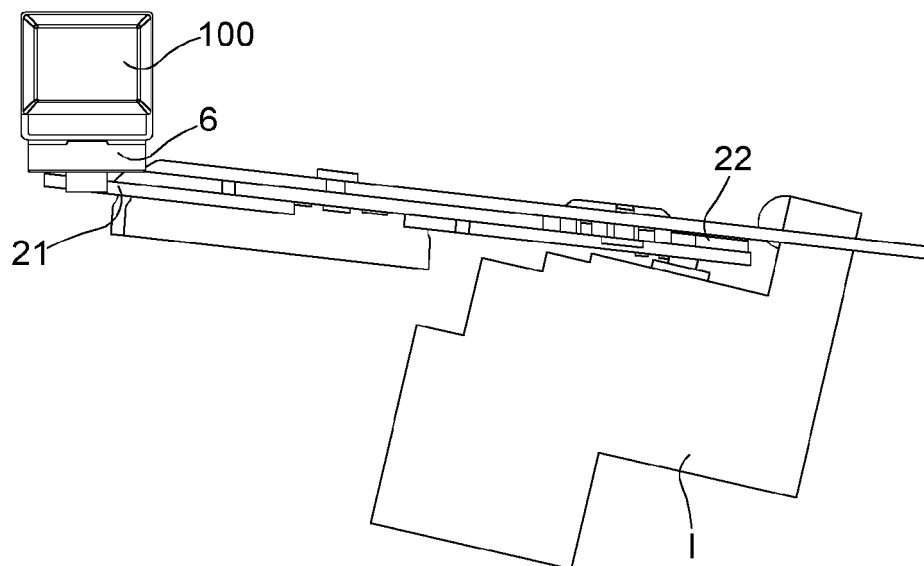


Fig. 11

Fig.12

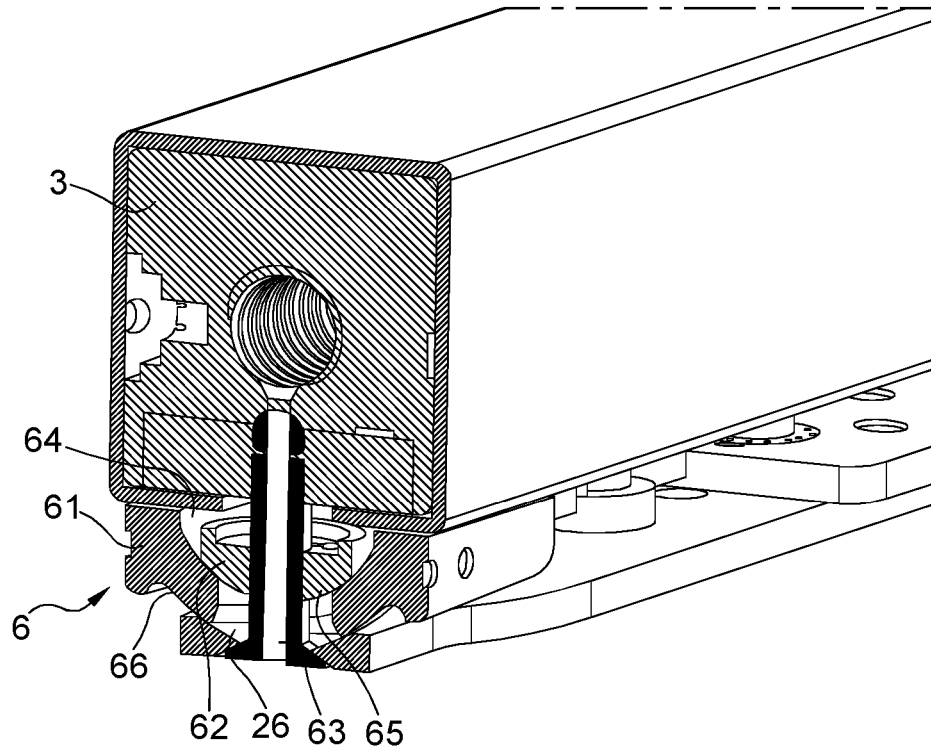
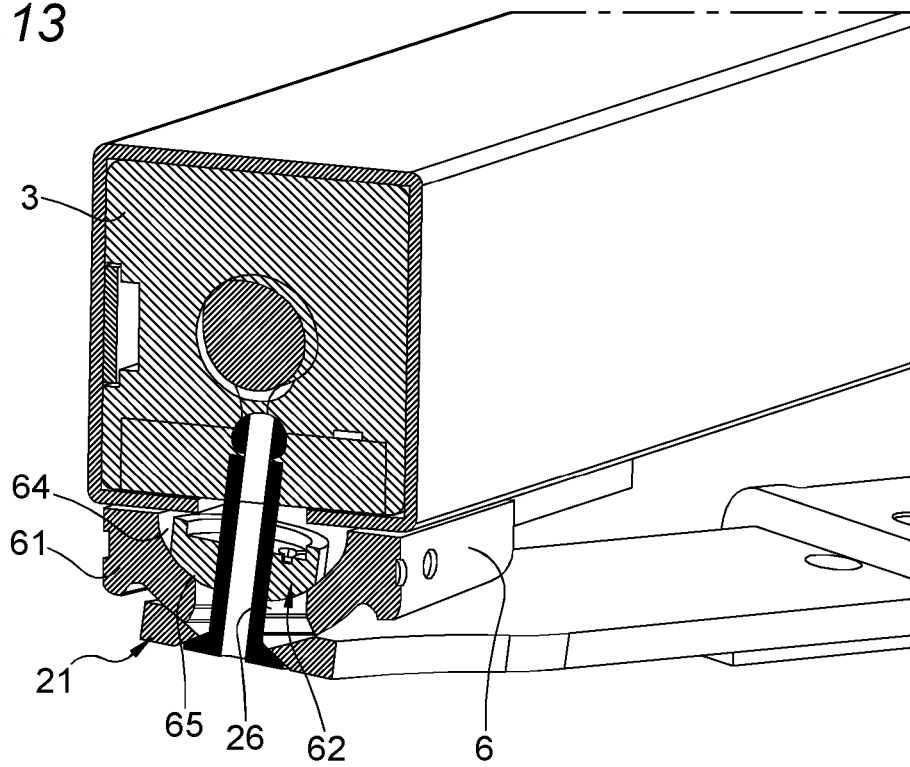
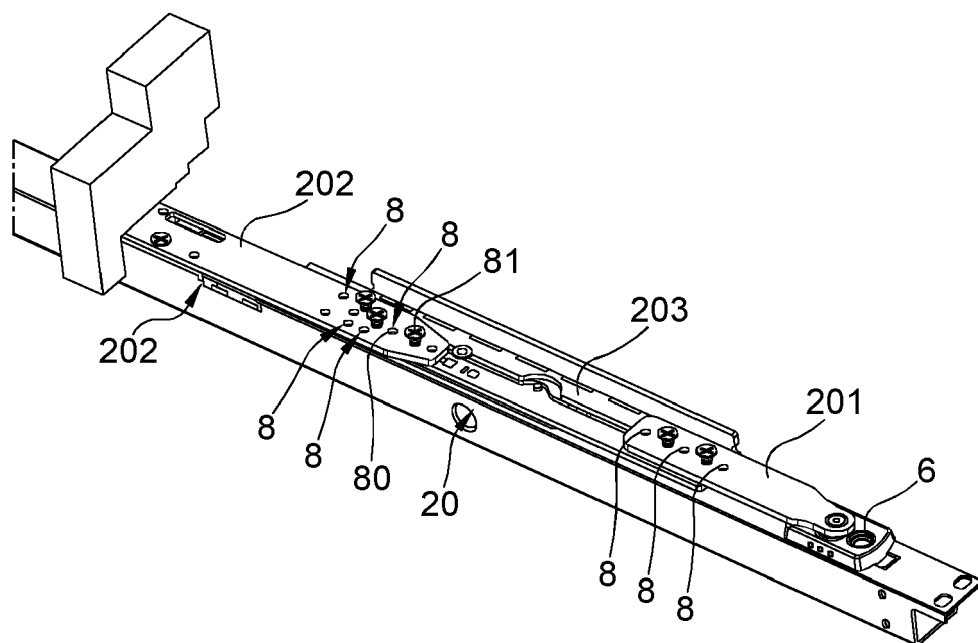
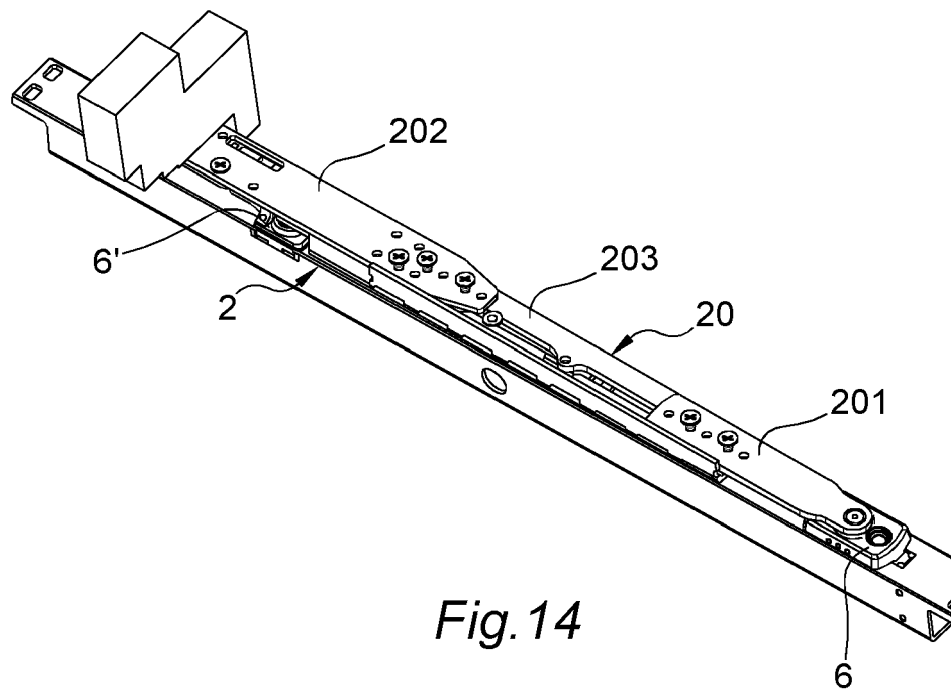


Fig.13









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EPO FORM 1503 03.82 (P04C01)

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Y	* paragraphs [0025] - [0041]; figures 1-16	14	E05D15/522
A	* -----	7, 8	E05F15/616
Y, D	EP 1 801 340 B1 (ROTO FRANK AG [DE]) 14 October 2009 (2009-10-14)	14	E05F15/622
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The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>14 July 2023</b>	Examiner <b>Rémondot, Xavier</b>
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	

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