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

(57) An actuation device for frames comprising a movement mechanism and a linear actuator for actuating the movement mechanism. The movement mechanism comprises a first arm and a second arm which are articulated to each other by way of articulation means. A first end of the first arm is connected to a runner and a second end of the first arm is connected to the frame. A first end of the second arm is rotatably connected to a frame structure which is connected to the frame and an intermediate portion of the second arm is connected to the first arm. The articulation means comprise a first pin which is fixed to the first arm and which can slide in a respective guide which is formed in the second arm, a second pin which is fixed to the second arm and which can slide in a respective guide which is formed in the first arm and a third pin which can slide in a respective third guide. The second guide and the third guide at least partially extend in accordance with a curvilinear trajectory.

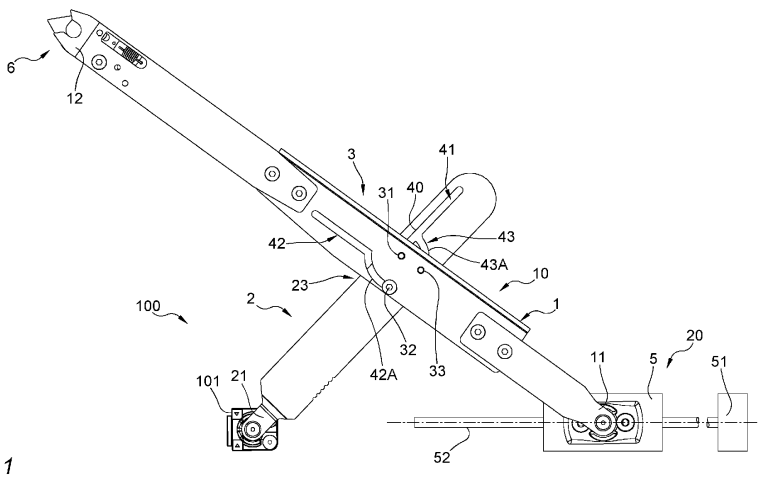

Fig.1

EP 4 379 178 A1

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Description

[0001] The present invention relates to an actuation device for frames of the type comprising a pair of arms which are articulated to each other, and which can be actuated by means of a linear actuator.

[0002] In the field of the technical sector of automation of frames, there are known a great variety of solutions for opening windows by means of motorized mechanisms. In particular, it is known to provide mechanisms which are suitable for making a window carry out a folding opening and closing movement.

[0003] An example of such mechanisms is described in the European patent application EP1801340 A1, in which a scissor type mechanism is used for the movement of the window.

[0004] The opening and closing of the scissor type mechanism is obtained by means of a linear actuation which is suitable for moving together and apart two arms of the scissors by means of the movement of a runner.

[0005] There is provided in both arms a guide, inside which a respective pin slides during the opening/closing movement of the mechanism.

[0006] These guides substantially develop in two portions with a first portion which has a substantially linear development while following the linear portion the guide which is formed in the arm which is hinged to the frame structure of the window has a curvilinear development.

[0007] This actuation mechanism and other known actuation mechanisms are not always found to be particularly effective for the adequate use of the power of the motor and for allowing an optimum compromise between the capacity for applying sufficient force in the opening and closing steps of the window, spatial requirements and speed of movement of the window.

[0008] In fact, it must be observed that known actuation systems with scissor type or quadrilateral mechanisms, particularly as a result of the intrinsic characteristics of such mechanisms, have a capacity for initial thrust which is virtually zero, given that the levers are located very open with the window closed and therefore geometrically in a particularly disadvantageous condition.

[0009] In fact, scissor type and quadrilateral mechanisms increase the thrust capacity thereof gradually with the tendency of the angle between the arms to close.

[0010] Naturally, for reasons of spatial requirement, with a closed window the arms of the scissors are substantially aligned and, for this reason, the angle between them is only a few degrees.

[0011] Under this condition, though applying a significant force to actuate the levers, the force applied thereby for urging the window and to open it is very low.

[0012] Consequently, the known systems which use scissor type mechanisms or quadrilateral mechanisms are mainly used in windows with transom hopper type opening or more generically with hinges which are mounted in the lower portion of the frame structure.

[0013] These types of window do not in fact require highly performing automation with a good capacity for thrust from the first few centimetres of travel given that it is the weight itself of the window which promotes the opening thereof.

[0014] The known systems which are provided with scissor type or quadrilateral mechanisms are, however, found to be very poorly suitable for also being used in bay windows or windows with hinges at the top, where the weight in this state acts in an unfavourable manner and runs counter to the opening direction.

[0015] This problem may generally be evident in all the situations in which great forces are required to move the window, therefore, for example, in the case of windows with great dimensions or in the case in which "bonded" seals are present, a phenomenon which is brought about by a state of closure which has lasted for some time with concomitant high temperatures, or by the fact of being partially frozen during winter time or caused by particular environmental situations, such as the presence of powerful cross-winds.

[0016] Furthermore, still for intrinsic reasons connected with the characteristics of the known scissor type mechanisms, there often occur vibration phenomena of the window during the opening and closing movement thereof.

[0017] Therefore, the problem addressed by the present invention is to provide an actuation device for frames 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.

[0018] Another object of the present invention is to provide an actuation device which is suitable for ensuring high performance levels even in the initial portion of the opening step and/or in the final portion of the closing step of the window.

[0019] Another object of the present invention is to provide an actuation device which is relatively compact and structurally simple so as to be able to be integrated in the frame structures of frames with conventional shapes and dimensions.

[0020] Another object of the present invention is to limit the vibration phenomena during the opening and closing of the window.

[0021] An object of the present invention is also to provide in technical terms an actuation device for windows which allows an effective movement of the window in the context of a simple, rational solution with quite contained costs.

[0022] This problem is solved and these objects are achieved at least partially by the invention by means of an actuation device for frames comprising a movement mechanism and a linear actuator for actuating the movement mechanism.

[0023] Preferably, the movement mechanism comprises a first arm and a second arm which are articulated to each other by way of articulation means.

[0024] Preferably, a first end of the first arm is connected to a runner which is linearly movable by means of the

linear actuator and a second end of the first arm is or can be connected to the frame.

[0025] Preferably, a first end of the second arm is rotatably connected to a frame structure which is or can be connected to the frame and an intermediate portion of the second arm is connected to the first arm.

[0026] Preferably, the articulation means comprise a first pin which is fixed to the first arm and which can slide in a respective guide which is formed in the second arm and a second pin which is fixed to the second arm and which can slide in a respective guide which is formed in the first arm.

[0027] Preferably, the articulation means comprise a third pin which can slide in a respective third guide.

[0028] Preferably, the third pin is fixed to the first arm and the third guide is formed in the second arm or, vice versa, the third pin is fixed to the second arm and the third guide is formed in the first arm.

[0029] Preferably, the second guide at least partially extends in accordance with a curvilinear trajectory.

[0030] Preferably, the third guide at least partially extends in accordance with a curvilinear trajectory.

[0031] It will be appreciated that the device of the present invention allows optimum use of the torque which is supplied by the motor of the linear actuator, particularly in the initial steps of the movement of the frame. The presence of two curvilinear trajectories in fact allows advantageous amplification, when necessary, of the path travelled by the linear actuator, therefore allowing the movement of the frame.

[0032] The presence of three pins further allows an improvement in the robustness of the mechanism, further allowing the alignment between the arms of the mechanism to be maintained more easily when necessary.

[0033] The better alignment of the arms further contributes to reducing the presence of vibrations, further improving the movement of the frame.

[0034] The present invention may also have one or more of the following preferred features in addition to the ones mentioned above.

[0035] In some embodiments, the third guide extends in the form of a branch of the first guide, being connected to the first guide at an intermediate location thereof.

[0036] In this manner, two pins can slide, over a section of the path of the mechanism, within a common portion in order then to be separated, one in one guide, the other in the other guide, in a step following the opening of the frame.

[0037] According to another aspect, the curvilinear trajectory of the second guide comprises a circumferential arc having a radius of curvature which is different from a respective circumferential arc which is defined by the curvilinear trajectory of the third guide.

[0038] Preferably, the radius of curvature of the circumferential arc which is formed by the second guide is greater than the radius of curvature of the circumferential arc which is formed by the third guide.

[0039] This allows a more robust structure to be obtained.

[0040] In some embodiments, the first pin and the third pin are aligned in a longitudinal extent direction of the first arm.

[0041] Preferably, the first guide comprises a first section, which is preferably rectilinear, the intermediate location being defined in the region of an end of the first section, the movement mechanism being configured in such a manner that the first pin and third pin both slide in the first section when the first and second arms are substantially aligned with each other.

[0042] As a result of these features, the two pins can advantageously be used to optimize the alignment of the two arms in the first steps for opening the frame.

[0043] Preferably, the third guide comprises a tilted section which connects the curvilinear trajectory to the first guide in the region of the intermediate location, wherein the tilted section extends in the region of the intermediate location tilted with respect to a longitudinal extent direction of the first guide.

[0044] As a result of the presence of a tilted section in the region of the third guide, it is possible to reduce the risk of blockages of the mechanism, promoting the transition of the pin between the first guide and the third guide, and vice versa.

[0045] Preferably, the first guide comprises, in addition to the first section, a second section, which is preferably rectilinear and which is separated from the first section by means of the intermediate location, and a tilted section which follows the second rectilinear section.

[0046] The presence of a tilted section also in the region of the first guide allows an improvement in the stability of the mechanism in the steps in which one pin is in this tilted section and the other pin is in the rectilinear section.

[0047] Preferably, the tilted section of the first guide and the tilted section of the third guide extend laterally relative to the first and second sections of the first guide in the direction of the same side.

[0048] In this manner, the two tilted sections may cooperate with each other by bringing together the benefits provided by the presence of these features.

[0049] In some embodiments, the distance between the first pin and the third pin in the longitudinal extent direction of the first arm is such that, when the third pin is in the region of the intermediate location, the first pin is in the tilted section of the first guide.

[0050] Preferably, the distance between the first pin and the third pin is substantially equal to the radius of curvature of the curvilinear trajectory of the third guide.

[0051] In some embodiments, the distance between the second pin and a travel limit stop location of the first guide is substantially equal to the radius of curvature of the curvilinear trajectory of the second guide.

[0052] Preferably, the curvilinear trajectory of the second guide defines a centre of curvature which is substantially a centre of curvature of the curvilinear trajectory of the third guide.

[0053] As a result of these features, it is also possible to promote the rotational movement of the arms, guiding the pins in a suitable manner along the relative curvilinear trajectories.

[0054] In some embodiments, the first guide and the third guide generally form a substantially Y-shaped path.

[0055] In this manner, the guide has a shape which can be achieved by means of simple mechanical processing operations and with a well-defined and precise trajectory.

[0056] Additional preferred aspects are also defined in the appended claims and by the following description.

[0057] In the present description, as in the claims appended thereto, and more generally in the context of the present invention, a number of terms and expressions are considered to assume, unless explicitly indicated otherwise, the meaning expressed in the following definitions.

[0058] In particular, the term "frame" is intended to indicate any type of frame suitable for allowing the opening and closing of an aperture present in a wall of a building, typically but not necessarily towards the exterior of the building.

[0059] The term "frame" is intended to indicate the assembly formed by the movable element and the frame structure which is intended to be fixed to the wall and which is suitable for underpinning the movable element and allowing the movement thereof.

[0060] The terms "substantially parallel" and "substantially perpendicular" with reference to the two movement directions or development directions of two different members are intended to indicate, in the context of the present invention, a condition of parallelism and orthogonality between the two directions, with a possible deviation of $\pm 10°$, preferably $\pm 5°$, with respect to complete parallelism and complete orthogonality, respectively.

[0061] 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 plan view of the actuation device according to the present invention in an open position;

Figures 2 and 3 are two perspective plan views of the actuation device according to the present invention in an intermediate position and in a closed position, respectively;

Figure 4 is a bottom view of the actuation device according to the present invention in an open position;

Figures 5 and 6 are two perspective bottom views of the actuation device according to the present invention in an intermediate position and in a closed position, respectively;

Figures 7 and 7A are a plan view and a view of a relevant detail of the actuation device according to the present invention in a position near the initial open position;

Figure 8 shows a detail, according to a plan view, of the actuation device according to the present invention in a position which is even nearer the initial open position;

Figures 9 and 9A show a view from below and a relevant detail of the actuation device according to the present invention in an additional intermediate position; and

Figures 10 and 11 are two additional views from below of the actuation device according to the present invention with a number of hidden details being represented by means of broken lines in a closed position and in an open position, respectively.

[0062] Initially with reference to Figure 1, an actuation device for frames according to the present invention is generally designated 100.

[0063] The actuation device 100 is advantageously of the type intended for being used to control the opening and closing of a frame by means of a folding movement, also known using the term "transom hopper window".

[0064] This movement may particularly be controlled by means of a pushing and pulling action which is carried out by means of a suitable movement mechanism 10 which is actuated by a relevant linear actuator 20, as will be set out in detail below.

[0065] The movement mechanism 10 may therefore be arranged in the region of the end of the frame opposite the hinging end, which is typically the upper end.

[0066] It will in any case be appreciated that the actuation device of the present invention may also be used for the movement of frames of different types.

[0067] Still with reference to Figure 1, the movement mechanism 10 comprises a first arm 1 and a second arm 2 which are articulated to each other by way of articulation means 3. Preferably, the articulation means 3 are configured in such a manner that the arms can move by means of a scissor type mechanism.

[0068] To this end, the first arm 1 is advantageously connected, in the region of a first end 11 thereof, to a movable runner 5 which can be moved by means of the linear actuator 20.

[0069] However, the second end 12 of the first arm 1 is connected to the frame, preferably by means of an engaging mechanism 6 which allows the movement mechanism 10 to be engaged with and disengaged from the frame in accordance with requirements.

[0070] In fact, the engaging mechanism 6 is advantageously configured in such a manner that, if it is necessary or desirable to carry out the manual movement of the window, it is possible to disengage the movement mechanism 10 and to act manually.

[0071] However, the second arm 2 is rotatably connected in the region of a first end 21 thereof to a frame structure 101 of the device 100 which is in turn connected to the frame structure of the frame, that is to say, the fixed structure of the frame, to which the movable portion is

secured.

[0072] The second arm 2 is further connected, in the region of an intermediate portion 23 thereof, to the first arm 1, in the region of a respective intermediate position.

[0073] The connection between the first arm and second arm is brought about by way of suitable articulation means 3, the features of which will be described in detail below.

[0074] Still with reference to Figure 1, the linear actuator 20 allows the end 11 of the first arm 1 to be moved towards and away from the end 21 of the second arm 2, bringing about the opening and closing of the movement mechanism 10.

[0075] In preferred embodiments, this movement is brought about by linearly moving the runner 5 by means of the linear actuator 20 which comprises to this end an electric motor 51 which rotates a screw 52, to which a corresponding nut which is not illustrated in the Figures and which is constructed on the runner 5 is connected, as illustrated, for example, in Figure 1.

[0076] The closed position of the actuation device 100 is illustrated, for example, in Figure 3 and, as may be observed, in this position the arms 1 and 2 are aligned with each other.

[0077] Still with reference to Figure 1, the articulation means 3 comprise a series of pins which are fixed to the first arm and second arm and a series of guides which are formed in the first arm and second arm, inside which the relevant pins slide.

[0078] As may be observed in Figures 1 and 4, a first pin 31 is fixed to the first arm 1 and slides in a respective first guide 41 which is formed in the second arm 2.

[0079] However, a second pin 32 is fixed to the second arm 2 and slides in a respective second guide 42 which is formed in the first arm 1.

[0080] A third pin 33 is further fixed to the first arm 1 and can slide in a respective third guide 43 which is still formed in the second arm 2.

[0081] It will be appreciated that, although in the embodiments illustrated in the Figures there are fixed two pins 31, 33 to the first arm 1 and there are constructed two guides 41, 43 in the region of the second arm 2, there may also be provided the opposite combination, that is to say, with two pins fixed to the second arm and two guides formed on the first arm.

[0082] Advantageously, the guides 41, 42, 43 have an appropriate shape which is suitable for advantageously controlling the opening and closing of the mechanism 10, which shape provides for the presence in one or more of the guides of at least one curvilinear trajectory.

[0083] In fact, as illustrated in Figures 2 and 3, the first arm 1 comprises a portion with a curvilinear trajectory 42A. It may be observed that the pin 32 travels along the curvilinear trajectory 42A of the guide 42 when the movement mechanism 10 changes from the intermediate position to the open position. In preferred embodiments, the curvilinear trajectory 42A is formed by a circumferential arc.

[0084] Preferably, the remaining portion of the guide 42 extends in a rectilinear manner and, still in preferred embodiments, it is substantially parallel with the longitudinal development of the arm.

[0085] Instead with reference to Figures 5 and 6, the second arm 2 in turn comprises a guide 43 which is indicated as the third guide in the present description and which defines a curvilinear trajectory 43A which is travelled by the pin 33 when the movement mechanism 10 moves from the closed/intermediate position to the open position. In this closed/intermediate position, the pin 33 has travelled along the rectilinear section, disengaging the engaging mechanism 6 and therefore preparing the frame for opening which, however, has not yet substantially started.

[0086] Preferably, the pin 33 travels along the curvilinear trajectory 43A substantially in the same portion of the movement of the actuation mechanism in which the second pin 42 travels along the curvilinear trajectory 42A, as may be observed, for example, in Figure 11.

[0087] In this case, the curvilinear trajectory 43A may also be formed by a circumferential arc. Preferably, the radius of curvature R2 of the circumferential arc which is formed by the second guide 42 is greater than the radius of curvature R3 of the circumferential arc which is formed by the third guide 43, as may be observed, for example, in Figure 10.

[0088] In preferred embodiments, the third guide 43 extends in the form of a branch of the first guide 41, being connected to the first guide 41 at an intermediate location 40 thereof. As may be observed in Figures 4 to 6, the first guide 41 and the third guide 43 can be joined, for example, generally forming a substantially Y-shaped path.

[0089] In any case, there may also be envisaged embodiments in which the third guide is not connected to the first guide or in which the connection is brought about at a different location from the intermediate location, for example, in the region of an end.

[0090] Still with reference to the shape of the first guide, it may be observed that in preferred embodiments the first guide 41 comprises a first section 41A which is preferably rectilinear. The intermediate location 40 is therefore defined in the region of an end of the first section 41A which continues as a second section 41B, which is still preferably rectilinear.

[0091] The movement mechanism 10 may therefore be configured in such a manner that the first pin and third pin 31, 33 both slide in the first section 41A when the first and second arms 1, 2 are substantially aligned with each other, as may be observed in Figure 6.

[0092] To this end, the first pin 31 and the third pin 33 can be aligned in a longitudinal extent direction of the first arm.

[0093] The movement of the pins 31, 32, 33 in the respective guides during the translational movement of the arms is illustrated in Figures 1 to 6, where Figures 1 and 4 illustrate the mechanism in an open position, Figures

2 and 5 illustrate the mechanism in the closed/intermediate position, in accordance with the meaning indicated above, and Figures 3 and 6 illustrate the mechanism in a closed position.

[0094] In a closed position, the pins 31 and 32 are both positioned in the region of an end of the guide 41 and 42, respectively. As mentioned above, the third pin 33 is also preferably in the guide 41 together with the pin 31.

[0095] Following the actuation of the linear actuator, the two ends 11 and 21 of the arms 1 and 2 are moved together and the pins advance inside the rectilinear sections 41A and 42B of the respective guides. When the pin 32 reaches the curvilinear trajectory, the arms 1 and 2 start to carry out a rotation with respect to each other following the approach of the two ends 11 and 21.

[0096] In the region of this position, the third pin 33 is advantageously arranged in the region of the intermediate location 40, as may be observed in Figure 8, and may therefore be moved, in a state drawn by the reciprocal rotation of the two arms, towards the third guide 43, thereby starting to travel along it.

[0097] To this end, there may be provided specific dimensional relationships in the geometry of pins and curved trajectories.

[0098] In some embodiments, for example, the distance d1 between the first pin 31 and the third pin 33 is substantially equal to the radius of curvature R3 of the curvilinear trajectory 43A of the third guide 43, as illustrated in Figure 10.

[0099] Still with reference to this Figure, in preferred embodiments the distance d2 between the second pin 32 and a travel limit stop location 44 of the first guide 41 is substantially equal to the radius of curvature R2 of the curvilinear trajectory 42A of the second guide 42.

[0100] Instead with reference to Figure 11, the centre of curvature C2 of the circumferential arc with the radius R2 may be substantially coincident with the centre of curvature C3 of the circumferential arc with the radius R3.

[0101] As previously mentioned, when the mechanism reaches the position for which the third pin 33 is in the intermediate position 40, the pins 32 and 33 start to travel along the respective curvilinear trajectories.

[0102] This movement produces the additional opening of the mechanism 10 and the resultant opening of the frame and can continue until reaching the position of Figures 1 and 4, in which the pins have reached a respective travel limit stop position.

[0103] In order to promote the transition of the third pin 33 towards the third guide 43, there may be provided a tilted section 43B which connects the curvilinear trajectory 43A to the first guide 41 in the region of the intermediate location 40.

[0104] In particular, as can better be seen in Figure 7A, the tilted section 43B extends, in the region of the intermediate location 40, tilted with respect to the longitudinal extent direction of the first guide 41.

[0105] Furthermore, the first guide may also have a tilted section 41C which is arranged in a position following the second rectilinear section 41B, as illustrated in Figures 7A and 8.

[0106] This tilted section 41C is particularly travelled by the first pin 31 when the mechanism 10 moves into a position of complete closure, slightly misaligning the arms and ensuring better and more stable closure of the mechanism.

[0107] It may also be observed that both the tilted sections 41C and 43B extend in the direction of the same side, laterally with respect to the first and second sections 41A, 41B of the guide 41, respectively.

[0108] Furthermore, as illustrated in Figure 10, the distance d1 between the first pin 31 and the third pin 33 is such that, when the third pin 33 is in the region of the intermediate location 40, the first pin 31 is in the tilted section 41C.

[0109] The invention thereby solves the problem proposed, at the same time affording a number of advantages. In fact, the actuation device of the present invention is found to be particularly effective in using the power of the electric motor in the different movement steps of the movement mechanism and consequently of the frame. In particular, the device of the present invention is less sensitive to the reduction of the force applied to the frame in the completely closed positions, thereby contributing to avoiding the problems associated with the known solutions and also being more suitable for actuating frames with great dimensions.

Claims

1. An actuation device (100) for frames comprising a movement mechanism (10) and a linear actuator (20) for actuating the movement mechanism (10), the movement mechanism comprising a first arm (1) and a second arm (2) which are articulated to each other by way of articulation means (3), wherein:

   - a first end (11) of the first arm (1) is connected to a runner (5) which is linearly movable by means of the linear actuator (20) and a second end (12) of the first arm (1) is or can be connected to the frame,
   - a first end (21) of the second arm (2) is rotatably connected to a frame structure which is or can be connected to the frame and an intermediate portion (23) of the second arm (2) is connected to the first arm (1);

   the articulation means (3) comprising a first pin (31) which is fixed to the first arm (1) and which can slide in a respective guide (41) which is formed in the second arm (2) and a second pin (32) which is fixed to the second arm (2) and which can slide in a respective guide (42) which is formed in the first arm (1), **characterized in that** it comprises a third pin (33) which can slide in a respective third guide (43), the

third pin (33) being fixed to the first arm (1) and the third guide (43) being formed in the second arm (2) or, vice versa, the third pin (33) being fixed to the second arm (2) and the third guide (43) being formed in the first arm (1), and **in that** the second guide (42) and the third guide (43) at least partially extend in accordance with a curvilinear trajectory (42A, 43A).

2. An actuation device (100) according to the preceding claim, wherein the third guide (43) extends in the form of a branch of the first guide (41), being connected to the first guide (41) at an intermediate location (40) thereof.

3. An actuation device (100) according to the preceding claim, wherein the curvilinear trajectory (42A) of the second guide (42) comprises a circumferential arc having a radius of curvature (R2) which is different from a respective circumferential arc (R3) which is defined by the curvilinear trajectory (43A) of the third guide (43).

4. An actuation device (100) according to the preceding claim, wherein the radius of curvature (R2) of the circumferential arc which is formed by the second guide (42) is greater than the radius of curvature (R3) of the circumferential arc which is formed by the third guide (43).

5. An actuation device (100) according to any one of the preceding claims, wherein the first pin (31) and the third pin (33) are aligned in a longitudinal extent direction of the first arm.

6. An actuation device (100) according to any one of the preceding claims, wherein the first guide (41) comprises a first section (41A), the intermediate location (40) being defined in the region of an end of the first section (41A), the movement mechanism (10) being configured in such a manner that the first pin and third pin (31, 33) both slide in the first section (41A) when the first and second arms (1, 2) are substantially aligned with each other.

7. An actuation device (100) according to the preceding claim, wherein the first section is rectilinear.

8. An actuation device (100) according to any one of the preceding claims, wherein the third guide (43) comprises a tilted section (43B) which connects the curvilinear trajectory (43A) to the first guide (41) in the region of the intermediate location (40).

9. An actuation device (100) according to the preceding claim, wherein the tilted section (43B) extends in the region of the intermediate location (40) tilted with respect to a longitudinal extent direction of the first guide (41).

10. An actuation device (100) according to any one of the preceding claims, wherein the first guide (41) comprises, in addition to the first section (41A), a second section (41B), which is preferably rectilinear and which is separated from the first section (41A) by means of the intermediate location (40), and a tilted section (41C) which follows the second section (41B).

11. An actuation device (100) according to the preceding claim, wherein the second section (41B) is rectilinear.

12. An actuation device (100) according to claim 8 or 9 and claim 10 or 11, wherein the tilted section (41C) of the first guide and the tilted section (43B) of the third guide extend laterally relative to the first and second sections (41A, 41B) of the first guide (41) in the direction of the same side.

13. An actuation device (100) according to any one of claims 10 to 12, wherein the distance between the first pin (31) and the third pin (33) in the longitudinal extent direction of the first arm (1) is such that, when the third pin (33) is in the region of the intermediate location (40), the first pin (31) is in the tilted section (41C) of the first guide (41).

14. An actuation device (100) according to any one of the preceding claims, when dependent on claim 3, wherein the distance (d1) between the first pin (31) and the third pin (33) is substantially equal to the radius of curvature (R3) of the curvilinear trajectory (43A) of the third guide (43).

15. An actuation device (100) according to any one of the preceding claims, when dependent on claim 3, wherein the distance (d2) between the second pin (32) and a travel limit stop location (44) of the first guide (41) is substantially equal to the radius of curvature (R2) of the curvilinear trajectory (42A) of the second guide (42).

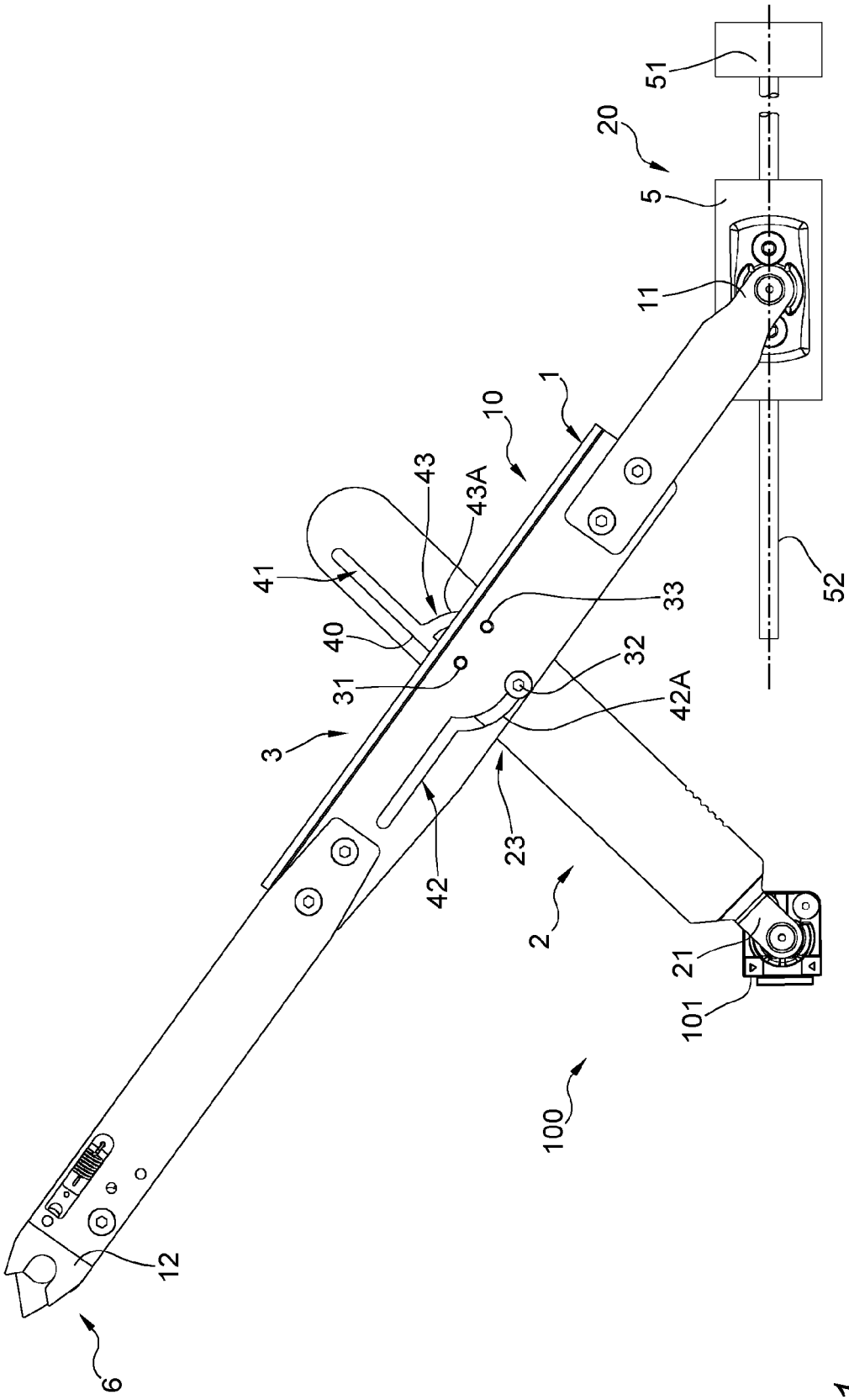

Fig.1

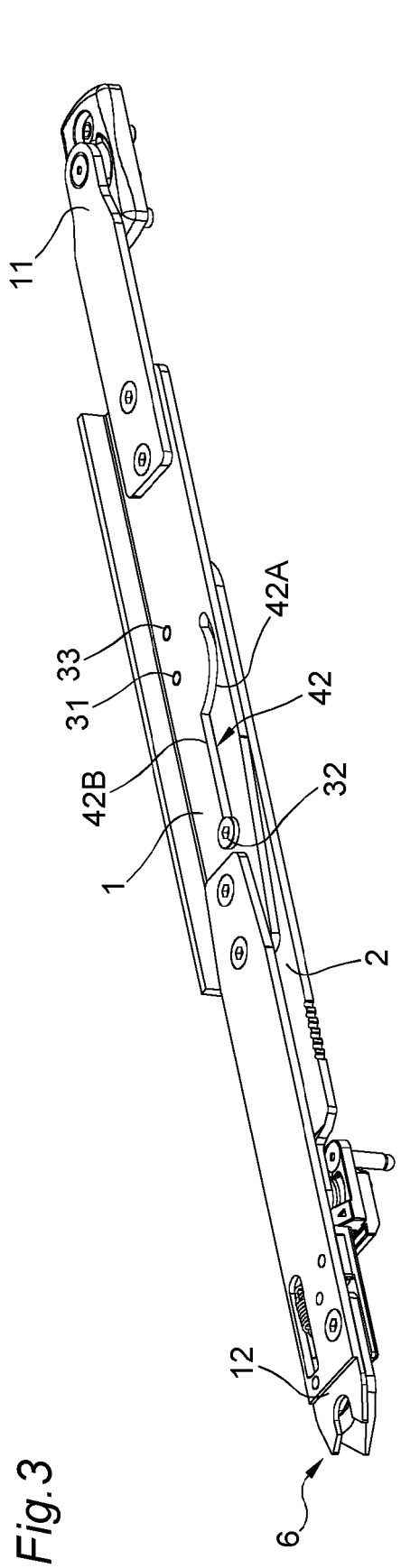

Fig.3

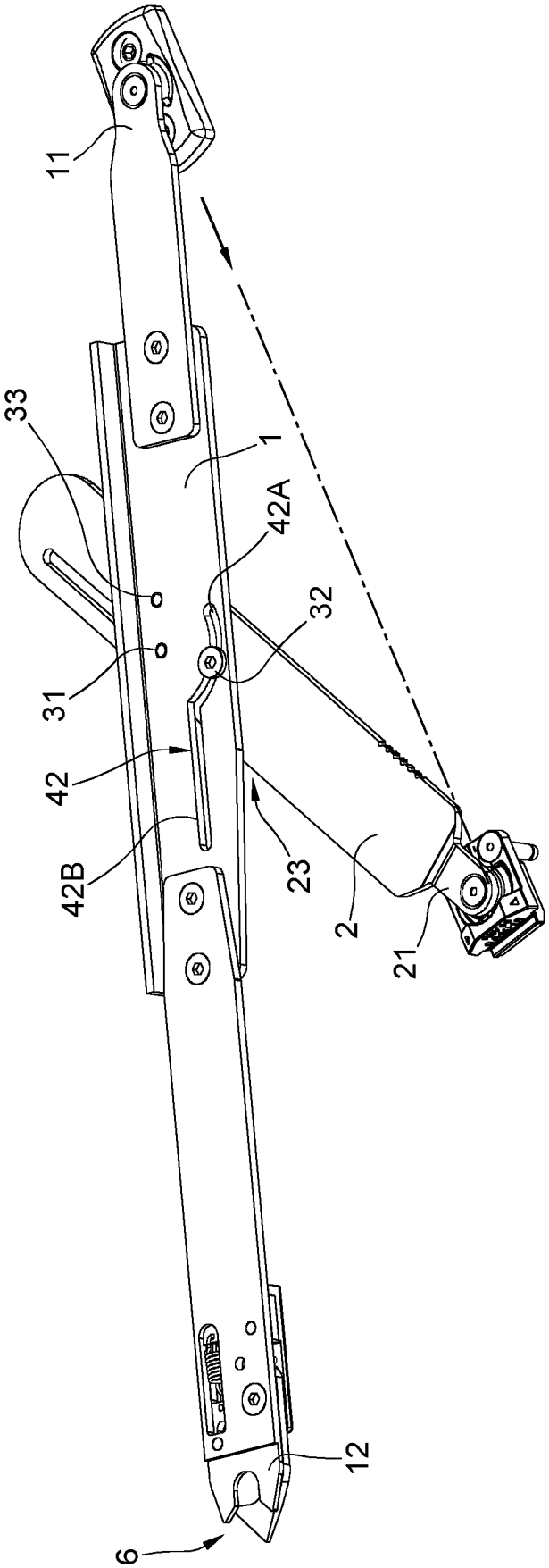

Fig.2

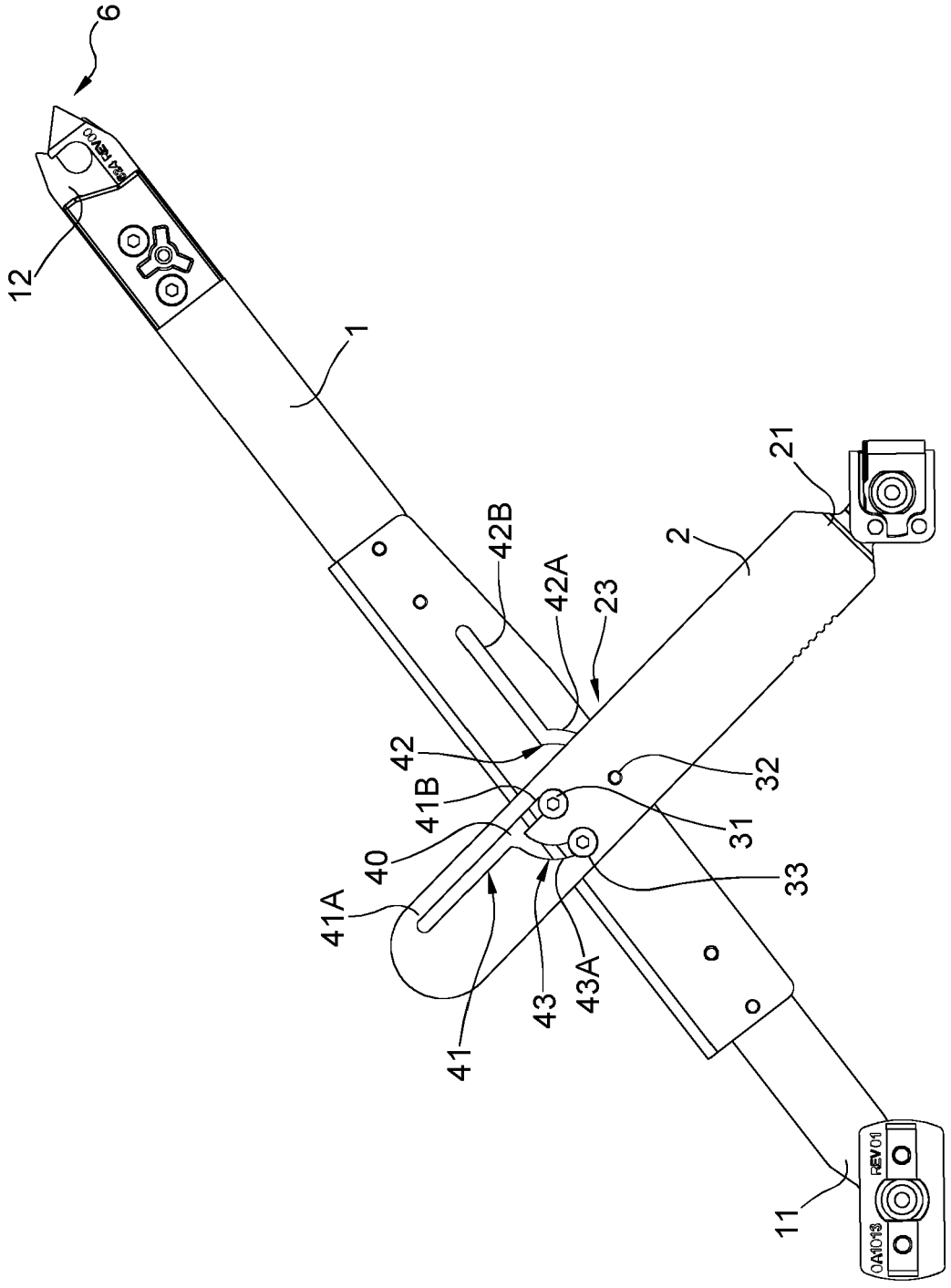

Fig.4

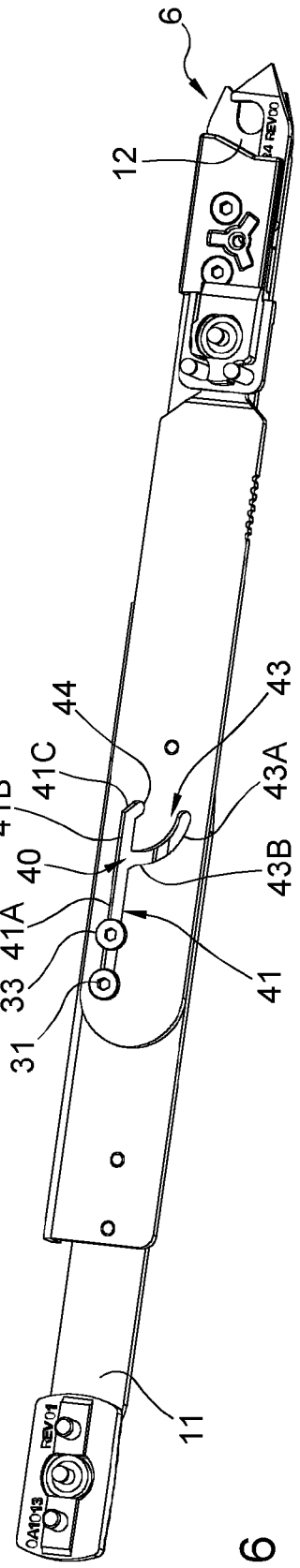
6
12
44
43
41C
43A
41B
40
43B
41A
41
33
31
11

Fig.6

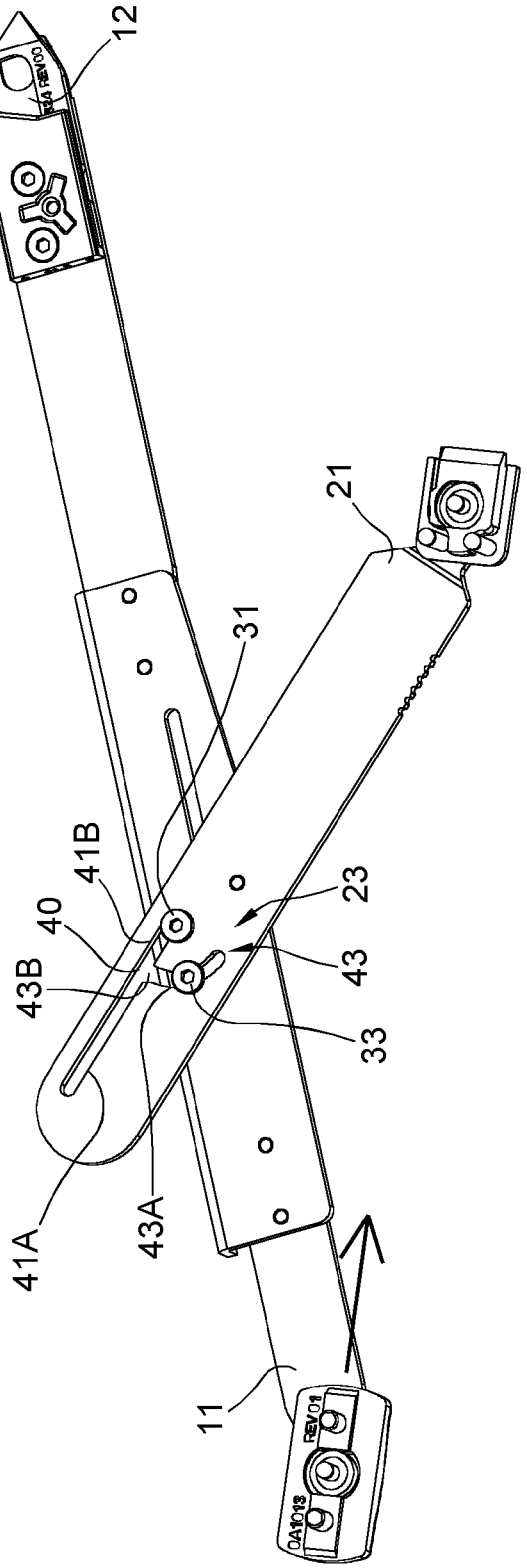
12
21
31
41B
40
23
43
43B
33
41A
43A
11

Fig.5

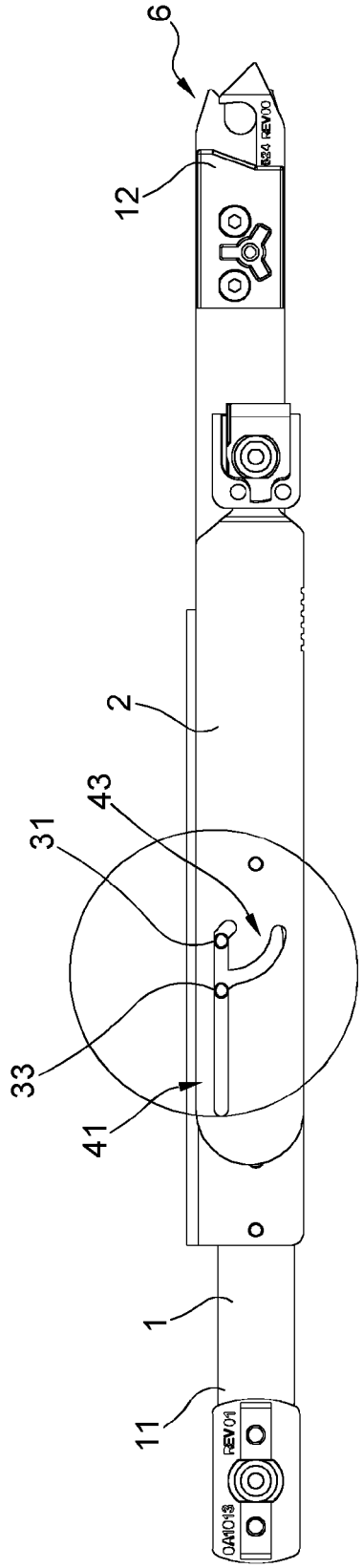

Fig.7

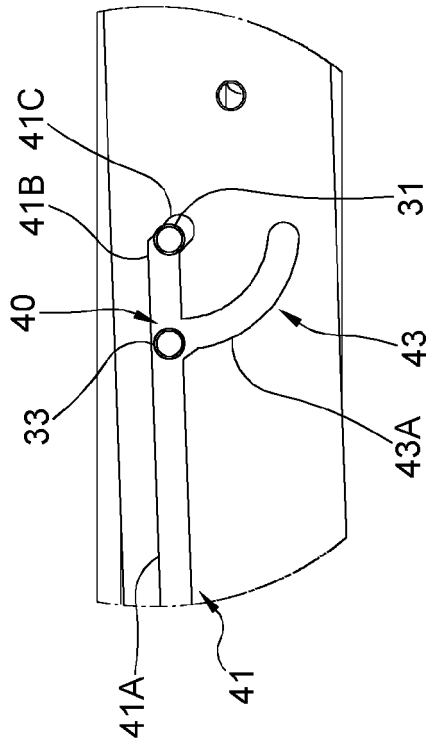

Fig.8

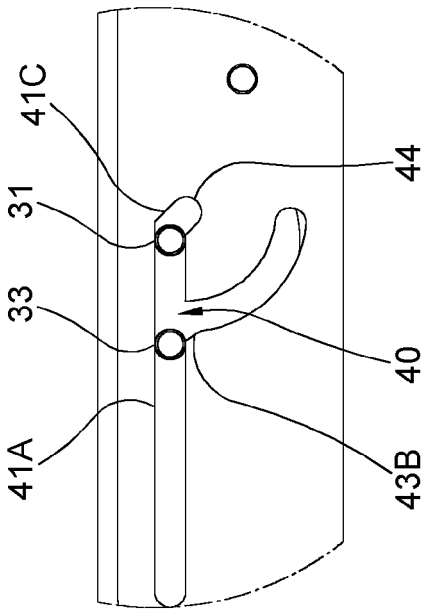

Fig.7A

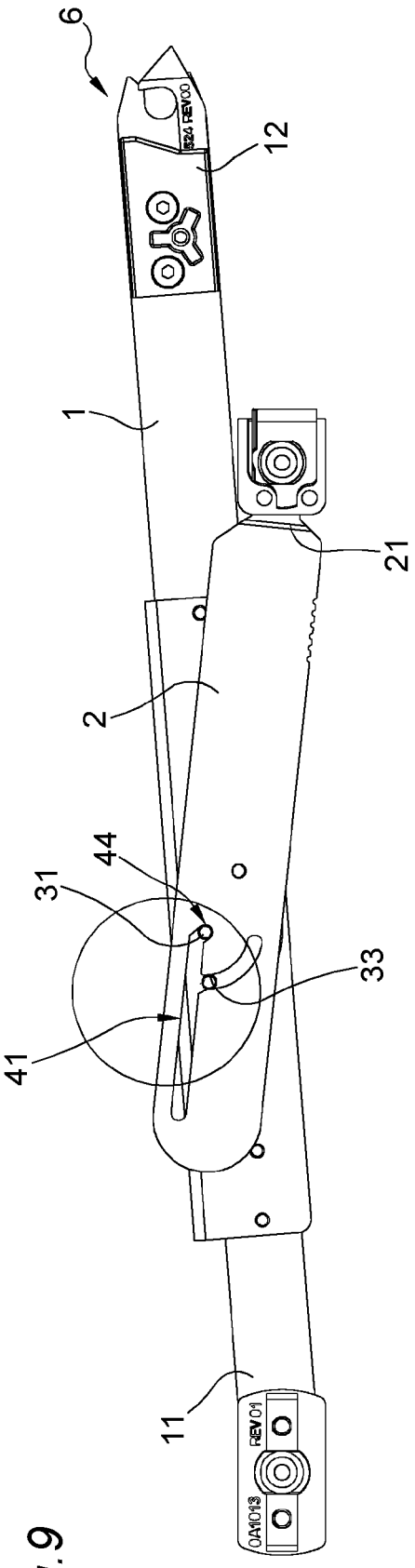
6
12
1
21
2
44
31
33
41
11
REV01
0A1013

Fig.9

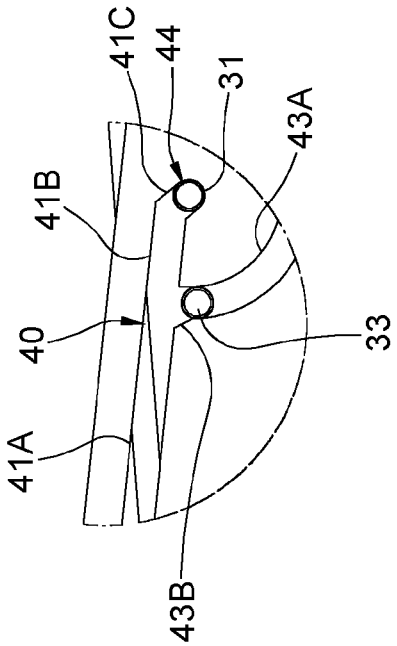
41C
44
31
43A
41B
40
33
41A
43B

Fig.9A

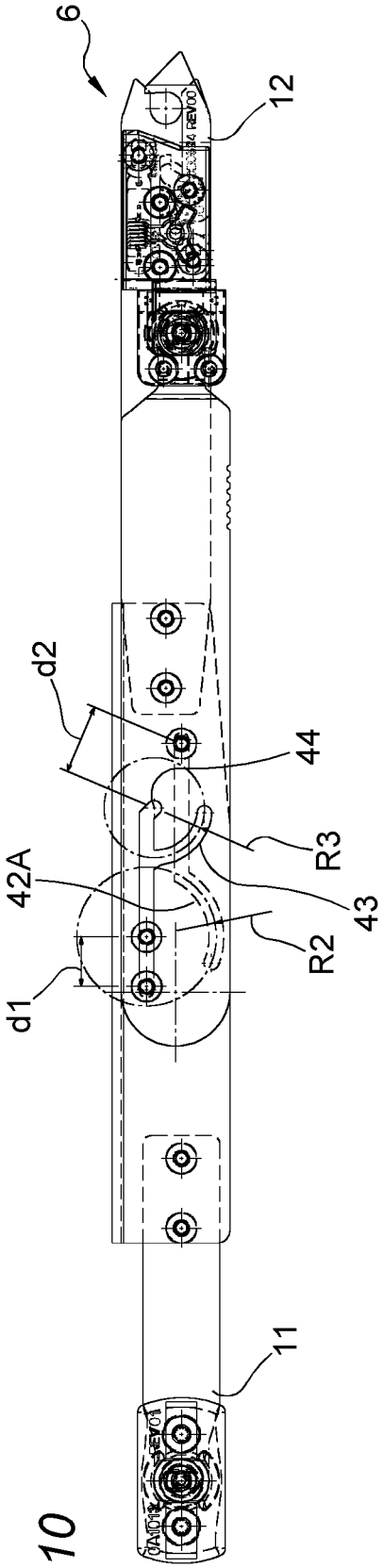

Fig.10

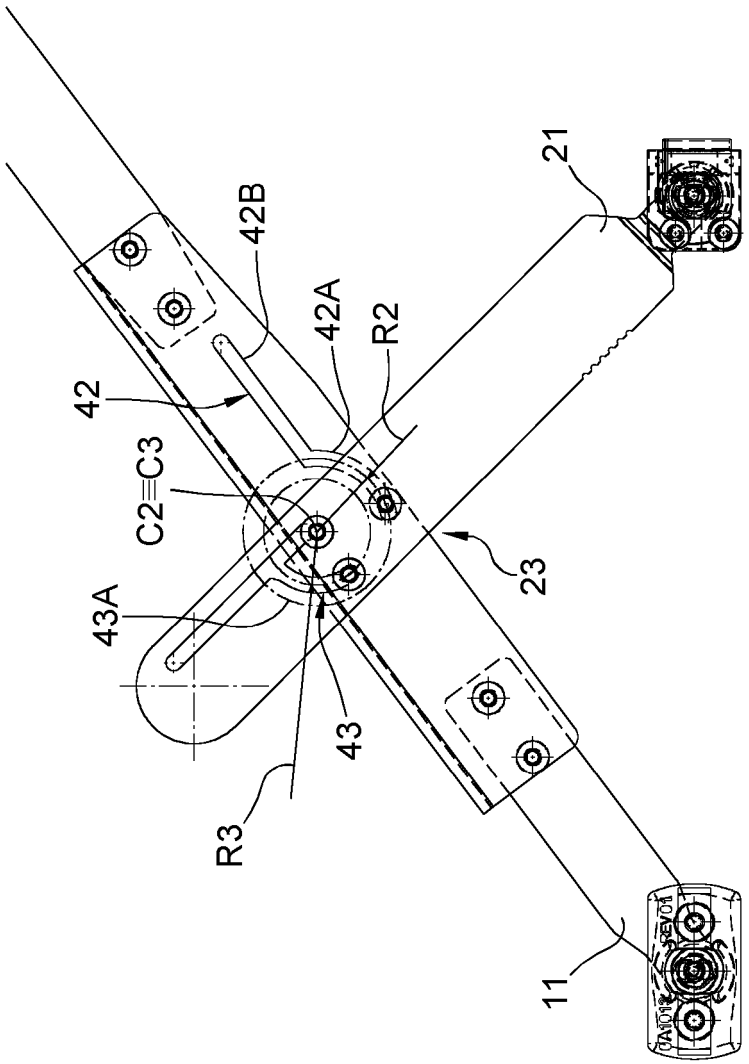

Fig.11

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EUROPEAN SEARCH REPORT

Application Number
EP 23 21 3676

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	EP 1 801 340 A1 (ROTO FRANK AG [DE]) 27 June 2007 (2007-06-27) * the whole document *	1-15	INV. E05D15/52 E05F15/622 E05F15/63
Y	AT 269 677 B (WEBER WILHELM [DE]) 25 March 1969 (1969-03-25) * page 1, line 25 - line 32 * * page 1, line 36 - page 2, line 43; figures 1-3 *	1-15	ADD. E05D15/48
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			TECHNICAL FIELDS SEARCHED (IPC) E05D E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 April 2024	Viethen, Lorenz

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08-04-2024

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