



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.03.2024 Bulletin 2024/11

(21) Application number: **23196220.0**

(22) Date of filing: **08.09.2023**

(51) International Patent Classification (IPC):
E05F 15/54 ^(2015.01) **E05F 15/56** ^(2015.01)
E05F 15/57 ^(2015.01) **E05F 15/611** ^(2015.01)
E05F 15/614 ^(2015.01) **E05F 15/632** ^(2015.01)
E05F 15/635 ^(2015.01) **E05F 15/652** ^(2015.01)
E05F 15/665 ^(2015.01) **E05F 15/673** ^(2015.01)

(52) Cooperative Patent Classification (CPC):
E05F 15/54; E05F 15/56; E05F 15/57;
E05F 15/611; E05F 15/614; E05F 15/632;
E05F 15/635; E05F 15/652; E05F 15/665;
E05F 15/673; E05Y 2201/638; E05Y 2201/696;
E05Y 2800/262; E05Y 2900/104; E05Y 2900/40

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **09.09.2022 IT 202200018444**

(71) Applicant: **S.T.E.A. Engineering S.r.l**
20056 Trezzo sull'Adda (IT)

(72) Inventor: **FILIPPINI, Daniele**
Trezzo sull'Adda (IT)

(74) Representative: **Tirloni, Bartolomeo et al**
BTA Srl
2nd floor
Viale Papa Giovanni XXIII, 106
24121 Bergamo (IT)

(54) **SYSTEM FOR MOVING A MOVABLE BODY WITH RESPECT TO A FIXED BODY**

(57) System for moving (100) a movable body (101) having a degree of freedom with respect to a fixed body (102) rigidly constrained to the ground, wherein the system for moving (100) comprises:
- a linear actuator (1) rigidly fixed to one of the fixed body (102) and the movable body (101), wherein the linear actuator (1) comprises a movable slider (2), along a first rectilinear direction (200), with respect to one of the fixed

body (102) and the movable body (101);
- a guide (3) formed on another of the fixed body (102) and the movable body (101), wherein the slider (2) slidably engages the guide (3), wherein the guide (3) forms an angle (300) greater than 0° and less than 90° with a projection of the guide (3) on a reference plane (400) perpendicular to the first direction (200).

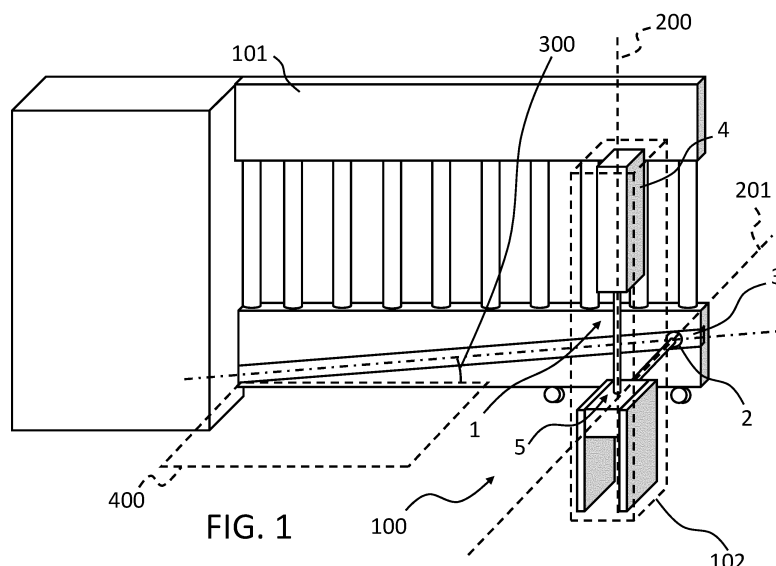


FIG. 1

Description

Technical field of the invention

[0001] The present invention concerns a system for moving a movable body, such as for example a gate, an elevator, a window (window/door/door-window) etc., with respect to a fixed body (e.g. constrained to the ground).

State of the art

[0002] In the field of systems for moving a movable body of large dimensions and/or encumbrances and having a degree of freedom (translational or rotational) with respect to a fixed body rigidly constrained to the ground, several solutions are known.

[0003] For example, in the case of sliding gates, the translation (e.g., horizontal) of the gate to open/close the passage at the gate can take place thanks to one or more rack-pinion systems coupled to the (main body of) the gate. In the case of automatic sliding gates, the pinions can be connected to gearmotors which, when they receive a command signal from a command and control unit (e.g., remotely controlled by a user via a remote control), make the pinions rolling along the rack, allowing the (horizontal) translation of the gate. For example, in the case of electric elevators, the movement (up/down) of the cabin can take place thanks to the action of an electric motor winch which activates a pulley system to which are connected the movement ropes of the cabin and the movement ropes (in the opposite direction to the cabin) of counterweights (for example having a weight comparable to the empty weight of the cabin).

Summary of the invention

[0004] The Applicant has considered that the known systems for moving may present some disadvantages and/or can be improved in some aspects.

[0005] For example, the Applicant has realized that in the case of automatic sliding gates the presence of a gearmotor entails a high cost of the system for moving as this component is expensive and/or not very efficient from an energy point of view.

[0006] Furthermore, for example in the case of electric elevators, the Applicant has realized that the system for moving is complex and/or expensive to implement (in terms of time and/or costs), for example for the preparation of the ropes for the counterweights and/or an antifall safety system (for example a braking system that comes into action when a predetermined speed limit is exceeded, for example in the event of breakage of the ropes), and/or may require frequent maintenance interventions in order to check the state of integrity of the various components (e.g., ropes and/or pulley system and/or braking system).

[0007] In this context, the Applicant has therefore faced the problem of realizing a system for moving a movable

body of large dimensions and/or encumbrances (in particular a gate, a lift, a window etc.), with respect to a fixed body (constrained to the ground) that is simple and/or economical to manufacture and at the same time safe and/or efficient (e.g., energy).

[0008] According to the Applicant the aforementioned problem is solved by a system for moving in accordance with the attached claims and/or having one or more of the following characteristics.

[0009] According to an aspect the invention relates to a system for moving a movable body having a degree of freedom with respect to a fixed body rigidly constrained to the ground, wherein said system for moving comprises:

- a linear actuator rigidly fixed to one of said fixed body and said movable body, said linear actuator comprising a slider movable with respect to said one of said fixed body and said movable body, said slider being movable along a first rectilinear direction;
- a guide formed on another of said fixed body and said movable body, wherein said slider slidably engages said guide,

wherein said guide forms an angle greater than 0° and less than 90° with a projection of said guide on a reference plane perpendicular to said first direction.

[0010] For the purposes of the present invention, whenever geometric elements (e.g., lines, planes, angles, including the aforementioned angle) are placed in relation to the guide (or to the further guide), it is meant that such elements are placed in relation to any generating line (or development line) of the guide. In the case of a (at least partially) non-rectilinear guide (e.g., helical), it is considered the straight line tangential to the guide (e.g. to the generating or development line of the guide) at a point of contact between the slider and the guide.

[0011] The Applicant has realized that a slider of a linear actuator (fixed to one of the fixed body and the mobile body) which engages a guide (formed on another of the fixed body and the mobile body) forming an angle greater than 0° and less than 90° with its projection on a plane (the reference plane) perpendicular to the direction of rectilinear movement of the slider (i.e., the first direction) allows the movement of the slider to be transmitted to the movable body in a simple, effective and/or safe way (e.g., without necessarily setting up systems dedicated to safety). Furthermore, the inclination of the guide with respect to the reference plane makes it possible to use a linear actuator as a driving element of the system for moving, i.e. a component with low cost and/or high energy efficiency. Furthermore, the linear actuator and the guide coupled respectively to one and the other between the fixed body and the movable body, advantageously allow the system for moving of the present invention to be made compact (e.g., low encumbrance) and/or simple to realize.

[0012] The present invention in one or more of the

aforementioned aspects may present one or more of the following preferred characteristics.

[0013] Preferably said angle is less than or equal to 75°, more preferably less than or equal to 65°, even more preferably less than or equal to 55°. In this way it is obtained an effective movement of the movable body which is moved for large sections in the face of limited movements of the slider.

[0014] Preferably said angle is greater than or equal to 1°, more preferably greater than or equal to 5°, even more preferably greater than or equal to 10°. In this way the movement of the movable body is favored (e.g., it is more harmonious and/or regular) and/or is efficient (e.g., in terms of power required from the linear actuator, e.g., to overcome the friction force). Furthermore, angle values above the aforementioned values allow the use of a wide range of linear actuators, thus allowing economic savings.

[0015] Preferably said guide comprises (or consists of) a groove. Preferably said slider is inserted in the groove.

[0016] In one alternative embodiment said guide comprises (or consists of) a raised track. Preferably said slider wraps (at least partially) said raised track.

[0017] In this way the engagement between slider and guide is achieved in a simple and/or rational way.

[0018] Preferably said slider comprises one or more wheels which roll along the guide, more preferably with a rotation axis perpendicular to the first direction and to said guide (e.g., to the generating line of the guide). This reduces the friction between the slider and the guide.

[0019] Preferably said linear actuator comprises a motor element structured for moving said slider along said first direction.

[0020] In one embodiment, said motor element is a piston, for example pneumatic or hydraulic or electro-mechanical. Alternatively, said motor element is an electric motor. In this way, simple and/or inexpensive and/or easily available on the market components are used. Preferably said linear actuator comprises a transmission system which mechanically connects said motor element and said slider. In this way, the movement from the motor to the slider is easily transmitted.

[0021] Preferably said transmission system comprises a first element (preferably having the shape of a rod), more preferably having a main development direction parallel to said first direction.

[0022] Preferably said motor element is structured for linearly moving said transmission system, more preferably said first element, along said first direction.

[0023] Preferably said transmission system comprises a second element (preferably having the shape of a rod), more preferably having a main development direction perpendicular to said first direction and to said guide (e.g., to the generating line of the guide). Preferably said first and second element are rigidly fixed to each other, said first element being interposed between said motor element and said second element.

[0024] Preferably said slider is fixed to one end of said

second element distal from said first element (in other words, the slider is fixed to the end of the second element opposite to the first element).

[0025] An L-shaped arm is thus created between the first and second element, with the second element perpendicular to the guide, so as to distance the actuator from the movable body and limit damage and/or breakages to the system for moving.

[0026] Preferably said transmission system comprises a stabilization rigidly body fixed to, and more preferably interposed between, said first and second element. Preferably said stabilization body is made of metal material. Preferably said stabilization body, in a cross-section parallel to said reference plane, has a greater development than a respective development of said first and/or second element. In this way it is possible to strengthen the transmission system.

[0027] Preferably said linear actuator comprises a further guide slidably engaged by said transmission system, more preferably by said stabilization body. Preferably said further guide develops parallelly to said first direction. Preferably said further guide is shaped to prevent a rotation of the stabilization body about a first axis parallel to the first direction and a second axis parallel to the reference plane, more preferably about any axis.

[0028] The Applicant has realized that the further guide creates a constraint element that leaves the stabilization body with only one degree of translational freedom (along the first direction) and denies any other degree of freedom, including any rotation of the stabilization body. In this way the stabilization body, together with the further guide, absorbs at least part of the stresses (e.g., torsion, rotation, etc.) generated by the interaction between slider and guide, which, through the transmission system, could otherwise discharge onto the motor element, damaging and/or wearing it. Furthermore, the presence of such a constraint element can help keep the movement of the slider well aligned with the first direction.

[0029] In one embodiment said degree of freedom is translational. Preferably said movable body translates along a direction perpendicular to said first direction, and preferably parallel to said guide (more precisely to a direction parallel to a main component of said guide). Preferably, said guide has a (substantially) rectilinear development (in other words, the line of development of the guide is a straight line).

[0030] In this way it is possible to realize a linear translation of the movable body in a simple way, for example to realize a sliding movement for a sliding gate and/or an elevator.

[0031] In one embodiment said degree of freedom is rotational. Preferably said movable body is rotatable about a rotation axis parallel to said first direction. Preferably said guide has an at least partially (preferably entirely) helical development about said rotation axis.

[0032] In this way it is possible to realize a rotation of the movable body about the rotation axis in a simple way, for example to realize a swing movement of the movable

body (e.g., for a swing gate and/or a window, such as a door or a window).

[0033] In one embodiment said first direction is vertical (i.e., perpendicular to the ground plane). In this way, it is possible to realize a horizontal translation of the movable body suitable for example for a gate or a sliding window, or a rotation of the movable body suitable for example for a swing gate and/or a classic window or door.

[0034] In one embodiment said first direction is horizontal. In this way, it is possible to realize a vertical translation of the movable body suitable for example for a lift and/or a shutter, or a rotation of the movable body suitable for example for a top-hung window.

[0035] Preferably a ratio between a length of said guide (e.g., along a main component of the generating line) and an overall stroke of said slider along the first direction (e.g., equal to a length of said further guide) is greater than or equal to 5, more preferably greater than or equal to 10, and/or less than or equal to 60, more preferably less than or equal to 50. In this way, it is possible to realize the movement of large movable bodies while keeping limited the encumbrance of the system for moving, and at the same time using a linear actuator that is economical and/or easily available on the market.

[0036] Preferably said stroke of said slider (e.g., equal to the length of said further guide) is less than or equal to 80 cm, more preferably less than or equal to 70 cm, and/or greater than or equal to 5 cm, more preferably greater than or equal to 10 cm.

[0037] In one embodiment said movable body is an element for obstructing a passage (e.g., gate, window, door, door-window, shutter, etc.) and said fixed body is a support element onto which said element for obstructing is mounted.

[0038] Preferably said mobile body is an automatic gate (sliding or swing). The Applicant has surprisingly realized that the application of the system for moving according to the present invention to an automatic gate is not only possible but also particularly advantageous as it allows to avoid the use of a gearmotor, limiting overall costs and/or energy consumption. Furthermore the system for moving (with the exception of the slider and part of the transmission system) can be housed inside the gate upright, with advantages in terms of encumbrances and/or protection of the system for moving and/or aesthetic advantages. In one embodiment, said mobile body is a vertical transport device (e.g., an elevator cabin, a goods lift, etc.) and said fixed body is a lift shaft of said vertical transport device (e.g., the shaft of the elevator or of the goods lift). The Applicant has surprisingly realized that the application of the system for moving according to the present invention to a vertical transport device is not only possible but also particularly advantageous as it allows to avoid the use of a counterweights system and/or a complex braking system, simplifying the overall structure of the vertical transport device and/or reducing the risks of malfunction, while at the same time guaranteeing a desired level of safety (in the event of a fault, it

is for example sufficient to block the sliding between the slider and the guide). Preferably said system for moving comprises:

- 5 - a further linear actuator rigidly fixed to said one of said fixed body and said movable body (more preferably on the side opposite to said linear actuator), said further linear actuator comprising a further slider movable with respect to said one of said fixed body and said movable body, said further slider being movable along a further first rectilinear direction;
- 10 - a still further guide formed on said another of said fixed body and said movable body, wherein said further slider slidingly engages said still further guide,

wherein said still further guide forms a further angle greater than 0° and less than 90° with a projection of said still further guide on a further reference plane perpendicular to said first direction.

- 20 **[0039]** Preferably said further first direction is parallel to said first direction and/or said further angle is equal to said angle. In this way the system for moving is symmetrical and balanced.

- 25 **[0040]** Preferably said further slider and said slider are movable along, respectively, said further first direction and said first direction in opposite directions.

- 30 **[0041]** In this way it is possible to improve the balance of the movable body with respect to the fixed body, during the movement of the movable body. The Applicant has in fact realized that this embodiment is particularly advantageous if the movable body is suitable for transporting passengers and/or objects, such as for example in the case of an elevator and/or a goods lift.

- 35 **[0042]** Preferably said further linear actuator, said further slider, and said still further guide have the same characteristics as (more preferably are - substantially - structurally the same as), respectively, said linear actuator, said slider, and said guide. In this way the realization of the system for moving is simplified and/or made rational.

Brief description of the figures

[0043]

- 45 figure 1 schematically shows a system for moving according to a first embodiment of the present invention applied to a sliding-type element for obstructing a passage;
- 50 figure 2 schematically shows the system for moving of figure 1 in a further configuration; figures 3a-3b schematically show a system for moving according to a second embodiment of the present invention applied to a swing-type element for obstructing a passage; figure 4 schematically shows a system for moving according to a third embodiment of the present invention applied to a vertical transport device.

Detailed description of some embodiments of the invention

[0044] The characteristics and the advantages of the present invention will be further clarified by the following detailed description of some embodiments, presented by way of example and not limitative of the present invention, with reference to the attached figures.

[0045] In the figures the reference number 100 generally indicates a system for moving according to the present invention. The system for moving 100 moves a large and/or encumbering movable body 101 with respect to a fixed body 102 rigidly constrained to the ground.

[0046] The system for moving 100 comprises a linear actuator 1 comprising a slider 2 movable along a first rectilinear direction 200. The system for moving 100 also includes a guide 3 (geometrically similar to a straight line defined by a generating line of the guide itself, shown in figure 1 with the line-dot dashed straight line), with the slider 2 that slidably engages the guide 3.

[0047] Advantageously the guide 3 (more precisely the generating line of the guide 3) forms an angle 300 with a projection of the guide 3 on a reference plane 400 perpendicular to the first direction 200.

[0048] Exemplarily the guide 3 consists of a groove and the slider 2, for example, is inserted into the groove 3.

[0049] Exemplarily the slider 2 comprises a wheel that rolls along the guide 3. For example, the rotation of the wheel occurs about a rotation axis 201 perpendicular to the first direction 200 and to the guide 3. The rotation of the wheel about the axis 201 promotes the sliding of the guide 3 with respect to the wheel, and therefore the movement of the movable body.

[0050] In one embodiment not shown, the guide consists of a raised track, wherein the slider wraps that track. In this embodiment, the slider can for example be realized by a clamping element, for example having a shape similar to a "c", with an appropriate number of wheels placed between the clamping element and the track. In this way it is realized in a simple and/or rational way the engagement between guide and slider.

[0051] The present invention envisages in any case any form of guide and/or slider, and/or any type of coupling between guide and slider, provided that it is realized a sliding engagement between the guide and the slider.

[0052] Exemplarily the linear actuator 1 comprises a motor element 4 structured to move the slider 2 along the first direction 200. For example, the motor element 4 is a pneumatic or hydraulic piston (or, alternatively, electro-mechanical). Alternatively, the motor element can be an electric motor.

[0053] Exemplarily the linear actuator 1 comprises a transmission system 5 which mechanically connects the motor element 4 and the slider 2. Exemplarily the motor element 4 is structured to linearly move the transmission system 5 along the first direction 200.

[0054] With reference to figure 2, an example of the

structure of the transmission system 5 is briefly described. The present invention in any case comprises any type of transmission system that allows the motion to be effectively transmitted from the motor element to the slider.

[0055] Exemplarily the transmission system 5 comprises a first element 5', for example having the shape of a rod, having a main development direction parallel to the first direction 200. Exemplarily the transmission system 5 comprises a second element 5'', for example having the shape of a rod too, having a main development direction perpendicular to the first direction 200 and to the guide 3.

[0056] Exemplarily the transmission system 5 comprises a stabilization body 6 rigidly fixed to, and exemplarily interposed between, the first 5' and the second 5'' element. Exemplarily the stabilization body 6 is made of metallic material, for example steel, iron, or cast iron.

[0057] Exemplarily the stabilization body 6, in a section parallel to the reference plane 400, has a development greater than a respective development of both the first 5' and second 5'' element. In other words, the stabilization body 6 is a massive component that allows an overall strengthening of the transmission system 5.

[0058] For example, as shown in the figures, the first element 5' is fixed, at a first end, to the motor element 4 and, at a second end (opposite the first end), to the stabilization body 6. The second element 5'' is for example fixed, at a respective first end proximal to the first element 5', to the stabilization body 6 and, at a second end distal from the first element 5', to the slider 2. In this way a simple connection is made between the elements of the transmission system 5 which turns out to be simple and/or rational.

[0059] Exemplarily the linear actuator 1 also comprises a further guide 7 (shown in a purely schematic way) slidably engaged by the stabilization body 6 and integral with the motor element 4.

[0060] Exemplarily the further guide 7 develops parallel to the first direction 200, and is exemplarily shaped to prevent a rotation of the stabilization body 6 around any axis. In other words, the further guide 7 realizes a constraint element that leaves the stabilization body 6 only one degree of translational freedom (along the direction 200) and denies any other degree of freedom, including any rotation of the stabilization body 6, so that the first 5' and second element 5'' do not undergo twisting and/or bending, which could be transmitted to the motor element 4. For example, the further guide 7 (not shown in the figures) can comprise a first and a second rod arranged parallel to the first direction 200, with these rods slidably engaging two grooves obtained in the stabilization body 6 on opposite sides thereof. In other words, the stabilization body 6 has, in horizontal section, an "H" shape, with the two rods of the further guide 7 slidably inserted into the two recesses of the "H" shape.

[0061] Exemplarily the system for moving 100 comprises a command and control unit (not shown) connect-

ed to the linear actuator 1 to generate and send a command signal to the linear actuator 1 in order to move the slider 2. Exemplarily the system for moving 100 also comprises a power source (e.g., a battery or the power network) connected to the command and control unit to provide electrical power to allow the operation of the unit. For example, the command and control unit can be controlled remotely by a user, for example by transmitting a wireless signal (radio frequency or Bluetooth) via remote control. The electronics and/or control components that allow the activation of the linear actuator 1 to cause the movement of the slider 2 are not further described here as they are for example of a known type.

[0062] With reference to figures 1 and 2, it is shown for example the application of the system for moving 100 described above to a sliding type element for obstructing a passage, such as for example an automatic gate. In particular, the movable body 101 is made up of a main body of the automatic gate and the fixed body 102 is made of a support element on which the body of the gate is mounted (for example a riser column).

[0063] Exemplarily the guide 3 is obtained on the body of the gate and the linear actuator 1 is rigidly fixed to the support element, for example housed inside this support element. Exemplarily the angle 300 is equal to approximately 30°.

[0064] Exemplarily an overall stroke of the slider 2 (for example, a length of the further guide 7) along the first direction 200 is equal to approximately 20 cm.

[0065] Exemplarily one stroke of the gate body is equal to approximately 4 metres.

[0066] In this embodiment, the first direction 200 is vertical. For example, the gate translates horizontally. Advantageously, in this embodiment, the guide 3 has a rectilinear development (in other words, the line of development of the guide is a straight line).

[0067] As schematically shown in figure 2, the control unit, when it receives a wireless signal via remote control, sends the command signal to the linear actuator 1 which moves (through the transmission system 5 and the further guide 7) the slider 2. The slider 2 pushes alternately against the upper (when moving upwards) and lower (when moving downwards) walls of the groove 3, which causes a horizontal translation (see for example the arrow to the right in figure 2) of the body of the gate (made possible also by the support wheels 70 of the gate), thanks to the principle of inclined planes. In this way it is made possible the opening of the passage 500, delimited, on one side, by a rigid structure 600, e.g., a wall, and, on the other side, by the end of the body of gate distal to the wall 600. With reference to figures 3a (schematic perspective view) and 3b (schematic top view), it is shown the application of the system for moving 100 to a swing-type element for obstructing a passage, for example a gate or a window (door/window). For example, the movable body 101 is made of the assembly formed by: body of the gate/window 101' and hinge system 101'', which is associated with the body of the gate/window 101' to

transmit the rotation. The fixed body 102 is for example a support element for the body of the gate/window 101', with the hinge system 101'' which is interposed between the fixed body 102 and the body of the gate/window 101'.

[0068] Exemplarily the guide 3 is obtained on the hinge system 101'' and the linear actuator 1 is rigidly fixed to the support element, for example housed inside this support element. Exemplarily an overall stroke of the slider 2 along the first direction 200 is equal to 20 cm. Exemplarily the angle 300 is equal to about 40°.

[0069] In this embodiment, the first direction 200 is vertical. For example, the hinge system 101'' is rotatable about a rotation axis 202 parallel to the first direction 200. Advantageously, in this embodiment, the guide 3 has a helical development.

[0070] The control unit, when it receives the wireless signal via remote control, sends the command signal to the linear actuator 1 which moves (through the transmission system 5 and the further guide 7) the slider 2. The slider 2 pushes alternately against the upper walls (when it moves upwards) and lower (when it moves downwards) of the groove 3, which causes a rotation (see for example the clockwise arrow in figure 2) of a first element 101''' of the hinge system 101''. This first element 101''' is in turn mechanically connected to a second element 101'''' of the hinge system 101'' (for example via respective toothed wheels), to which is mechanically fixed the body of the gate/window 101'. The rotation of the first element 101''' is transmitted to the second element 101'''' (whose toothed wheel is for example idle), which in turn rotates (for example in the opposite direction to the aforementioned rotation of the first element 101''') moving the body of the gate/window 101'.

[0071] With reference to the figure 4, it is shown a system for moving 100 according to a further embodiment of the present invention, wherein the system for moving 100 is advantageously applied to a vertical transport element, such as for example an elevator. For example, the movable body 101 consists of the elevator cabin, and the fixed body 102 consists of the elevator shaft. Exemplarily the actuator 1 is rigidly fixed to the cabin 101 and the guide 3 is obtained on the shaft 102, for example it runs along the entire vertical extension of the lift shaft.

[0072] In this embodiment, the first direction 200 is horizontal, with the elevator translating vertically. Advantageously, in this embodiment, the guide 3 has a rectilinear development. Exemplarily the angle 300 is equal to approximately 50°.

[0073] Exemplarily the system for moving 100 comprises, in addition to the aforementioned elements described above, the following further elements:

- a further linear actuator 1' comprising a further slider 2' movable along a further first rectilinear direction 200', exemplarily parallel to the first direction 200;
- a still further guide 3', where said further slider 2' slidably engages said still further guide 3'.

[0074] Advantageously the still further guide 3' forms a further angle 300', exemplarily of a value equal to the angle 300, with a projection of the still further guide 3' on a further reference plane 400' perpendicular to the further first direction 200'.

[0075] Exemplarily the further slider 2' and the slider 2 are movable along, respectively, the further first direction 200' and the first direction 200 in opposite directions to each other. Exemplarily the further linear actuator 1', the further slider 2', and the further guide 3' are (substantially) structurally the same as, respectively, the linear actuator 1, the slider 2, and the guide 3.

[0076] Exemplarily the further actuator 1' is rigidly fixed to the cabin 101, for example on opposite sides of the cabin with respect to the actuator 1 (in order to improve the balancing and/or linearity of the movement of the cabin). Exemplarily the further guide 3' is obtained on the shaft 102 and runs along the entire vertical extension of the lift shaft.

[0077] Exemplarily a respective overall stroke of the slider 2 (for example, a length of the further guide 7) and of the further slider 2' along, respectively, the first direction 200 and the further first direction 200' is equal to approximately 50 cm.

[0078] Exemplarily one stroke of the cabin of the elevator is equal to approximately 10 metres. The control unit, when it receives the wireless signal via remote control, sends the command signal to both the linear actuator 1 and the further linear actuator 1' which, respectively, move (through the respective transmission system and the respective further guide) the slider 2 and the further slider 2'. The slider 2 and the further slider 2' push respectively against opposite walls of the guide 3 and the further guide 3' (e.g., during the descent, the slider 2 pushes against the wall 20 of the guide 3 and the further slider pushes against the wall 20' of the further guide 3', vice versa, during the ascent, the sliders push against the opposite walls of the respective guide) which causes a vertical translation of the elevator.

Claims

1. System (100) for moving a movable body (101) having a degree of freedom with respect to a fixed body (102) rigidly constrained to the ground, wherein said system (100) for moving comprises:

- a linear actuator (1) rigidly fixed to one of said fixed body (102) and said movable body (101), said linear actuator (1) comprising a slider (2) movable with respect to said one of said fixed body (102) and said movable body (101), said slider (2) being movable along a first rectilinear direction (200);
- a guide (3) formed on another of said fixed body (102) and said movable body (101), wherein said slider (2) slidably engages said guide (3),

wherein said guide (3) forms an angle (300) greater than 0° and less than 90° with a projection of said guide (3) on a reference plane (400) perpendicular to said first direction (200).

2. System (100) for moving according to claim 1, wherein said angle (300) is less than or equal to 75°, preferably less than or equal to 55°.
3. System (100) for moving according to any one of the preceding claims, wherein said angle (300) is greater than or equal to 1°, preferably greater than or equal to 10°.
4. System (100) for moving according to any one of the preceding claims, wherein said guide (3) comprises a groove, wherein said slider (2) is inserted in the groove, and wherein said slider (2) comprises one or more wheels which roll along the guide (3) with rotation axis (201) perpendicular to the first direction (200) and to said guide (3).
5. System (100) for moving according to any one of the preceding claims, wherein said degree of freedom is translational, wherein said movable body (101) translates along a direction perpendicular to said first direction (200) and parallel to said guide (3), and wherein said guide (3) has a substantially rectilinear development.
6. System (100) for moving according to any one of claims 1-4, wherein said degree of freedom is rotational, wherein said movable body (101) is rotatable about a rotation axis (202) parallel to said first direction (200), and wherein said guide (3) has an at least partially helical development about said rotation axis (202).
7. System (100) for moving according to any one of the preceding claims, wherein said first direction (200) is vertical or horizontal, wherein a ratio between a length of said guide (3) and an overall stroke of said slider (2) along the first direction (200) is greater than or equal to 5 and less than or equal to 60, and wherein said stroke of said slider (2) is less than or equal to 80 cm and greater than or equal to 5 cm.
8. System (100) for moving according to any one of the preceding claims, wherein said movable body (101) is an element for obstructing a passage, preferably it is an automatic gate, and said fixed body (102) is a support element onto which said element for obstructing is mounted or, wherein said movable body (101) is a vertical transport device and said fixed body (102) is a lift shaft of said vertical transport device.
9. System (100) for moving according to any one of the

preceding claims, wherein said linear actuator (1) comprises:

- a motor element (4) structured for moving said slider (2) along said first direction (200), said motor element (4) being a piston or an electric motor; 5
- a transmission system (5) which mechanically connects said motor element (4) and said slider (2), said transmission system (5) comprising: 10

- a first element (5') having a main development direction parallel to said first direction (200);
- a second element (5'') having a main development direction perpendicular to said first direction (200) and to said guide (3), said slider (2) being fixed to an end of said second element (5'') distal from said first element (5'); 15 20
- a stabilization body (6) rigidly fixed to, and interposed between, said first (5') and second element (5''),

wherein said first element (5') is interposed between said motor element (4) and said second element (5''), wherein said stabilization body (6) is made of metal material and, in a cross-section parallel to said reference plane (400), has a greater development than a respective development of said first (5') and second element (5''), 25 30

- a further guide (7) slidingly engaged by said transmission system (5), wherein said further guide (7) develops parallelly to said first direction (200) and is shaped to prevent a rotation of the stabilization body (6) about an axis parallel to the first direction (200) and an axis parallel to the reference plane (400). 35

10. System (100) for moving according to any one of the preceding claims, comprising: 40

- a further linear actuator (1') rigidly fixed to said one of said fixed body (102) and said movable body (101), said further linear actuator (1') comprising a further slider (2') movable with respect to said one of said fixed body (102) and said movable body (101), said further slider (2') being movable along a further first rectilinear direction (200') parallel to said first direction (200); 45 50
- a still further guide (3') formed on said another of said fixed body (102) and said movable body (101), wherein said further slider (2') slidingly engages said still further guide (3'), wherein said still further guide (3') forms a further angle (300'), equal to said angle (300), with a projection of said still further guide (3') on a further reference plane (400') perpendicular to said further first 55

direction (200'),

wherein said further slider (2') and said slider (2) are movable along, respectively, said further first direction (200') and said first direction (200) in opposite directions, and wherein said further linear actuator (1'), said further slider (2'), and said still further guide (3') have the same features of, respectively, said linear actuator (1), said slider (2), and said guide (3).

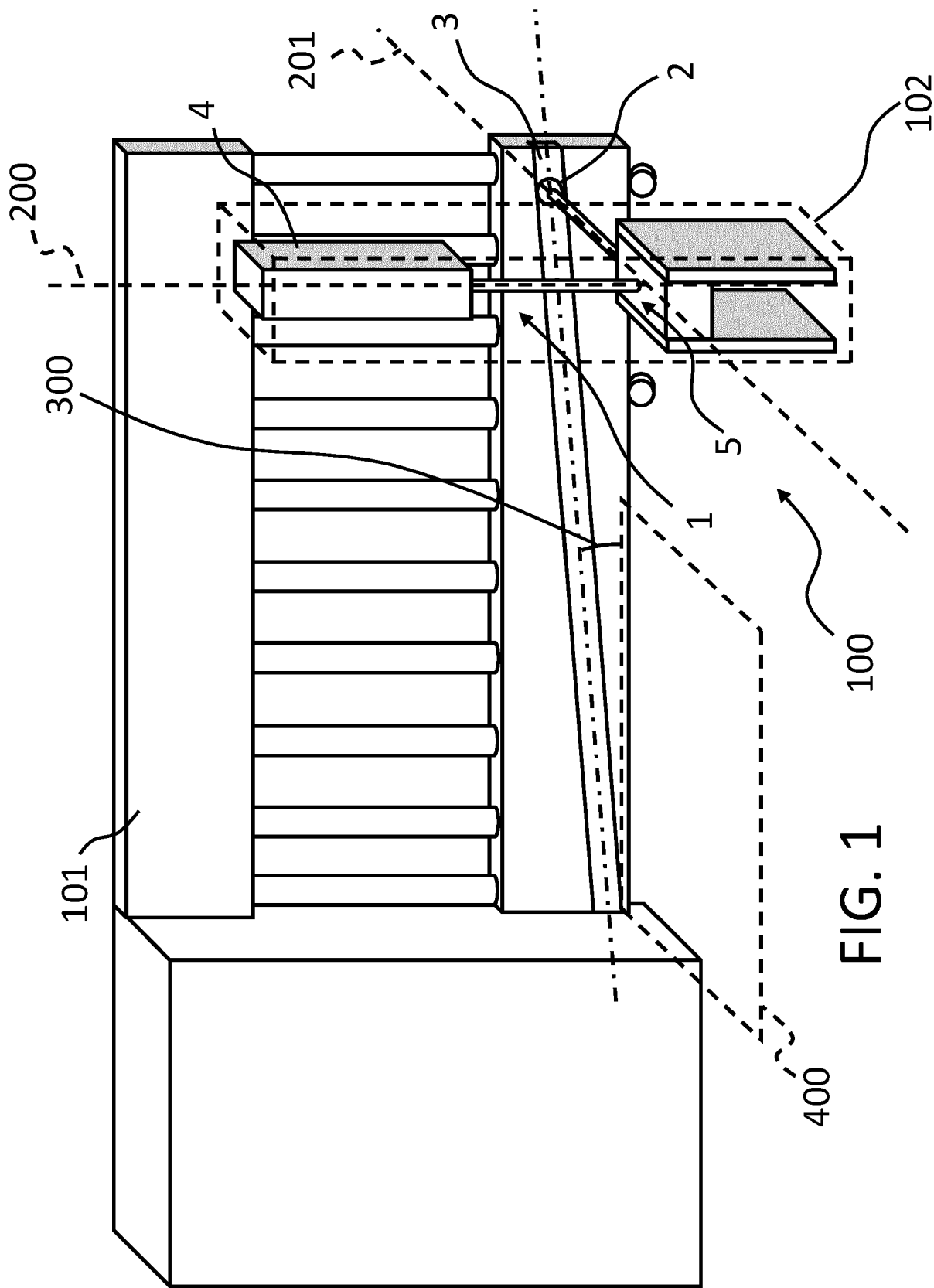


FIG. 1

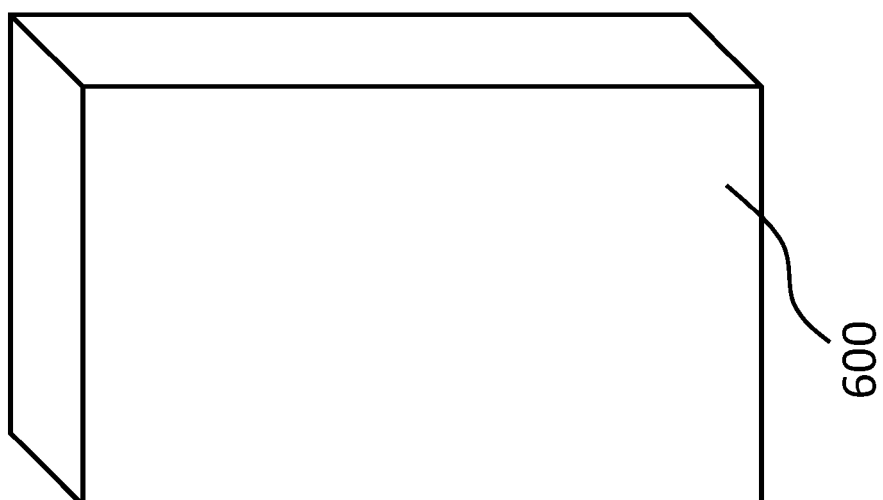
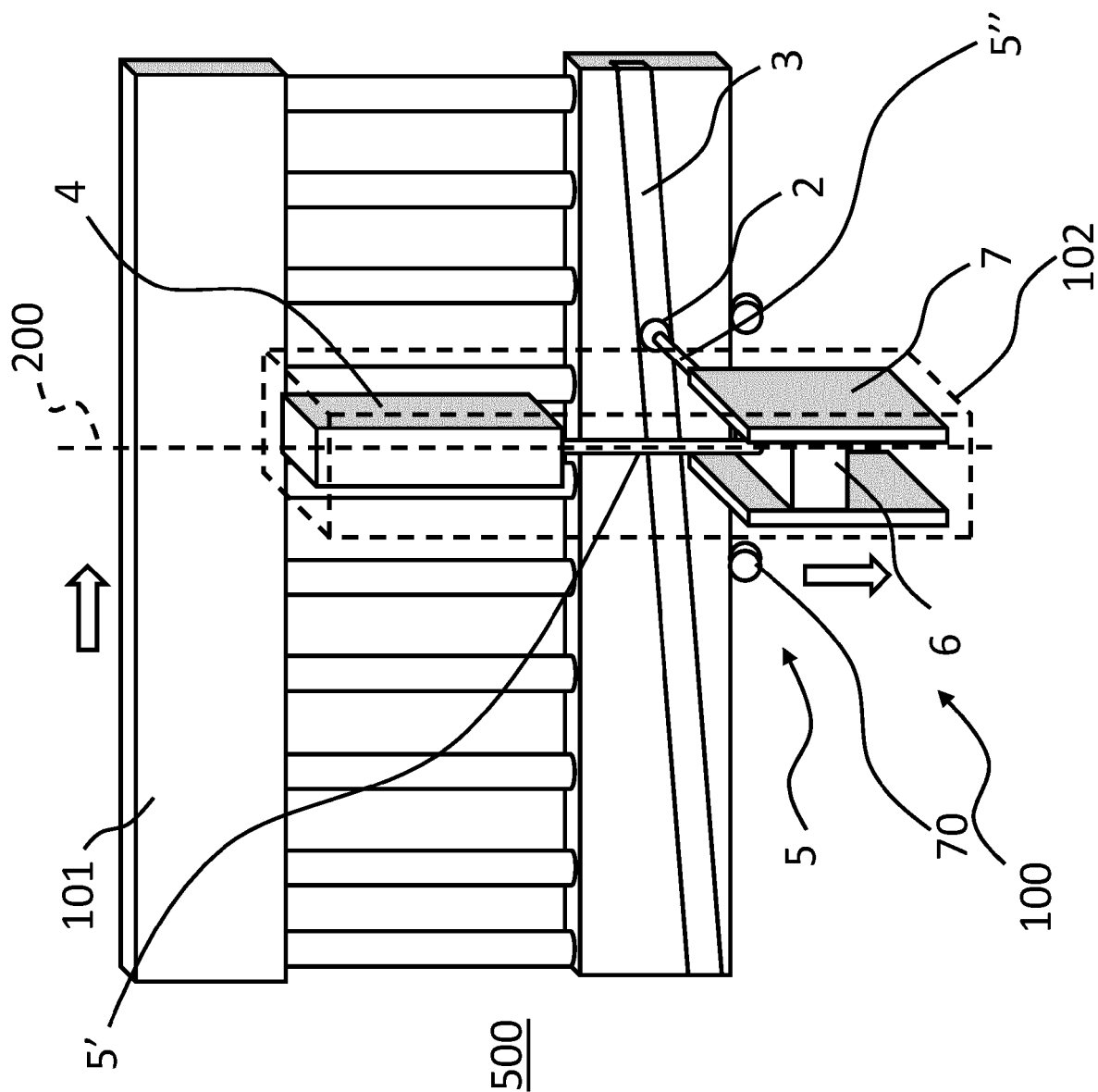
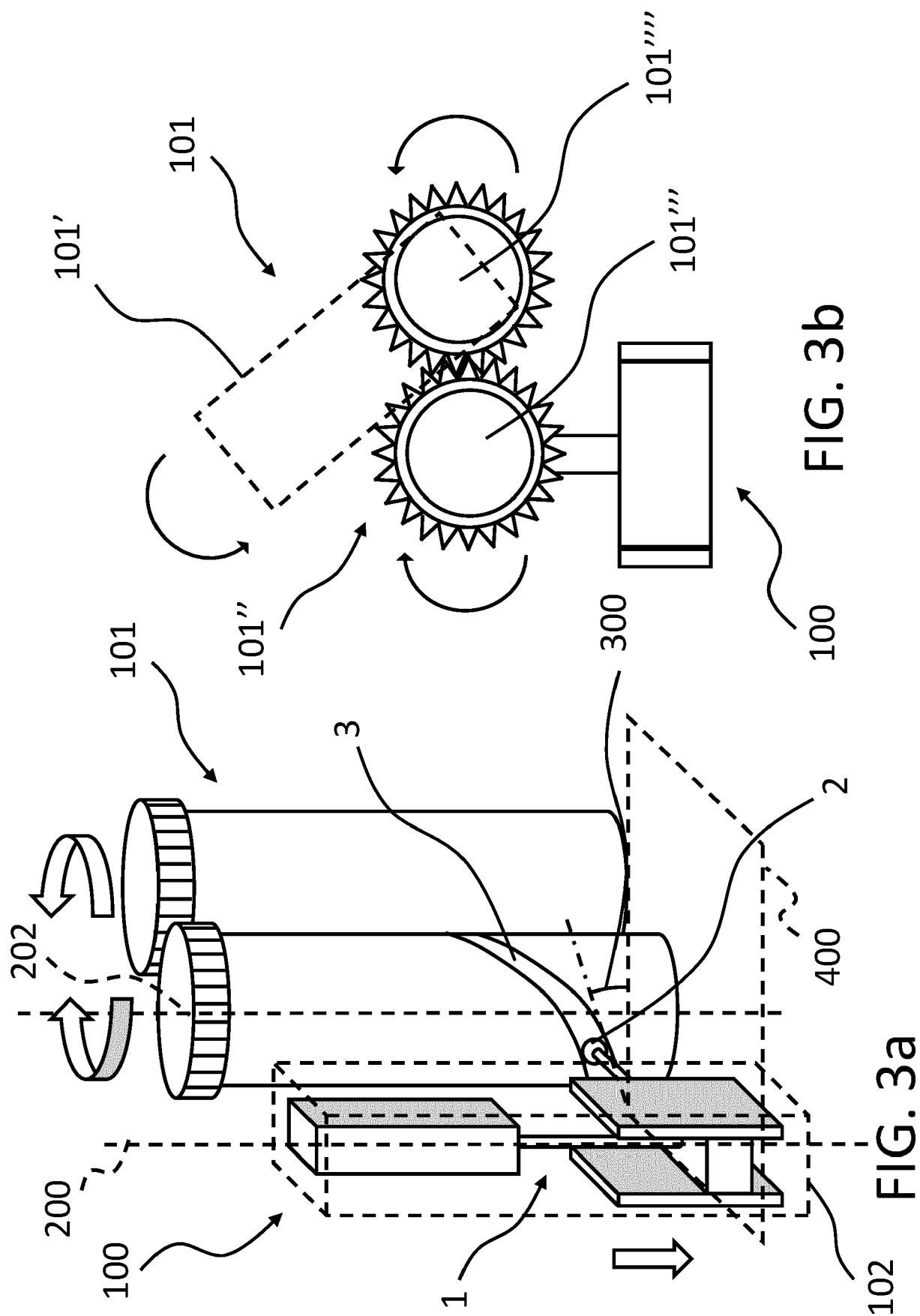
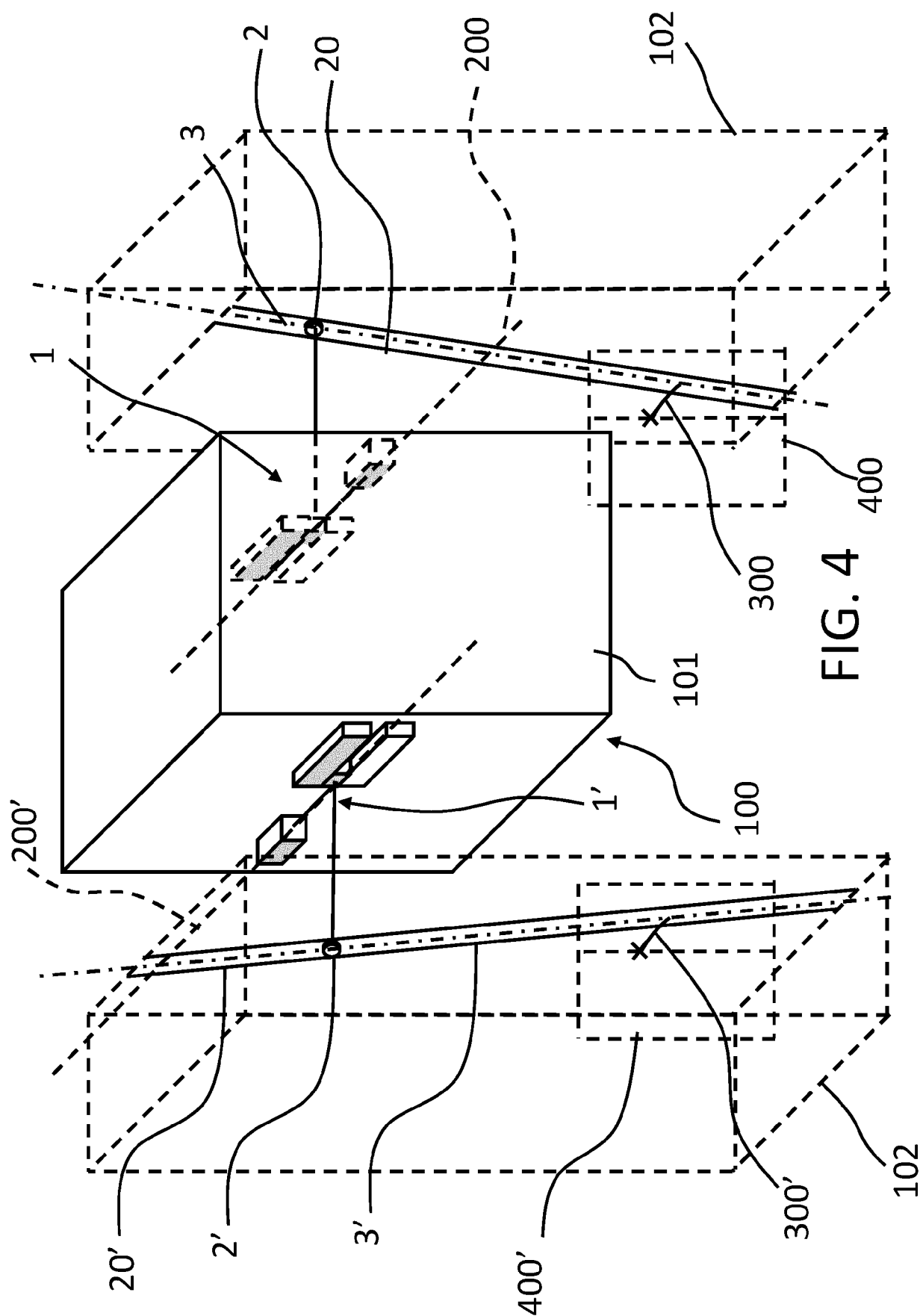


FIG. 2







EUROPEAN SEARCH REPORT

Application Number

EP 23 19 6220

5

10

15

20

25

30

35

40

45

50

55

2

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2010/319262 A1 (STULL E J [US]) 23 December 2010 (2010-12-23)	1-4, 6-10	INV.
A	* figures * * paragraph [0002] * * paragraphs [0016] - [0021] * -----	5	E05F15/54 E05F15/56 E05F15/57 E05F15/611 E05F15/614
X	EP 1 503 020 A1 (DAVID AUTOMATIONS S R L [IT]) 2 February 2005 (2005-02-02)	1-4, 6-8	E05F15/632 E05F15/635
A	* paragraph [0001] * * paragraphs [0008] - [0019] * * figures * -----	5, 9, 10	E05F15/652 E05F15/665 E05F15/673
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E05F
Place of search		Date of completion of the search	Examiner
The Hague		23 January 2024	Mund, André
CATEGORY OF CITED DOCUMENTS		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	
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			

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

EP 23 19 6220

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

23-01-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010319262 A1	23-12-2010	US 2010319262 A1	23-12-2010
		WO 2009097484 A1	06-08-2009
EP 1503020 A1	02-02-2005	NONE	

EPO FORM P0459

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