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(54) **ROOF WINDOW WITH WIPING OR CLEANING MEANS AND/OR SCREEN**

(57) Roof window comprising a frame with a substantially flat light-transmitting plate, wherein the roof window is provided with a cleaning and/or wiping means mounted on or in the frame and configured and mounted to be moved reciprocally over the substantially flat light-trans-

mitting plate for the purpose of cleaning the plate and/or removing rainwater on the plate; and drive means configured to move the cleaning and/or wiping means reciprocally.

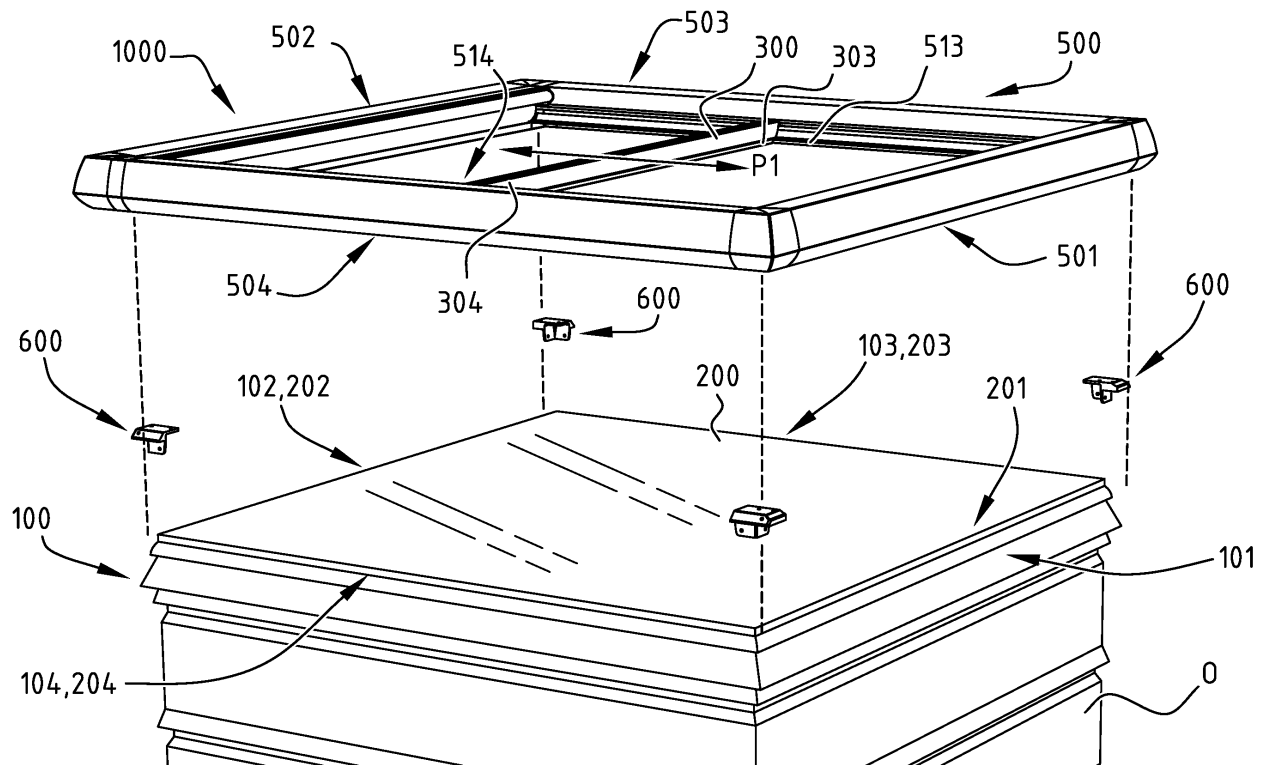


FIG. 1

Description

Field of the invention

[0001] The present invention relates a roof window comprising a frame with a substantially flat light-transmitting plate, and more particularly to a roof window with one or more additional functionalities, such as for instance a water drainage functionality or a sunblind.

Background

[0002] It is a known problem in roof windows with flat light-transmitting plates that, following rain, raindrops remain on the plate. The plate will typically sag slightly, particularly in the case of glass plates placed horizontally or at a slight incline, whereby the rainwater remains on the plate. To date, no good solution has been found for solving this problem in a simple manner.

[0003] Good solutions for providing other functionalities, such as good sunblind means, are not known in the prior art either.

Summary of the invention

[0004] Embodiments of the invention have the object of providing a roof window with improved functionalities, and particularly a roof window with which the above described problems are wholly or partially obviated.

[0005] A first aspect of the invention relates to a roof window comprising a frame with a substantially flat light-transmitting plate. The roof window is provided with a cleaning and/or wiping means mounted on or in the frame and drive means. The cleaning and/or wiping means is configured and mounted to be moved reciprocally over the substantially flat light-transmitting plate for the purpose of cleaning the plate and/or removing rainwater on the plate. The drive means are configured to move the cleaning and/or wiping means reciprocally.

[0006] Providing a cleaning and/or wiping means on or in the frame of a roof window enables the window to be cleaned at regular points in time and/or when rain is detected and/or on the basis of control signals, and the light-transmitting plate can thus remain clean without a window cleaner being needed.

[0007] The cleaning and/or wiping means, and still more preferably also the drive means, are preferably accommodated in a module comprising a framework, wherein the framework is fixed on the frame of the roof window. In this way the module with the cleaning and/or wiping means and the drive means can be easily fixed on existing roof windows, without these requiring conversion.

[0008] In an embodiment the substantially flat light-transmitting plate is substantially rectangular with a first side and a second side lying opposite thereto, a third side and a fourth side lying opposite thereto. The cleaning or wiping means is then preferably an elongate element ex-

tending from the third side to the fourth side. The drive means are then preferably configured to move the cleaning or wiping means from the first side to the second side and back again. In a further developed embodiment the framework of the module has a third side and a fourth side which are parallel to the third and fourth side of the substantially flat light-transmitting plate, and guide means are provided in the third and fourth side of the framework for the purpose of guiding a first and second end of the elongate cleaning or wiping means during the reciprocal movement. In this way a robust device can be obtained which requires no or little maintenance and achieves a good cleaning of the plate.

[0009] According to another variant, the cleaning and/or wiping means can be fixed to the periphery of the light-transmitting plate for pivoting around a pivot point and can be configured to perform a rotating movement over the light-transmitting plate around the pivot point, for instance in the manner of a classic windscreen wiper in a car. In such an embodiment a plurality of cleaning and/or wiping means can be provided along the periphery of the light-transmitting plate, such that the whole surface area of the light-transmitting plate is cleaned and/or wiped.

[0010] The cleaning or wiping means preferably comprises a window wiper. It is however also possible to use a brush roller in addition to or instead of a window wiper, wherein the drive means are then preferably further configured to rotate the brush roller. Such a brush roller will allow elements adhering to the plate to be removed as well, and will thus further improve the cleaning of the plate.

[0011] In a further developed embodiment the roof window further comprises a roller and a panel (also referred to as screen) which is connected thereto and can be rolled onto the roller and unrolled over the flat light-transmitting plate, and the drive means are further configured to roll up and unroll the panel over the flat light-transmitting plate. The roller is preferably provided in the framework of the module.

[0012] When the light-transmitting plate is substantially rectangular, the roller is preferably provided on a side of the plate, and the drive means are preferably configured to unroll the panel in the direction of an opposite side of the plate. The roller can for instance be provided in a profile of the framework of the module, which extends along the second side of the light-transmitting plate.

[0013] In a further developed embodiment the drive means comprise a carriage which is movable along the third side between the first and second side, which carriage is configured to be coupled in a cleaning or wiping position to the cleaning and/or wiping means for the purpose of moving the cleaning and/or wiping means from the first side to the second side and back again, and to be coupled in a panel position to the panel for the purpose of moving the panel from the second side to the first side and back again. The drive means then for instance comprise a toothed belt driven by a motor and extending along

the third side, wherein the carriage is coupled to the toothed belt.

[0014] In a possible embodiment a first carriage is provided along the third side and a second carriage is provided along the fourth side. For this purpose a first and second coupling can respectively be provided between the first and second carriage and a first and second end of the cleaning and/or wiping means. These first and second couplings are preferably hinged couplings, still more preferably hinged couplings allowing a rotation around an axis directed vertically relative to the plane of the framework. The coupling is preferably also configured to allow a certain variation in the distance between the first and the second carriage, so that the cleaning and/or wiping means can be placed at a slight angle relative to the direction of the first and second side. This slight angle for instance lies between 1 and 10°. Such a coupling allows the cleaning and/or wiping means to be manually arranged in the framework in simple manner. This further also allows the first and second carriage to be controlled such that the cleaning and/or wiping means are placed on the flat light-transmitting plate slightly obliquely at the start of a movement, i.e. at a slight angle relative to the first and second side, such that the starting power at the start of the movement is smaller. This can be particularly advantageous for large roof windows. The coupling can also be configured to uncouple the cleaning and/or wiping means when the distance between the first and second coupling is too great, for instance in the case of a control error, a coupling error or a failure of the drive means.

[0015] In a possible embodiment the panel has a first end edge which is connected to the roller and a second end edge which is held at a second location close to the roller, wherein an unrolling bar is provided on an inner side of the panel, such that the panel extends from the roller, over the unrolling bar and to the second location, and wherein the drive means are configured to move the unrolling bar over the light-transmitting plate. In this way the panel will be unrolled in a doubled state, i.e. two "panel" surfaces one above the other, over the light-transmitting plate. The panel is then preferably provided with a pattern of more and less light-transmitting zones, and mounted such that in the unrolled state two surfaces of the panel extend over the light-transmitting plate and the two surfaces are displaceable relative to each other for the purpose of controlling the light incidence through the light-transmitting plate. A pattern comprising alternately an opaque strip and a translucent strip can thus for instance be provided, wherein the strips are oriented parallel to the longitudinal direction of the roller. When the opaque strips in a first surface are situated precisely above the opaque strips in a second surface, the light incidence will thus be greater than when the opaque strips in the first surface are offset relative to the opaque strips in the second surface. The light-transmitting and thus the sun-shielding properties of the panel can be controlled by making this offset greater or smaller. Note that the offset can be adjusted in simple manner by moving

the unrolling bar away from the first roller to greater or lesser extent. The unrolling bar can thus be moved to a position beyond the first side, and a small additional translation can there also be provided in order to adjust the light transmission of the panel.

[0016] Another advantage of providing an unrolling bar on an inner side of the panel is that it is possible to prevent dirt from also being rolled up when the panel is rolled onto the roller. The panel is preferably provided on the rolls such that the panel extends from an underside of the roller to an underside of the unrolling bar, and then around the unrolling bar to an upper side of the unrolling bar, and then returns to the second location which is situated above the lower surface of the two surfaces of the panel lying one above the other, close to the roller. In this way dirt which is present on the panel when not rolled up will be discharged along the side of the unrolling bar, onto the roof window.

[0017] When the drive means comprise a carriage, as described above, the carriage can be configured to be coupled in a panel position to the unrolling bar for the purpose of moving the panel, in a doubled state, to the first side.

[0018] As described above, in a possible embodiment a first carriage is provided along the third side and a second carriage is provided along the fourth side. These first and second carriages are configured to be coupled to a first and second end of the unrolling bar via respectively a first and second coupling. These first and second couplings can be hinged couplings which allow a rotation around an axis oriented vertically relative to the plane of the framework (as described above), but can also be an "ordinary" coupling.

[0019] According to another variant, the panel has a first end edge connected to the roller and a second end edge connected to a second roller, wherein the roller is provided on a first side of the light-transmitting plate and the second roller is provided on a second, opposite side of the light-transmitting plate; wherein the drive means are configured to unroll the panel from the roller while it is being rolled onto the second roller, and vice versa. In this way the rolls are thus used as a scroll. The panel can then be provided with at least a first and a second zone, each with a surface area substantially corresponding to the surface area of the light-transmitting plate, wherein the first zone differs from the second zone. The different zones can thus for instance have a different light transmission. It is also possible to provide an "empty" zone, i.e. a zone where no cloth or screen is present, and light can thus enter freely through the panel. In addition, it is possible to provide zones with lighting elements, for instance OLEDs.

[0020] In a possible embodiment the roof window is provided with a rain sensor for detecting rain, and the drive means are coupled to the rain sensor such that the wiping and/or cleaning means is moved when rain is detected. For this purpose the rain sensor can be configured to communicate wirelessly with a control which is coupled

to the drive means.

[0021] In a possible embodiment the roof window is provided with a wireless receiver, and the drive means are coupled to the wireless receiver such that the wiping and/or cleaning means and/or the panel can be moved in accordance with the wirelessly received signals. The wireless receiver can form part of the above stated control, which is coupled to the drive means and is configured to control the drive means in accordance with the wirelessly received signals.

[0022] In further possible embodiments the roof window can be provided with one or more additional other sensors, such as a light sensor, a temperature sensor, a CO₂ sensor and so on. The drive means are then preferably coupled to these one or more other sensors such that the wiping and/or cleaning means and/or the panel is moved in accordance with the detected signals. For this purpose the sensor can be configured to communicate wirelessly with a control which is coupled to the drive means. The control then preferably comprises a wireless receiver, such that the control is able to control the drive means in accordance with the wirelessly received signals of the one or more sensors.

[0023] In a possible embodiment the drive means comprise a motor which is provided on respectively the first or second side of the framework, and the control is provided on respectively the first or second side of the framework. The motor can more particularly be provided in a profile on respectively the first or second side of the framework, and the control can be provided in a profile on respectively the first or second side of the framework. In this way the framework can be kept compact on the first and second side. The control can for instance comprise a PCB and a so-called hub system connected thereto, wherein the hub system is configured to communicate, optionally wirelessly, with a plurality of devices, such as sensors, mobile devices such as a smart phone or a tablet, a domotic system and so on. A user can then provide the control with instructions for controlling the drive means, for instance via his or her smart phone or tablet. A program, for instance an app, can for this purpose be installed on the smart phone or tablet (or on any other computer means which can be operated by a user) which allows the user to enter determined settings.

[0024] According to an embodiment, the framework of the module is formed by four hollow extrusion profiles, connected to each other by corner profiles, in which different components, such as the drive means and/or a part of the cleaning and/or wiping means and/or the roller, are accommodated. The motor of the drive means and the roller can more particularly be provided in a hollow profile on respectively the first or second side of the framework, and the control can be provided in a hollow profile on respectively the second or first side of the framework.

[0025] According to an embodiment, the light-transmitting plate is a glass plate or polycarbonate plate.

[0026] The drive means preferably comprise a tube

motor which is preferably provided in one of the profiles from which the framework of the module is formed.

[0027] According to a second aspect of the invention, a module according to any one of the following clauses is provided:

1. Module for a roof window, comprising a frame in which or on which a substantially flat light-transmitting plate is fixed, wherein the module comprises a framework which can be fixed on the frame and which is provided with a cleaning and/or wiping means (300) configured and mounted to be moved reciprocally in the framework and over the substantially flat light-transmitting plate (200) for the purpose of cleaning the plate and/or removing rainwater on the plate; drive means configured to move the cleaning and/or wiping means reciprocally.

2. Module according to the foregoing clause, wherein the framework has a first side, an opposite second side, a third side and a fourth side lying opposite thereto, and wherein the cleaning or wiping means (300) is an elongate element extending between the third side and the fourth side, and wherein the drive means (400) are configured to move the cleaning or wiping means from the first side to the second side and back again.

3. Module according to clause 1 or 2, wherein the cleaning or wiping means (300) comprises a window wiper and/or a brush roller.

4. Module according to any one of the foregoing clauses 1-3, further comprising a roller (610) mounted in the framework and a panel (620) which is connected thereto and can be rolled onto the roller and unrolled so as to extend in the framework (500), wherein the drive means (400) are further configured to roll up and unroll the panel (620).

5. Module according to clauses 2 and 4, wherein the roller (610) is provided on the second side and the drive means (400) are configured to unroll the panel (620) in the direction of the first side.

6. Module according to the foregoing clause, wherein the drive means (400) comprise a carriage (450) mounted in the framework and movable along the third side between the first and second side, which carriage is configured to be coupled in a cleaning or wiping position to the cleaning and/or wiping means (300) for the purpose of moving the cleaning and/or wiping means (300) from the first side to the second side and back again, and to be coupled in a panel position to the panel (620) for the purpose of moving the panel (620) from the second side to the first side and back again.

7. Module according to the foregoing clauses, wherein the drive means (400) comprise a toothed belt (420) driven by a motor, and wherein the carriage (450) is coupled to the toothed belt (420) which is provided on the third side (203).

8. Module according to any one of the clauses 4-7,

wherein the panel (620) has a first end edge (621) which is connected to the roller (610) and a second end edge (622) which is held at a second location close to the roller (610), and wherein an unrolling bar (630) is provided on an inner side of the panel (620), such that the panel (620) extends from the roller (610), over the unrolling bar (630) and to the second location, wherein the drive means (400) are configured to move the unrolling bar (630) over the light-transmitting plate (200).

9. Module according to clauses 6 and 8, wherein the carriage (450) is configured to be coupled in a panel position to the unrolling bar (630) for the purpose of moving the panel (620), in a doubled state, to the first side (201).

10. Module according to any one of the clauses 4-9, wherein the panel (620) is provided with a pattern of more and less light-transmitting zones (625, 626), and is mounted such that in the unrolled state two planes VI, V2 of the panel (620) extend over the light-transmitting plate (200) and the two planes VI, V2 are displaceable relative to each other for the purpose of controlling the light incidence through the light-transmitting plate (200).

11. Module according to the foregoing clause, wherein the pattern comprises more and less light-transmitting parallel strips (625, 626) which are oriented parallel to a longitudinal direction of the roller (610).

12. Module according to any one of the clauses 4-11, wherein the panel (620) has a first end edge (621) connected to the roller (610) and a second end edge (622) connected to a second roller (640) mounted in the framework (500), wherein the roller (610) is provided on a first side of the framework and the second roller is provided on a second, opposite side of the framework; wherein the drive means (400) are configured to unroll the panel (620) from the roller (610) while it is being rolled onto the second roller (640), and vice versa. 13. Module according to the foregoing clause, wherein the panel (620) is provided with at least a first and a second zone (626, 627, 628), each with a surface area substantially corresponding to the surface area of the framework, wherein the first zone (626) differs from the second zone (627).

[0028] According to a third aspect of the invention, a roof window and module according to any one of the following clauses are provided:

1. Roof window comprising a frame (100) with a substantially flat light-transmitting plate (200), wherein the roof window is provided with a roller (610) and a panel (620) which is connected thereto and can be rolled onto the roller and unrolled over the flat light-transmitting plate (200); and drive means (400) configured to roll up and unroll the panel (620) over the flat light-transmitting plate (200); wherein the panel

(620) has a first end edge (621) which is connected to the roller (610) and a second end edge (622) which is held at a second location close to the roller (610), and wherein an unrolling bar (630) is provided on an inner side of the panel (620), such that the panel (620) extends from the roller (610), over the unrolling bar (630) and to the second location, wherein the drive means (400) are configured to move the unrolling bar (630) over the light-transmitting plate (200).

2. Roof window according to the foregoing clause, wherein the light-transmitting plate (200) is substantially rectangular with a first side (201) and a second side (202) lying opposite thereto, and with a third side (203) and a fourth side (204) lying opposite thereto, and wherein the roller (610) is provided on the second side (202) and the drive means (400) are configured to unroll the panel (620) in the direction of the first side (201).

3. Roof window according to the foregoing clause, wherein the drive means (400) comprise a carriage (450) which is movable along the third side (203) between the first and second side (201, 202), which carriage is configured to be coupled in a panel position to the unrolling bar (630) for the purpose of moving the panel (620) from the second side (202) to the first side (201) and back again.

4. Roof window according to the foregoing clauses, wherein the drive means (400) comprise a toothed belt (420) driven by a motor, and wherein the carriage (450) is coupled to the toothed belt (420) which is provided on the third side (203).

5. Roof window according to any one of the foregoing clauses, wherein the panel (620) is provided with a pattern of more and less light-transmitting zones (625, 626), and is mounted such that in the unrolled state two planes VI, V2 of the panel (620) extend over the light-transmitting plate (200) and the two planes VI, V2 are displaceable relative to each other for the purpose of controlling the light incidence through the light-transmitting plate (200).

6. Roof window according to the foregoing clause, wherein the pattern comprises more and less light-transmitting parallel strips (625, 626) which are oriented parallel to a longitudinal direction of the roller (610).

7. Roof window according to any one of the foregoing clauses, wherein the roller is accommodated in a module (1000) comprising a framework (500), wherein the framework (500) is fixed on the frame (100) of the roof window.

8. Module for use in a roof window according to any one of the foregoing clauses, comprising a framework which is provided with a roller (610) accommodated in the framework and a panel (620) which is connected thereto and can be rolled onto the roller and unrolled in the framework; and drive means (400) configured to roll up and unroll the panel (620)

in the framework; wherein the panel (620) has a first end edge (621) which is connected to the roller (610) and a second end edge (622) which is held at a second location close to the roller (610), and wherein an unrolling bar (630) is provided on an inner side of the panel (620), such that the panel (620) extends from the roller (610), over the unrolling bar (630) and to the second location, wherein the drive means (400) are configured to move the unrolling bar (630) over the light-transmitting plate (200). 9. Module according to clause 8, wherein the unrolling bar is guided between opposite sides of the framework.

[0029] Embodiments of the invention according to the third aspect can thus be embodied without cleaning and/or wiping means (300) but with a panel. Advantageous features of the different aspects can be combined in random manner, as will be apparent to the skilled person.

[0030] Further aspects and embodiments of the invention are described in the appended claims.

Brief figure description

[0031] The above stated and other advantageous features and objects of the invention will become more apparent, and the invention better understood, on the basis of the following detailed description when read in combination with the accompanying drawings, in which:

Figure 1 is a cut-way perspective view of an embodiment of a roof window;

Figure 2 is a perspective view of an embodiment of the module of the roof window of figure 1;

Figure 3 is a perspective view of the module of figure 2, wherein the module has been cut in half;

Figure 4 is a perspective view of the components of the module of figure 2, wherein the framework itself has been omitted in order to make the components visible;

Figure 5A is a perspective view corresponding to the view of figure 4, but wherein the wiping means is in a wiping position;

Figure 5B is a perspective view corresponding to the view of figure 4, but wherein the panel is in a partially unrolled position;

Figure 5C illustrates a top view of a part of the panel;

Figure 5D illustrates a schematic view of an embodiment of the wiping means;

Figure 5E illustrates a schematic view of the operation of the wiping means;

Figure 5F illustrates a schematic view of a second embodiment of a roller with panel;

Figure 6 shows a perspective detail view of the roller side of the module of figure 3 mounted on a frame with a flat light-transmitting plate;

Figure 7 illustrates a perspective detail view of the module of figure 2, wherein a third side of the module

has been cut and wherein the module is mounted on a frame with a flat light-transmitting plate;

Figure 8A illustrates a perspective detail view of the module of figure 2, wherein a corner connection has been omitted in order to make the drive means visible;

Figure 8B illustrates a perspective detail view of the first side of the module of figure 2, wherein the drive means have been made visible;

Figure 9 illustrates a second embodiment of a roof window according to the invention;

Figure 9A illustrates schematically a top view of the panel which can be rolled up of the embodiment of figure 9;

Figure 10 illustrates schematically a top view of a third embodiment of a device according to the invention;

Figures 11A and 11B illustrate schematically the placing of a cleaning and/or wiping means;

Figures 12A-12F illustrate schematically an embodiment of a coupling between the carriages and the cleaning and/or wiping means; and

Figures 13A and 13B illustrate the uncoupling of the cleaning and/or wiping means when the carriages do not run synchronously.

[0032] In the accompanying drawings the same or similar elements are designated with the same or corresponding numerals throughout the figures.

Detailed embodiments

[0033] Figure 1 illustrates a roof window comprising a frame 100 with a substantially flat light-transmitting plate 200. In the illustrated embodiment frame 100 and light-transmitting plate 200 are substantially rectangular. Frame 100 has a first side 101, a second side 102 lying opposite thereto, a third side 103 and a fourth side 104 lying opposite the third side. In corresponding manner, light-transmitting plate 200 has a first side 201, a second side 202 lying opposite thereto, a third side 203 and a fourth side 204 lying opposite the third side. Frame 100 is for instance mounted on an upstand O which is provided on a roof. A possible embodiment of frame 100 and of upstand O is shown in more detail in figures 6 and 7. Such frames 100 are known, and are described in more detail in the Belgian patent applications BE 2016/5645 and BE 2016/5055 in the name of Glorieux, Jean Marc Gilles, which are included here by way of reference. As can be seen in figures 6 and 7, frame 100 can comprise a plurality of light-transmitting plates 200, 200' installed parallel to each other. Variants hereof, as described in the above stated Belgian patent applications, likewise fall within the scope of the present invention.

[0034] A module 1000 can be fixed on frame 100, for instance using four coupling pieces 600 which are attached to module 1000 on one side and to frame 100 on the other, for instance using screws. These coupling pieces

es 600 are preferably provided in the corners of frame 100. Module 1000 comprises a framework 500 with a first side 501, a second side 502 lying opposite thereto, a third side 503 and a fourth side 504 lying opposite the third side. A wiping means 300 is provided in framework 500. In the mounted state of module 1000 the wiping means 300 is configured and mounted to be moved reciprocally over light-transmitting plate 200 for the purpose of cleaning plate 200. Alternatively or additionally to wiping means 300, a cleaning means such as a brush roller can also be mounted in framework 500 for the purpose of cleaning the light-transmitting plate and/or removing rainwater on plate 200. In order to allow rainwater and/or dirt to be removed by wiping means 300 the sides 501 and 502 protrude relative to light-transmitting plate 200 such that respective openings 551 and 552 are formed respectively between first side 101 and first side 501, and between second side 102 and second side 502. The third and fourth sides 503, 504 of framework 500 can be situated above light-transmitting plate 200, see figure 7.

[0035] Wiping means 300 is here an elongate element extending between third side 503 and fourth side 504 of framework 500. Wiping means 300 is movable in the direction of arrow P1 from first side 501 to second side 502 of framework 500 and back again. This movement of wiping means 300 is caused by drive means 400, which will be further elucidated hereinbelow with reference to figures 8A and 8B.

[0036] Provided on third side 503 and fourth side 504 of framework 500 are guide means 513, 514 for guiding a first end 303 and a second end 304 of wiping means 300 during the reciprocal movement as according to arrow P1, see figure 1. These guide means 513, 514 are illustrated in more detail in figure 7, and are formed by a hollow profile of framework 500 in which a carriage 450 can be guided, as will be described in more detail hereinbelow with reference to figure 5A.

[0037] As best seen in figure 3, in the rest position wiping means 300, here in the form of a window wiper, is provided on the first side 501 of framework 500, and a roller 610 and a panel 620 which is connected thereto and can be rolled onto roller 610 is provided on the opposite, second side 502. In another embodiment (not shown) it is also possible to provide the rest position of wiping means 300 on the same side (i.e. second side 502) of framework 500 as roller 610. Panel 620 can be unrolled over the flat light-transmitting plate 200 in the direction of arrow P2. Provided for this purpose are drive means 400 which are configured to roll up and unroll panel 620 over plate 200, as will be described in more detail below. Figures 3 and 4 illustrate a situation in which panel 620 is in the fully rolled-up position.

[0038] Figure 5D illustrates schematically a possible section of wiping means 300. Wiping means 300 comprises an elongate carrier 310 in which is fixed an elongate wiping blade 320 manufactured from a flexible material, for instance a rubber or silicone material, see also figure 5A. In the illustrated embodiment wiping blade 320

comprises a first elongate strip 321 protruding from carrier 310 in the direction of light-transmitting plate 200, and a second strip 322 which is connected to a lower edge of first strip 321. An upper edge of first strip 321 is provided with a thickened portion 323, here an arrow-shaped thickened portion which is received in carrier 310. Second strip 322 forms an angle with first strip 321. In unloaded state the second strip 322 is preferably substantially perpendicular to the first strip 321, and second strip 322 extends relative to first strip 321 on either side thereof, such that wiping blade 320 has a substantially T-shaped cross-section. Such a form has the advantage that the wiping blade can fulfil a good wiping function while moving over plate 200 from first side 201 to second side 202 and back, both during the outward movement and during the return movement. This is illustrated in figure 5E. While moving to the right, see (1) in figure 5E, strip 321 bends to the left. When it reaches the first side 201 of plate 200, the wiping blade is carried to a position beyond the plate edge, see (2) in figure 5E, such that droplets and dirt V are removed through opening 551. While moving to the left, see (2) in figure 5E, strip 321 bends to the right. When it reaches the second side 202 of plate 200, the wiping blade is carried to a position beyond this plate edge, such that droplets and dirt V are removed through opening 552. Thickened portion 323 is preferably received with some clearance in carrier 310 such that, when the movement from the left to the right reverses, thickened portion 323 can move inward to some extent, thus facilitating this reversal.

[0039] Drive means 400 are provided for the purpose of driving the movement of wiping means 300 on the one hand and the movement of panel 620 on the other. These are shown in detail in figures 8A and 8B. Drive means 400 comprise a motor 410, here in the form of a tube motor, a rotating outer end 411 of which is coupled to a toothed belt 420. In the illustrated embodiment tube motor 410 is provided with one drive end 411, but the skilled person will appreciate that it is also possible to use a tube motor with two drive ends. Toothed belt 420 is further coupled to a coupling rod 430 which extends along the first side 501 of framework 500 for the purpose of transmitting the movement of motor 410 to a second, symmetrically arranged toothed belt 420' on the fourth side 504 of framework 500. Figure 4 shows only one toothed belt 420, but the skilled person will appreciate that a toothed belt 420' can be provided in corresponding manner on the fourth side 504 of framework 500, see figure 8B. A first end 431 of coupling rod 430 is coupled to toothed belt 420 and a second end 432 of coupling rod 430 is coupled to toothed belt 420'. The coupling between motor 410 and toothed belt 420, and between coupling rod 430 and toothed belt 420, is shown in more detail in figure 8A. Motor 410 is accommodated in a profile of framework 500 extending along first side 501, and has a drive end 411 with a coupling part 413 which is situated in a corner where first side 501 connects to third side 503 of framework 500. Coupling rod 430 is accommodated

parallel to tube motor 410, in a profile of framework 500 on first side 501, and in corresponding manner has an outer end 431 with a coupling part 433 which is configured to co-act with toothed belt 420. In this way a rotating movement of drive end 411 is converted into a rotation of toothed belt 420 and, via coupling rod 430, of toothed belt 420' as well.

[0040] Drive means 400 further comprise a first carriage 450 which is fixed on toothed belt 420. A second carriage 450' (not shown) can be provided in symmetrical manner on toothed belt 420'. First carriage 450 is movable along third side 203 of plate 200 and is configured to be coupled in a cleaning or wiping position to wiping means 300 for the purpose of moving the wiping means from the first side 201 to the second side 202 of plate 200 and back again. This is illustrated in figure 5A. First carriage 450 is further configured to be coupled in a panel position to the panel 620 for the purpose of moving panel 620 from the second side 202 to the first side 201 of plate 200 and back again.

[0041] Second carriage 450' is provided along fourth side 504. A first and second coupling 460, 460' can respectively be provided between the first and second carriage 450, 450' and the first and second end of the cleaning and/or wiping means 300, see also figures 11A and 11B, figures 12A-E and figures 13A and 13B, where first and second coupling 460, 460' are shown without carriages 450, 450'. This first and second coupling 460, 460' are preferably hinged couplings, still more preferably hinged couplings allowing a rotation around an axis A which is oriented vertically relative to the plane of the framework, see figures 13A and 13B. Coupling 460, 460' is preferably also configured to compensate for a determined minimum difference in the distance between the first and the second carriage 450, 450' so that cleaning and/or wiping means 300 can be placed at a slight angle relative to the direction of first and second side 501, 502. This slight angle for instance lies between 1° and 10°. Such a coupling allows cleaning and/or wiping means 300 to be manually arranged in framework 500 in simple manner, see figures 11A and 11B. This further also allows first and second carriage 450, 450' to be controlled such that cleaning and/or wiping means 300 are placed on the flat light-transmitting plate 200 slightly obliquely at the start of a movement, i.e. at a slight angle relative to the first and second side 501, 502, such that the starting power at the start of the movement is smaller because only a part of the underside of cleaning and/or wiping means 300 makes contact with the light-transmitting plate 200. Coupling 460, 460' can also be configured to uncouple cleaning and/or wiping means 300 when the distance between the first and second coupling 460, 460' is too great, for instance when the first and second coupling 460, 460' come to lie too far apart as a result of for instance a coupling error (in the example only one carriage 450 is properly coupled to a coupling 460), see figures 13A and 13B. After a determined distance, for instance between 10 cm and 20 cm, cleaning and/or wiping means

300 will detach from coupling 460, without damage, and fall onto plate 200. The "joints" 460, 460' ensure that an oblique position is allowed and the couplings 460, 460' cannot be torqued until they break.

[0042] These first and second carriages 450, 450' are also configured to be coupled to a first and second end of the unrolling bar via respectively a first and second coupling 465, 465'. These first and second couplings can be hinged couplings which allow a rotation around an axis oriented vertically relative to the plane of framework 500 (as described above for couplings 460, 460'), but can also be an "ordinary" coupling which does not allow rotation.

[0043] The drive means and/or a control coupled thereto can further be configured to detect a current peak in the case of an obstruction and to stop both carriages 450, 450' in order to prevent damage. It is further possible to provide detectors (not shown), such as microswitches, along the third and fourth side in order to monitor movement of carriages 450, 450' and to avoid or correct any variations of the movement of carriages 450, 450'.

[0044] As best seen in figure 6, panel 620 has a first end edge 621 which is connected to roller 610, and a second end edge 622 which is held at a second location close to roller 610. The second location can for instance be a profile edge of framework 500, at the position of the second side 502, on the inner side of framework 500. According to an alternative, the second location can be a fastening rib extending at the top of a frame profile on second side 502. An unrolling bar 630 is further provided on an inner side of panel 620 such that panel 620 extends from roller 610, over unrolling bar 630 and to the second location, here a profile edge 522. Drive means 400 with carriage 450 are configured to move unrolling bar 630 over plate 200 from the second side 202 to the first side 201 and back, see arrow P2. Figure 5B illustrates panel 620 in a partially unrolled state. In order to bring the panel into this state carriage 450 of drive means 400 was coupled to unrolling bar 630 for the purpose of moving panel 620, in a doubled state, to the first side 201.

[0045] As illustrated in figure 5C, panel 620 is preferably provided with a pattern of more and less light-transmitting zones 625, 626, here in the form of more and less light-transmitting parallel strips. Strip 625 can for instance be opaque, while strip 626 is translucent. By changing the position of plane V1 of panel 620 and of plane V2 of panel 620 relative to each other it is thus possible to control the light incidence through light-transmitting plate 200. In order to control the light transmission of panel 620 the unrolling bar 630 can be moved reciprocally slightly in the end position so as to ensure that strips 625 in plane V1 do or do not coincide, wholly or partially, with strips 625 in plane V2. Although an embodiment of panel 620 with strips 625, 626 is illustrated here, the skilled person will appreciate that other patterns, which allow the light transmission of panel 620 to be changed by changing the position of unrolling bar 630, are also possible.

[0046] Another possible embodiment of a roller 610' with panel 620 is shown in figure 5F. This embodiment has the advantage that it is possible to prevent dirt from also being rolled up when the panel is rolled onto the roller. Panel 620 is preferably provided on roller 610 such that panel 620 extends from an underside of roller 610 to a position beyond an underside of unrolling bar 630, and then around unrolling bar 630 to an upper side of unrolling bar 630, and then returns to the second location 622, situated above the lower plane V2 of the two planes VI, V2 of panel 620 lying one above the other, close to roller 610. In this way dirt V present on panel 620 when not rolled up will be discharged along the side of unrolling bar 630, onto the roof window. The second location 622, where the second end edge of panel 620 is held, can for instance be a profile edge of framework 500, at the position of second side 502, on the inner side of framework 500. According to an alternative, the second location can be a fastening rib extending at the top of a frame profile on second side 502.

[0047] Figure 9 illustrates a second embodiment of a roof window according to the invention. The roof window comprises an upstand O and a frame 100 with a light-transmitting plate 200. This frame 100 can be similar to the frame 100 described with reference to the first embodiment. A module 1000 is arranged on frame 100. Module 1000 comprises a framework 500 with a first side 501 and a second side 502 lying opposite thereto. A first roller 610 with a panel 620 is provided in a profile of framework 500 on first side 501. Panel 620 has a first end edge 621 which is fastened to roller 610. Panel 620 has a second end edge 622 which is fastened to a second roller 640 which is received in a profile of framework 500 on second side 502. Rolls 610, 640 with panel 620 thus form as it were a scroll system. Drive means (not shown) are further provided for unrolling panel 620 from roller 610 and simultaneously rolling panel 620 onto roller 640. Panel 620 can here be provided with two or more zones 627, 628, 629 with different properties, see also figure 9A. The zones 627, 628, 629 each have a surface area substantially corresponding to the surface area of the light-transmitting plate 200, and in this way allow a suitable panel zone 627, 628, 629 to be arranged above the light-transmitting plate 200, for instance in accordance with the desired light incidence. Zones 627 and 628 can for instance be screens with different light transmission. It is further also possible to provide panel 620 with an "empty" zone 629 where no cloth is provided, wherein this zone 629 is bounded by two longitudinal bands 629a, 629b which are intended to extend along the third and fourth side 503, 504 of light-transmitting plate 200 when the empty zone 629 is situated above plate 200. It is further possible to provide a zone with lighting means such as OLEDs.

[0048] The device of figure 9 can optionally further be provided with a cleaning or wiping means. A cleaning or wiping means can thus for instance be provided which can be moved from a third side 503 to a fourth side 504, and back again, under panel 620. It is particularly when

an empty zone 629 is provided that such a wiping means can be useful for removing fouling and/or rainwater.

[0049] Figure 10 illustrates schematically a third embodiment of a roof window according to the invention, seen in a top view. In this embodiment wiping means 300a, 300b, 300c, 300d are provided above a light-transmitting plate 200. Wiping means 300a is fixed hingedly round a pivot point 310a and is configured and mounted to perform a rotating movement over light-transmitting plate 200 from a third side 203 in the direction of a first side 201 and back again. Similarly, wiping means 300b is fixed hingedly round a pivot point 310b and is mounted and configured to be rotated over plate 200 from the first side 201 in the direction of a fourth side 204 and back again. Wiping means 300c is fixed hingedly round a pivot point 310c and is rotatable over plate 200 from a second side 202 in the direction of third side 203 and back again, and wiping means 300d is fixed hingedly round a pivot point 310d and configured to be rotated over plate 200 from fourth side 204 in the direction of second side 202 and back again. When wiping means 300a, 300b, 300c, 300d are suitably dimensioned, the whole surface area of light-transmitting plate 200 can in this way be wiped/cleaned. According to an alternative, or in combination therewith, cleaning means 300a, 300b, 300c, 300d can be provided which are mounted in similar manner but are embodied as brush elements. Drive means (not shown) drive the movement of wiping means 300a, 300b, 300c, 300d. Drive means 400 can for instance be provided with a control which ensures that the movements of the different wiping means 300a, 300b, 300c, 300d are coordinated with each other and that the wiping means for instance perform a reciprocal movement one after the other. The skilled person will appreciate that many modifications can be envisaged, wherein more or fewer than four wiping means are for instance used, wiping means are combined with brushing means, and so on. A roller with a panel can optionally also be provided in the embodiment of figure 10, for instance in a manner as described in the first embodiment or in a manner as described in the second embodiment above.

[0050] In the above described first and second embodiments wiping means 300 was integrated into a module 100. The skilled person will appreciate that it is also possible to integrate wiping means 300 into the frame 100 to which the light-transmitting plate is connected, and embodiments in which the wiping means and/or the roller with the panel are integrated into frame 100 likewise fall within the scope of protection of the present invention.

[0051] In the first, second and third embodiment of the roof window a rain sensor can further optionally be provided for the purpose of detecting rain, and the drive means can be coupled to the rain sensor such that the wiping and/or cleaning means is moved when rain is detected. The roof window can also be provided with a wireless receiver, and the drive means can be coupled to the wireless receiver such that the wiping and/or cleaning means and/or the panel can be moved in accordance

with the wirelessly received signals, for instance coming from a mobile device such as a smart phone or a tablet. Other optional elements, such as lighting elements, can also be integrated into the roof window. These optional elements can be integrated into frame 100 and/or into framework 500.

[0052] The rain sensor can be configured to communicate wirelessly with a control which is coupled to the drive means. The wireless receiver can then form part of the control which is coupled to the drive means, and is configured to control the drive means in accordance with the wirelessly received signals.

[0053] In further possible embodiments the roof window can be provided with one or more additional other sensors, such as a light sensor, a temperature sensor, a CO₂ sensor and so on. These can for instance be provided on frame 100 and/or on framework 500. The drive means are then preferably coupled to these one or more other sensors such that wiping and/or cleaning means 300 and/or panel 620 can be moved in accordance with the detected signals. For this purpose the sensor can be configured to communicate wirelessly with a control which is coupled to the drive means. The control then preferably comprises a wireless receiver, such that the control is able to control the drive means in accordance with the wirelessly received signals of the one or more sensors.

[0054] In a possible embodiment the drive means comprise a motor 410 which is provided on second side 502 of framework 500, and the control is provided on the first side 501 of framework 500. Motor 410 can more particularly be provided in a profile on the second side 502 of framework 500 (see figure 6), and the control can be provided in a profile on the first side 501 of framework 500. The control can for instance comprise a PCB and a so-called hub system connected thereto, wherein the hub system is configured to communicate, optionally wirelessly, with a plurality of devices, such as sensors, mobile devices such as a smart phone or a tablet, a domotic system and so on. A user can then provide the control with instructions for controlling the drive means, for instance via his or her smart phone or tablet. A program, for instance an app, can for this purpose be installed on the smart phone or tablet (or on any other computer means which can be operated by a user) which allows the user to enter determined settings. The user can thus for instance be given the option of entering that the roof window is provided in a kitchen or in a bedroom, and a determined light intensity profile can then be programmed in accordance therewith. The control can then control the drive means such that this determined light intensity profile is adhered to as far as possible.

[0055] Framework 500 can for instance be manufactured from plastic, for instance PVC or a composite material. Plate 200 can be manufactured from glass or from PC (polycarbonate), preferably from UV-stabilized PC. Plate 200 can optionally be provided with a coating, for instance for the purpose of obtaining determined optical

properties.

[0056] The skilled person will appreciate that the invention is not limited to the above described embodiments and that many modifications and variants are possible within the scope of the invention, which is defined solely by the following claims.

Claims

1. Roof window comprising a frame (100) with a substantially flat light-transmitting plate (200), **characterized in that** the roof window is provided with
 - a. a cleaning and/or wiping means (300) mounted on or in the frame and configured and mounted to be moved reciprocally over the substantially flat light-transmitting plate (200) for the purpose of cleaning the plate and/or removing rainwater on the plate;
 - b. drive means (400) configured to move the cleaning and/or wiping means reciprocally.
2. Roof window according to the foregoing claim, **characterized in that** the cleaning and/or wiping means (300) is accommodated in a module (1000) comprising a framework (500), wherein the framework (500) is fixed on the frame (100) of the roof window.
3. Roof window according to any one of the foregoing claims, **characterized in that** the substantially flat light-transmitting plate (200) is substantially rectangular with a first side (201) and a second side (202) lying opposite thereto, and with a third side (203) and a fourth side (204) lying opposite thereto, wherein the cleaning or wiping means (300) is an elongate element extending from the third side (203) to the fourth side (204), and wherein the drive means (400) are configured to move the cleaning or wiping means from the first side (201) to the second side (202) and back again.
4. Roof window according to claims 2 and 3, **characterized in that** the framework (500) has a third side (503) and a fourth side (504) which are parallel to the third and fourth side (203, 204) of the substantially flat light-transmitting plate (200), wherein guide means (513, 514) are provided in the third and fourth side (503, 504) of the framework (500) for the purpose of guiding a first and second end (303, 304) of the cleaning and/or wiping means (300) during the reciprocal movement.
5. Roof window according to claim 3 or 4, **characterized in that** a first opening (551) is present between the first side (201) of the plate (200) and the first side (501) of the framework (500), and that a second opening (552) is present between the second side

- (202) of the plate (200) and the second side (502) of the framework (500), wherein the wiping means is configured to remove rainwater and/or dirt through these first and second openings (551, 552).
6. Roof window according to the foregoing claim, **characterized in that** the cleaning or wiping means (300) comprises an elongate carrier (310) and fixed therein an elongate wiping blade (320) manufactured from a flexible material, wherein the wiping blade (320) comprises a first elongate strip (321) protruding from the carrier (310) in the direction of the light-transmitting plate (200), and a second strip (322) which is connected to a lower edge of the first strip (321); wherein the second strip (322) forms an angle with the first strip (321).
7. Roof window according to any one of the foregoing claims, **characterized in that** the cleaning or wiping means (300) comprises a window wiper and/or a brush roller, and that the drive means (400) are preferably further configured to rotate the brush roller.
8. Roof window according to any one of the foregoing claims, further comprising a roller (610) and a panel (620) which is connected thereto and can be rolled onto the roller and unrolled over the flat light-transmitting plate (200); wherein the drive means (400) are further configured to roll up and unroll the panel (620) over the flat light-transmitting plate (200).
9. Roof window according to the foregoing claim, **characterized in that** the light-transmitting plate (200) is substantially rectangular with a first side (201) and a second side (202) lying opposite thereto, and with a third side (203) and a fourth side (204) lying opposite thereto, and that the roller (610) is provided on the second side (202) and the drive means (400) are configured to unroll the panel (620) in the direction of the first side (201).
10. Roof window according to the foregoing claim, **characterized in that** the drive means (400) comprise a carriage (450) which is movable along the third side (203) between the first and second side (201, 202), which carriage is configured to be coupled in a cleaning or wiping position to the cleaning and/or wiping means (300) for the purpose of moving the cleaning and/or wiping means (300) from the first side (201) to the second side (202) and back again, and to be coupled in a panel position to the panel (620) for the purpose of moving the panel (620) from the second side (202) to the first side (201) and back again.
11. Roof window according to the foregoing claims, **characterized in that** the drive means (400) comprise a toothed belt (420) driven by a motor, and that the carriage (450) is coupled to the toothed belt (420)
- which is provided on the third side (203).
12. Roof window according to any one of the claims 8-11, **characterized in that** the panel (620) has a first end edge (621) which is connected to the roller (610) and a second end edge (622) which is held at a second location close to the roller (610), and that an unrolling bar (630) is provided on an inner side of the panel (620), such that the panel (620) extends from the roller (610), over the unrolling bar (630) and to the second location, wherein the drive means (400) are configured to move the unrolling bar (630) over the light-transmitting plate (200).
13. Roof window according to claims 10 or 11 and 12, **characterized in that** the carriage (450) is configured to be coupled in a panel position to the unrolling bar (630) for the purpose of moving the panel (620), in a doubled state, to the first side (201).
14. Roof window according to any one of the claims 8-13, **characterized in that** the panel (620) is provided with a pattern of more and less light-transmitting zones (625, 626), and is mounted such that in the unrolled state two planes V1, V2 of the panel (620) extend over the light-transmitting plate (200) and the two planes V1, V2 are displaceable relative to each other for the purpose of controlling the light incidence through the light-transmitting plate (200); wherein the pattern preferably comprises more and less light-transmitting parallel strips (625, 626) which are oriented parallel to a longitudinal direction of the roller (610).
15. Roof window according to any one of the foregoing claims, **characterized in that** the roof window is provided with a rain sensor for detecting rain, and the drive means are coupled to the rain sensor such that the wiping and/or cleaning means is moved when rain is detected; and/or **characterized in that** the roof window is provided with a wireless receiver, and that the drive means are coupled to the wireless receiver such that the wiping and/or cleaning means can be moved in accordance with the wirelessly received signals.

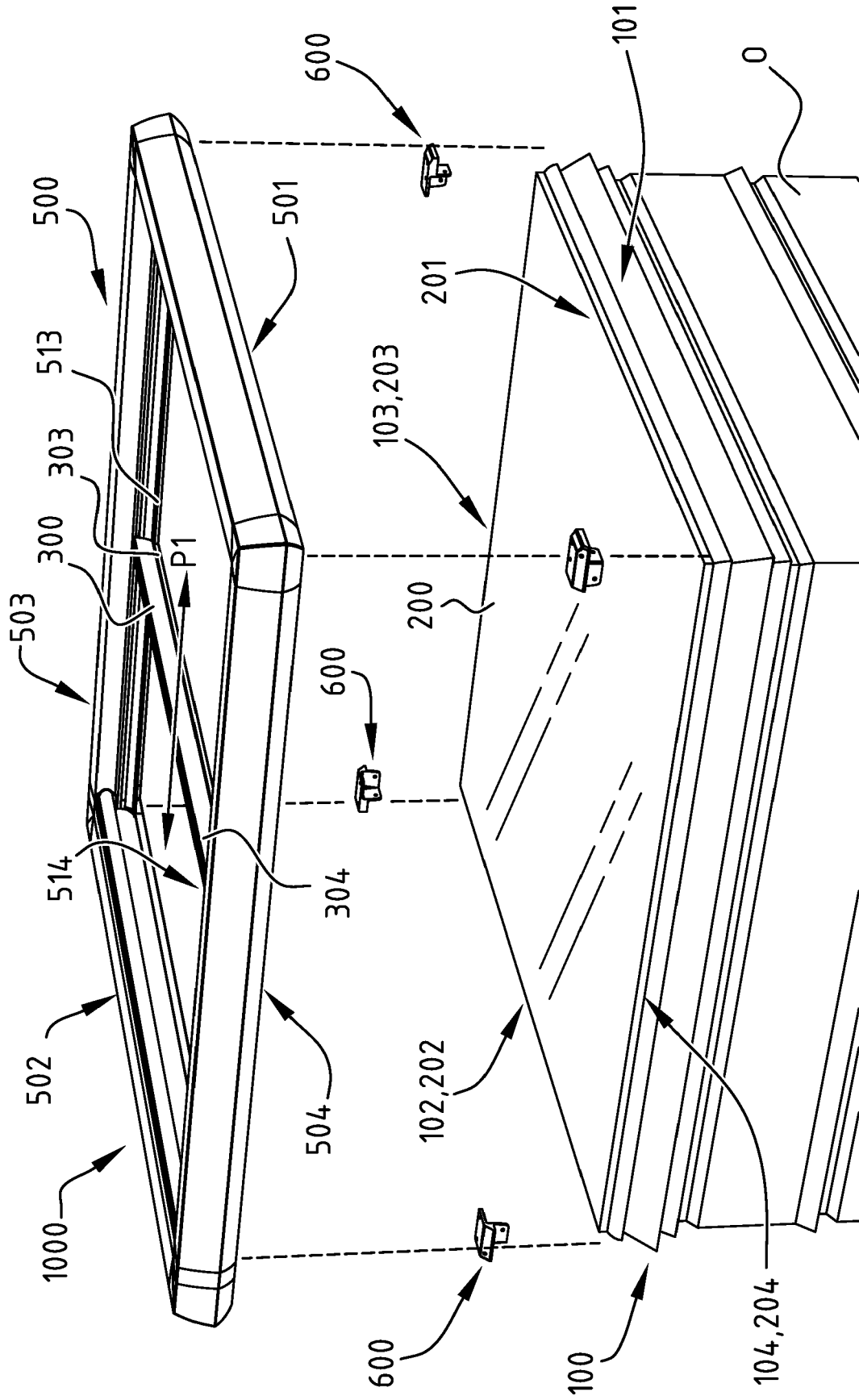


FIG. 1

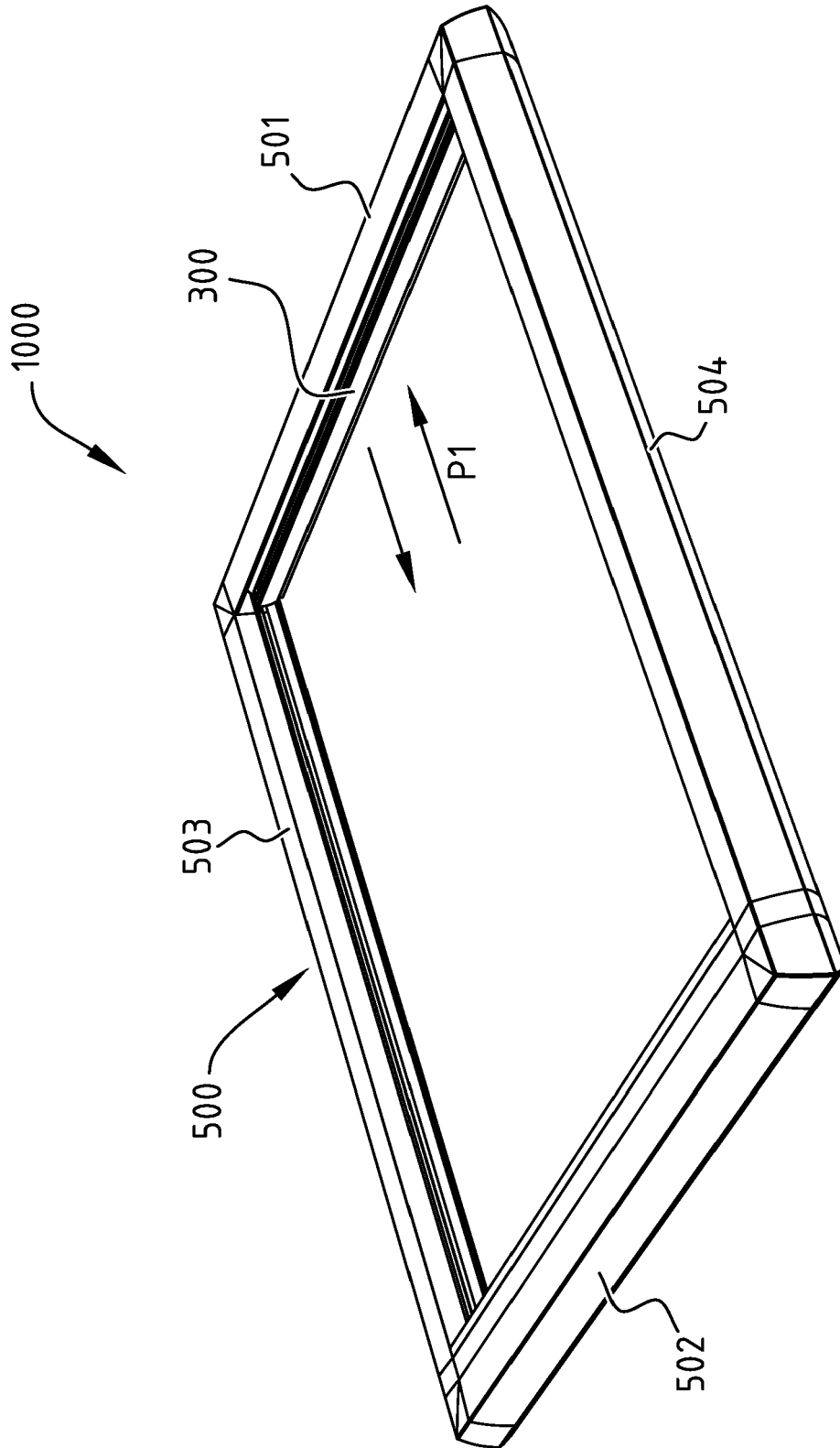


FIG. 2

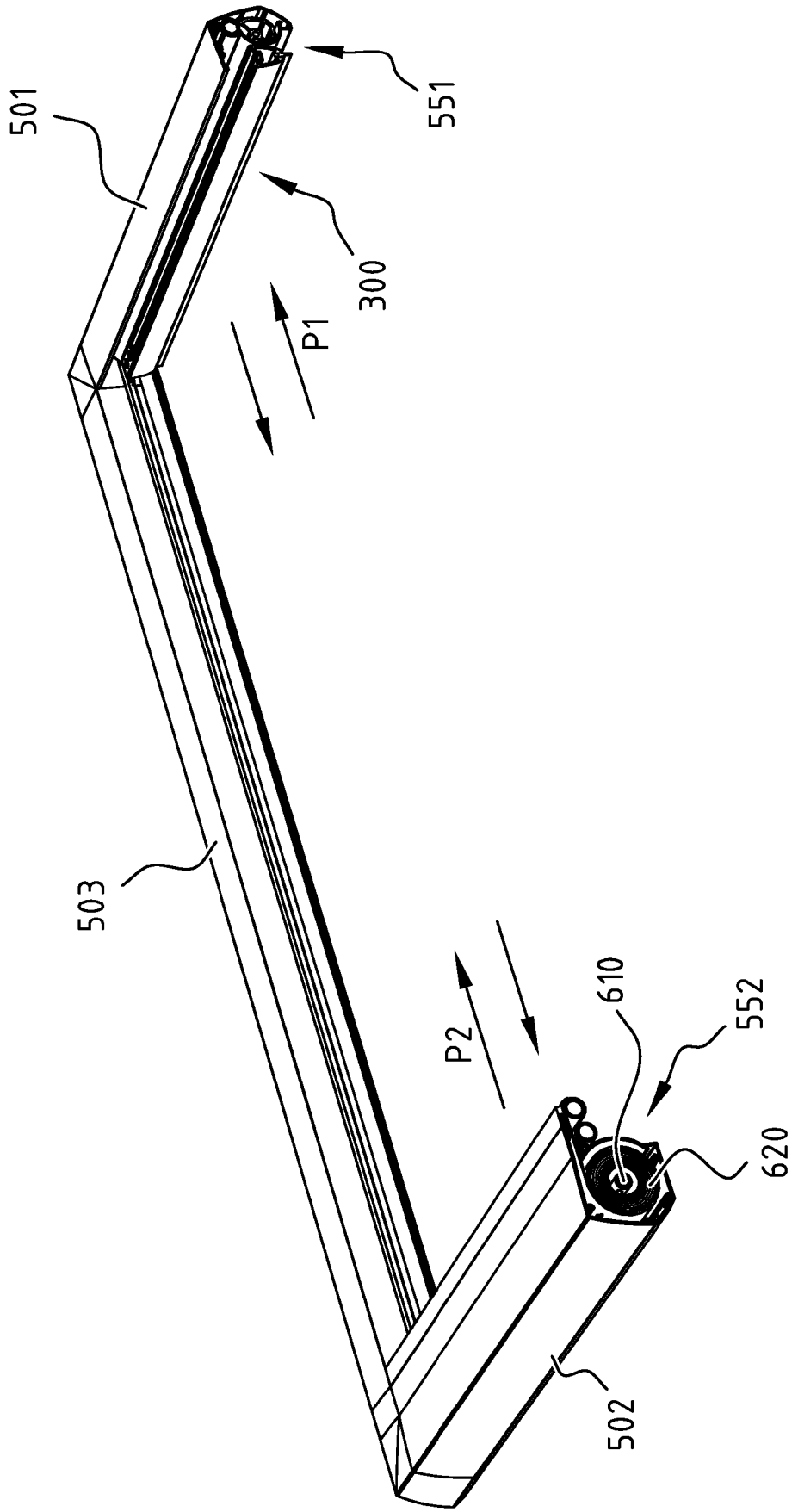


FIG. 3

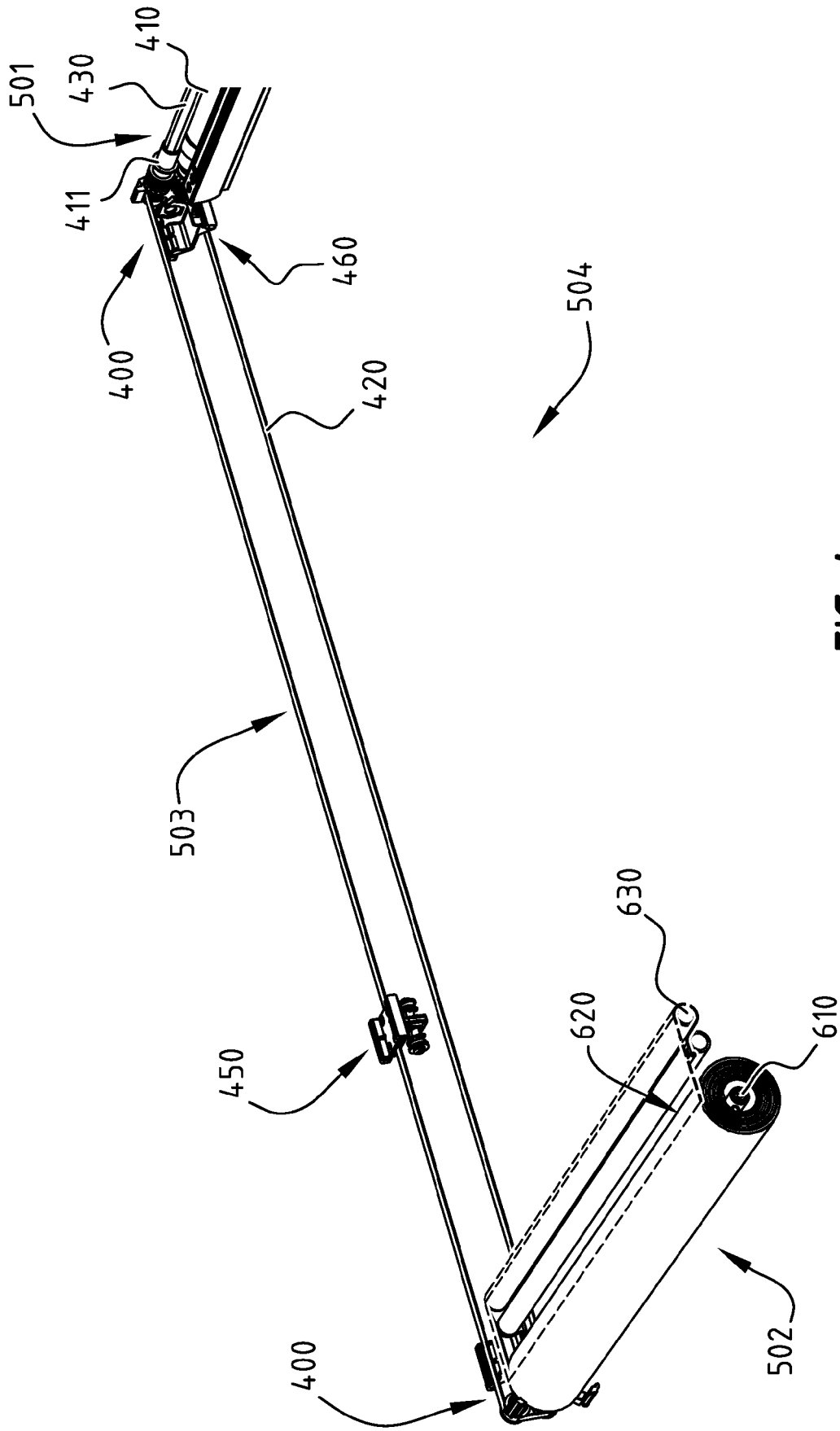


FIG. 4

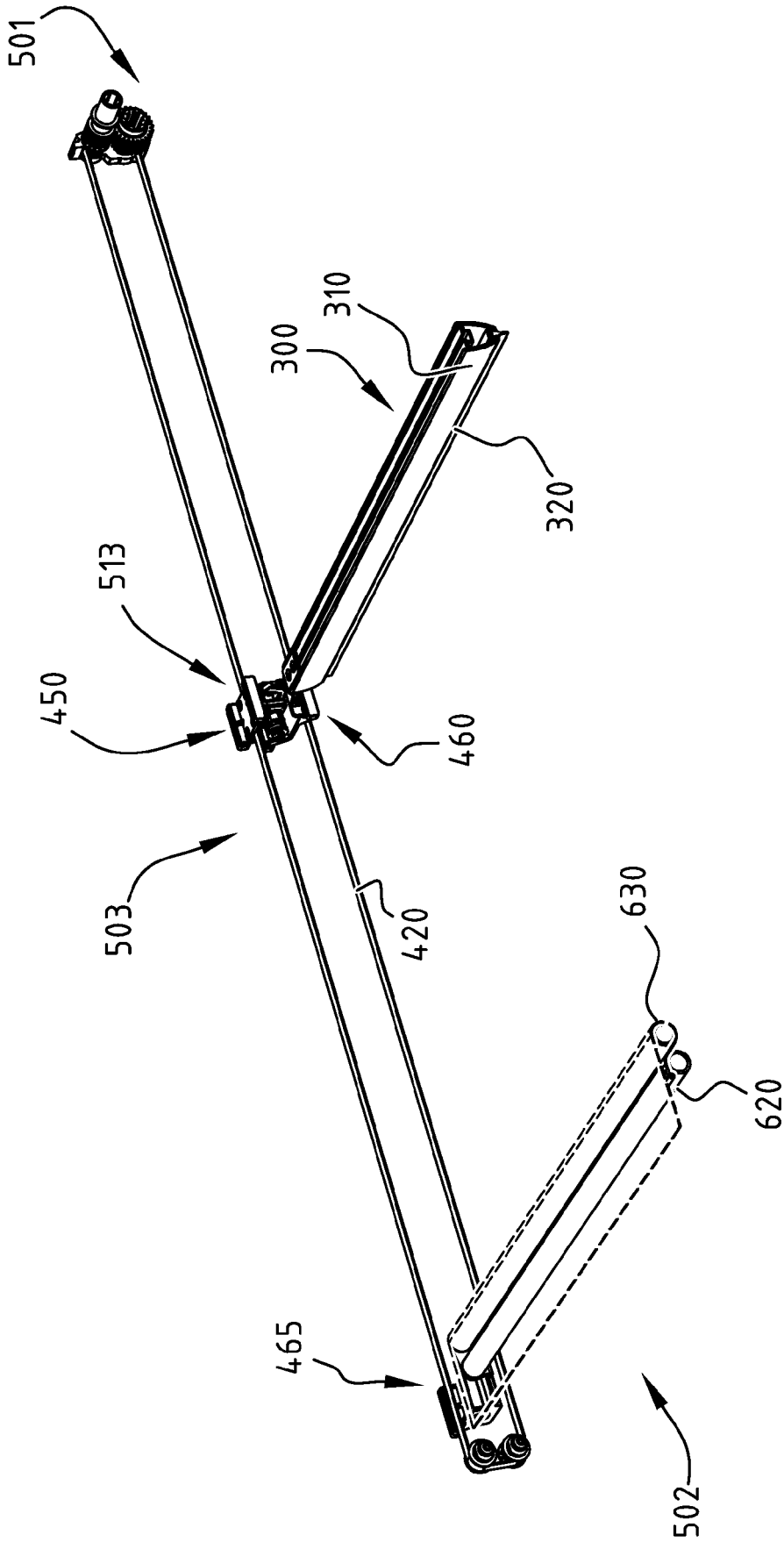


FIG. 5A

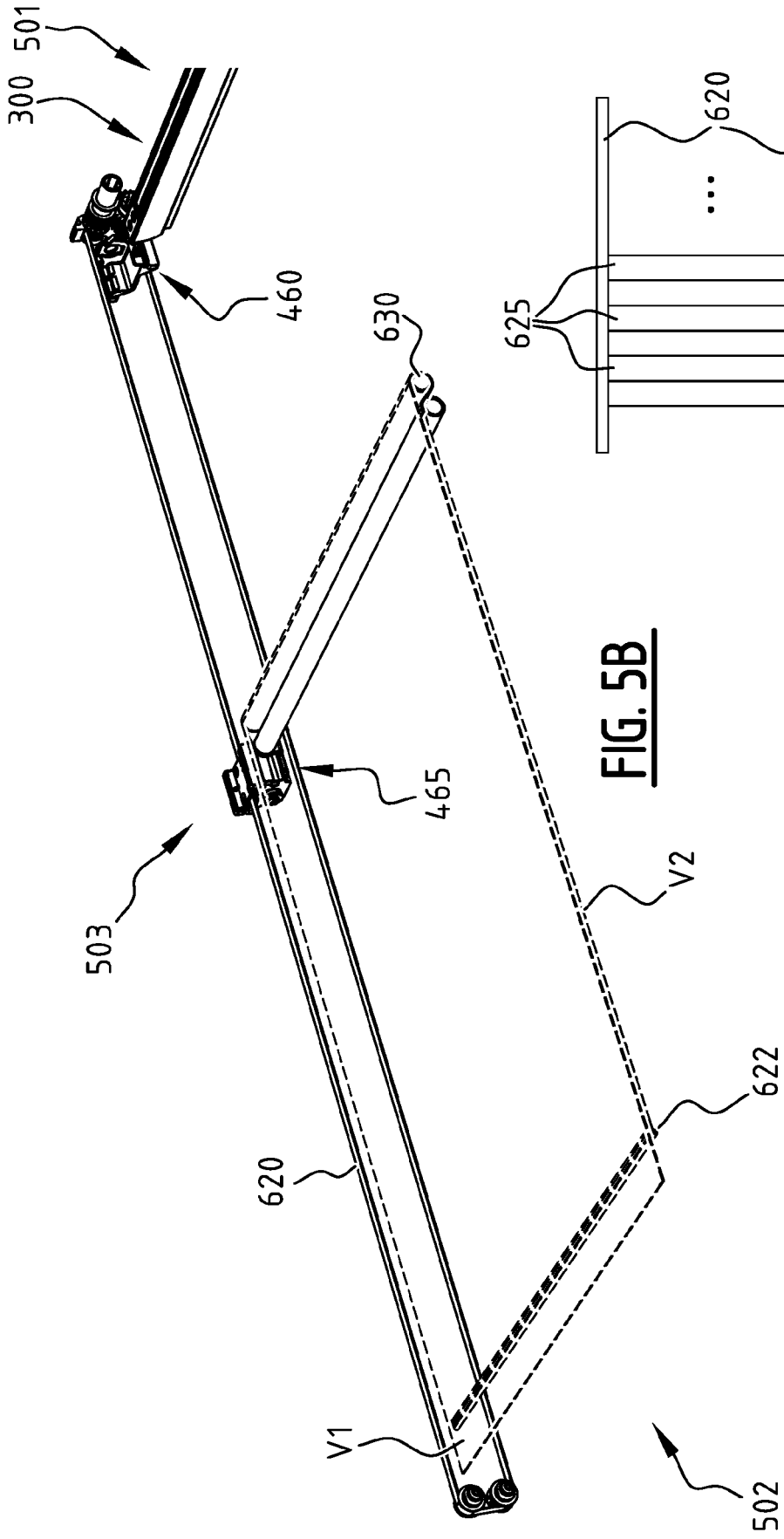


FIG. 5B

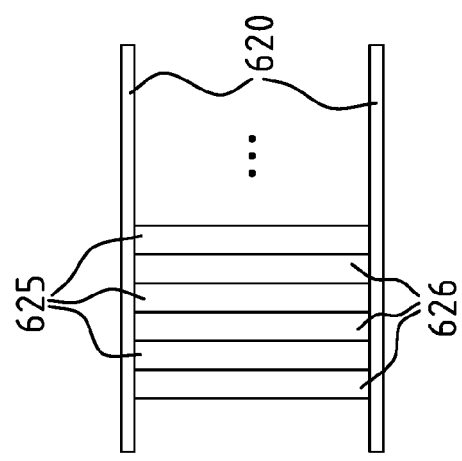


FIG. 5C

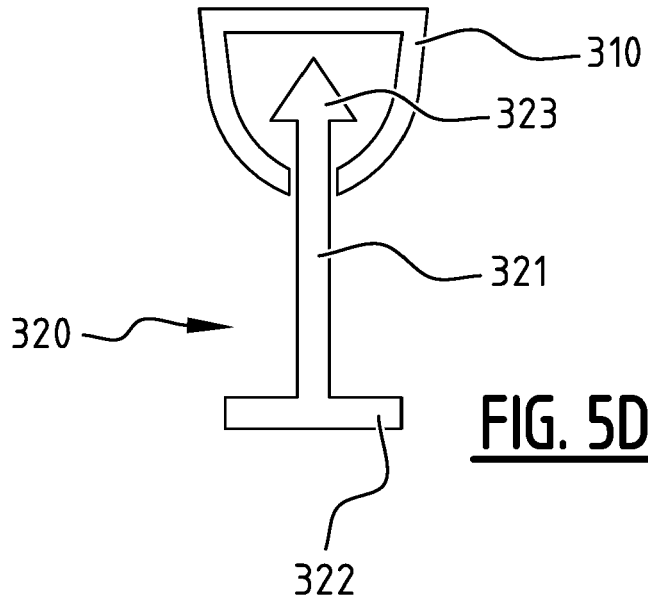


FIG. 5D

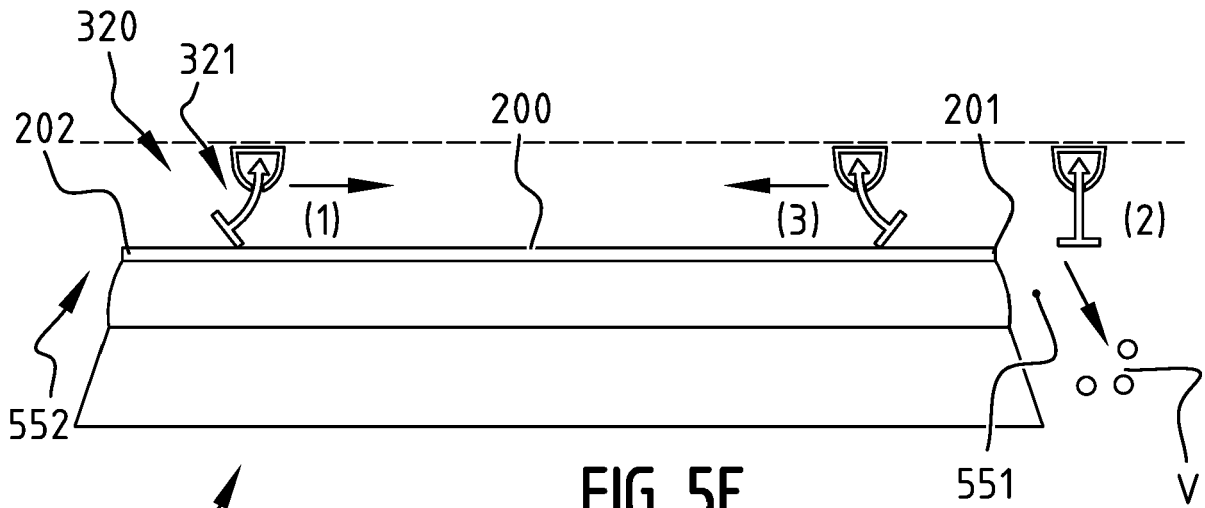


FIG. 5E

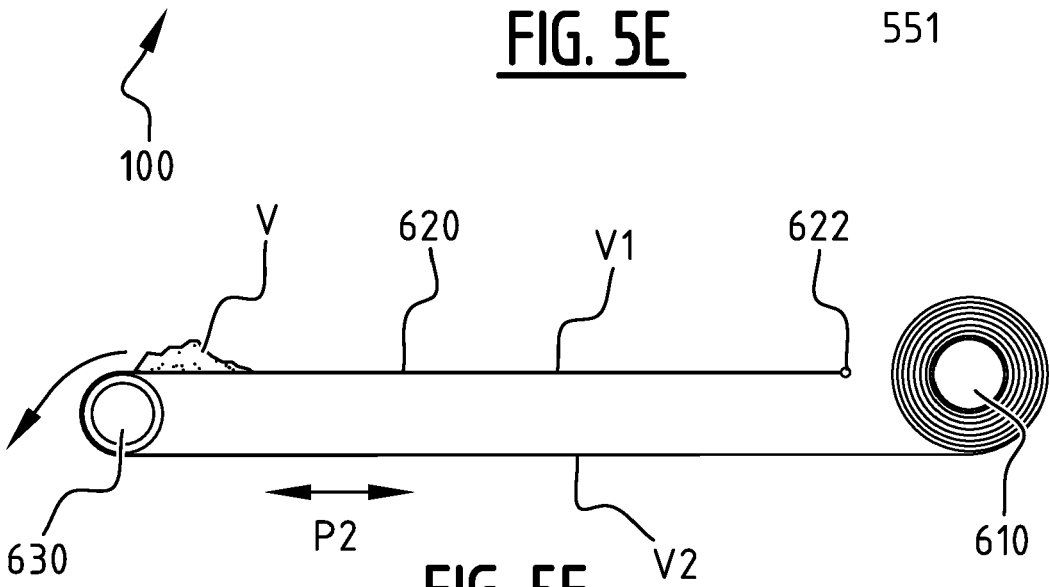


FIG. 5F

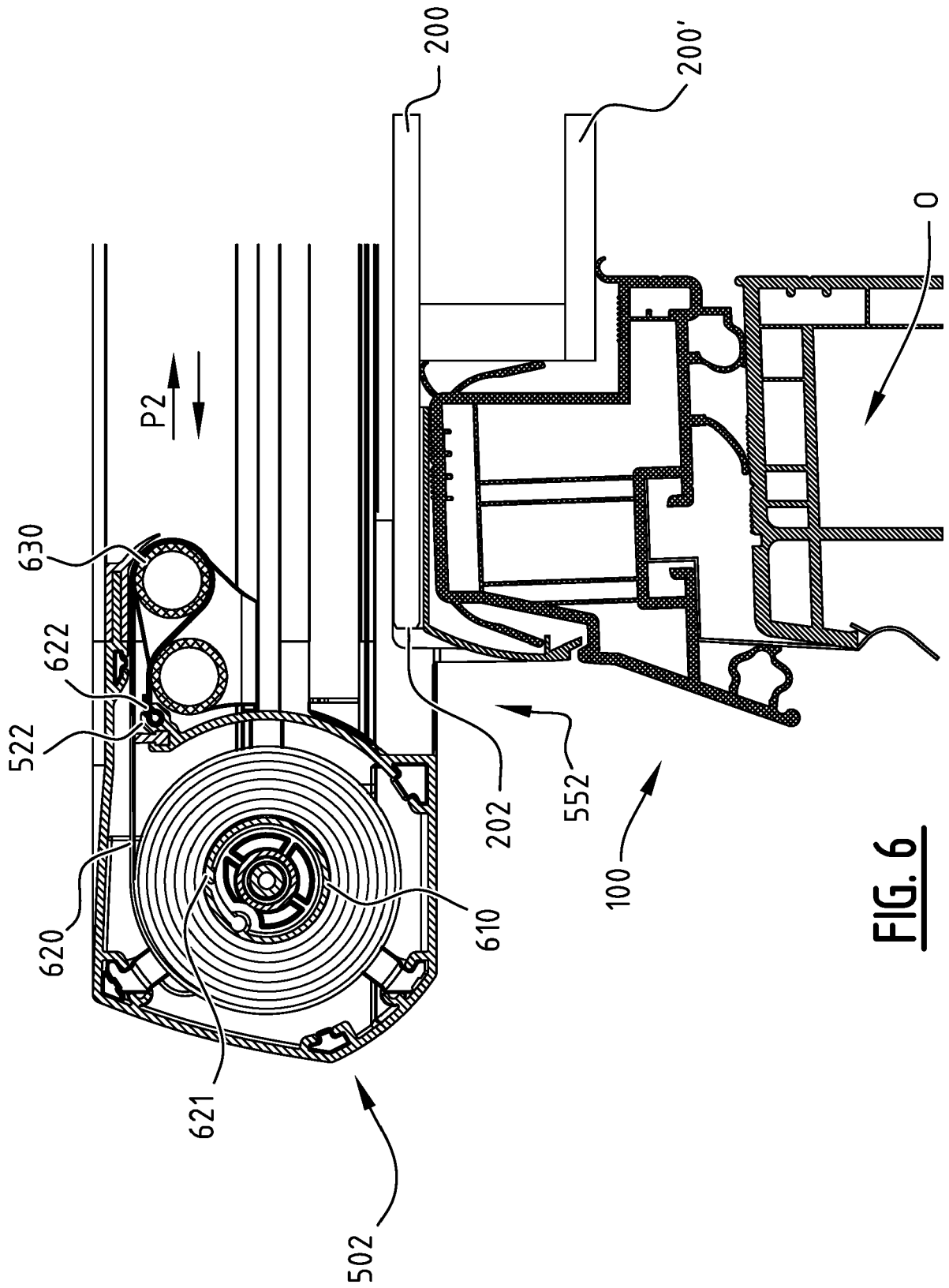


FIG. 6

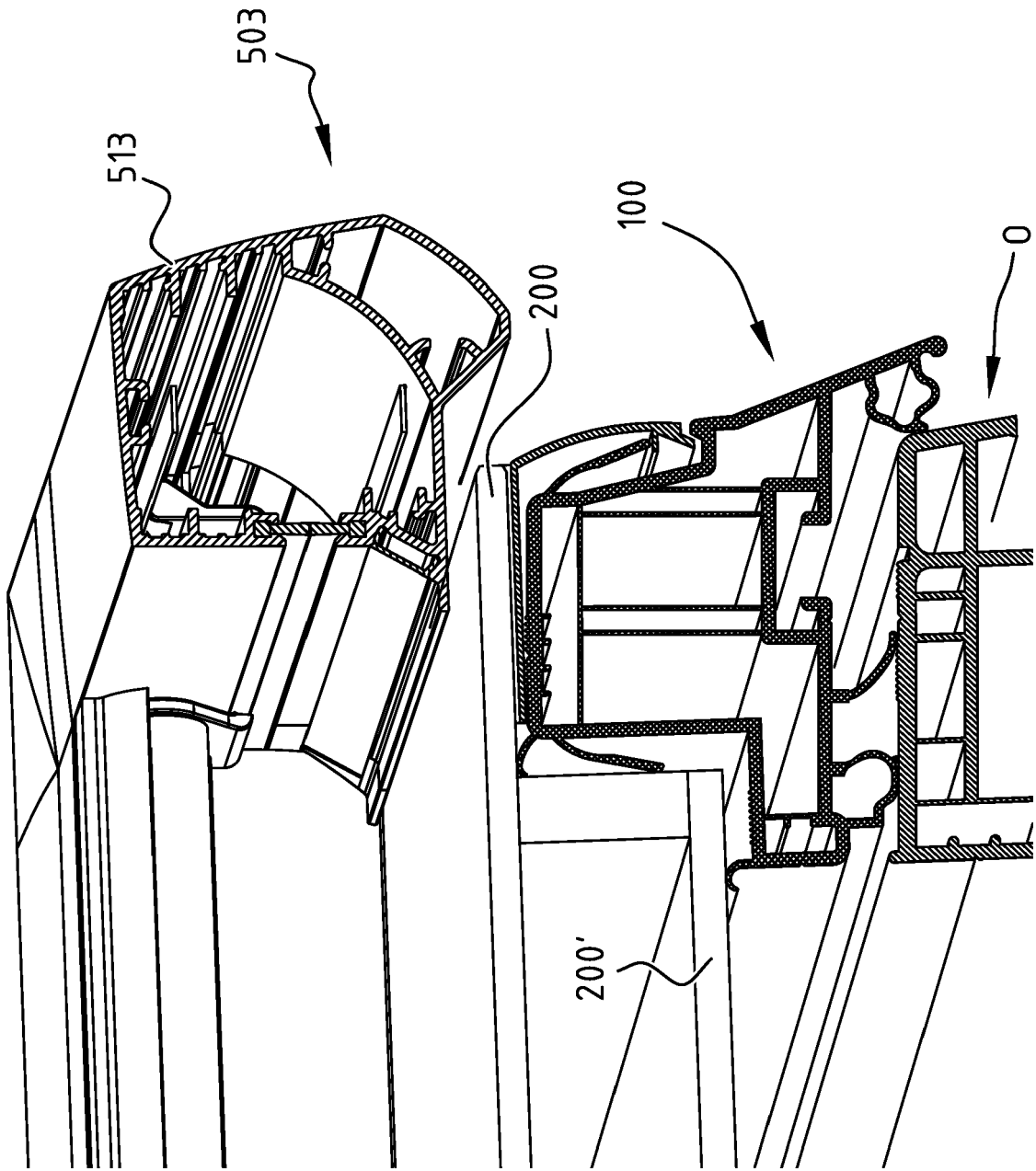


FIG. 7

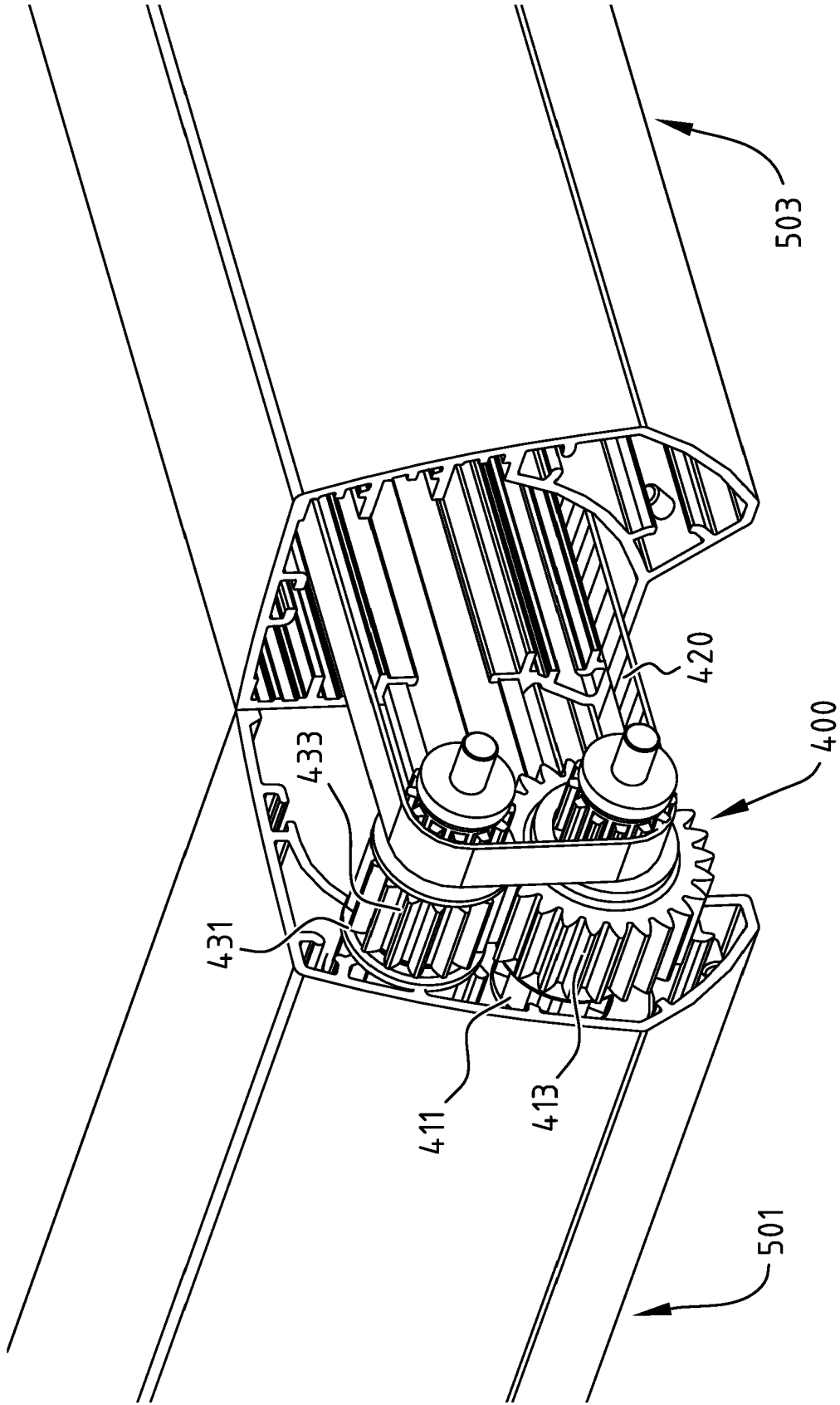


FIG. 8A

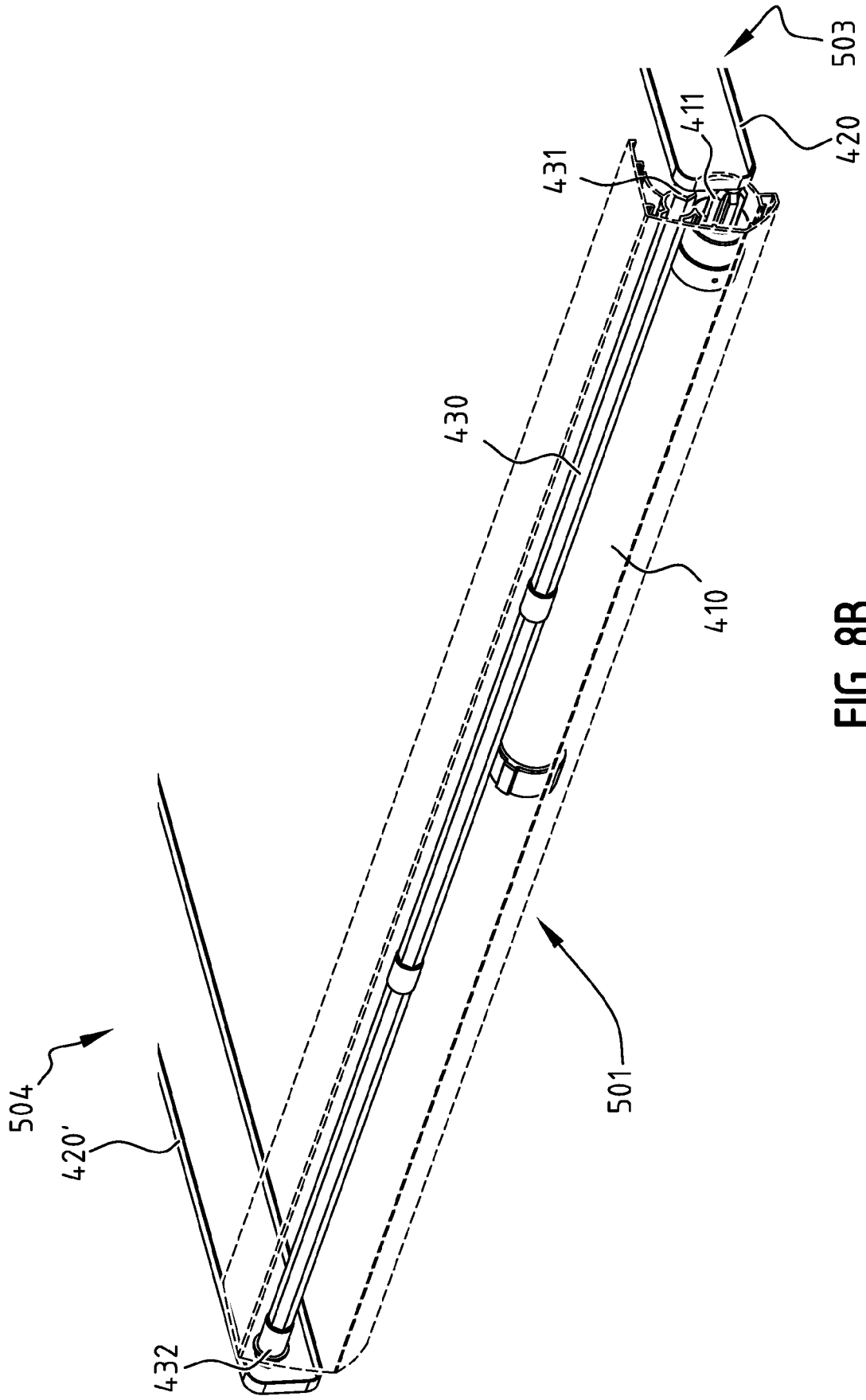


FIG. 8B

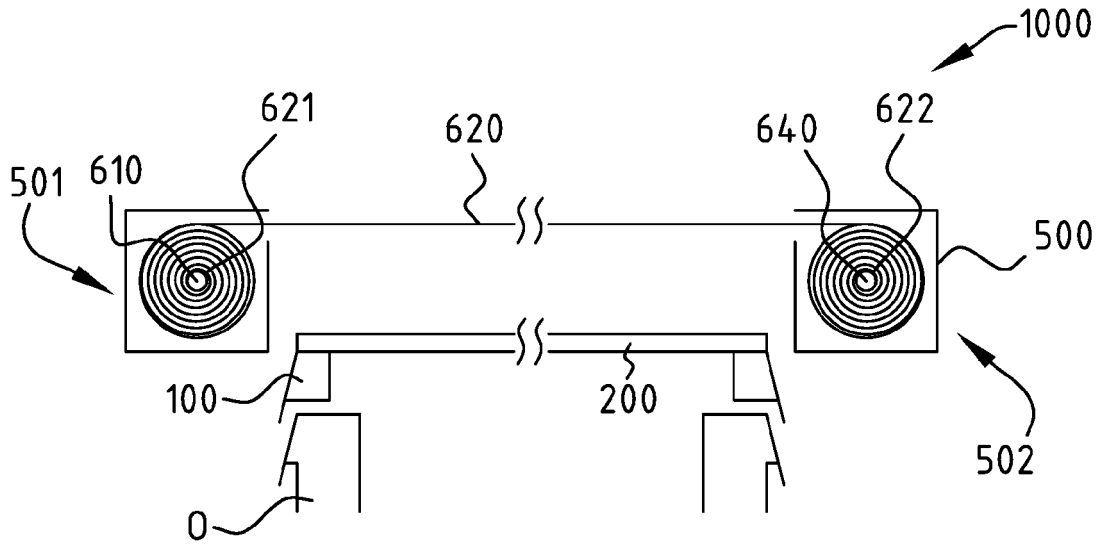


FIG. 9

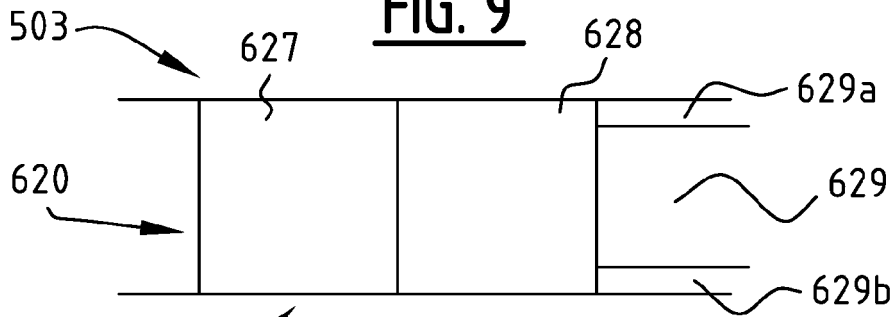


FIG. 9A

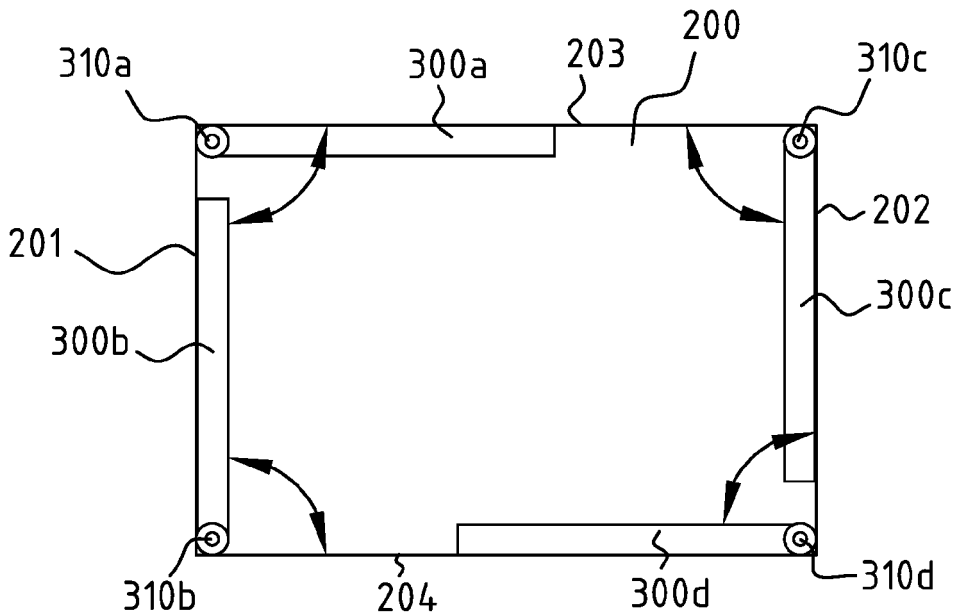
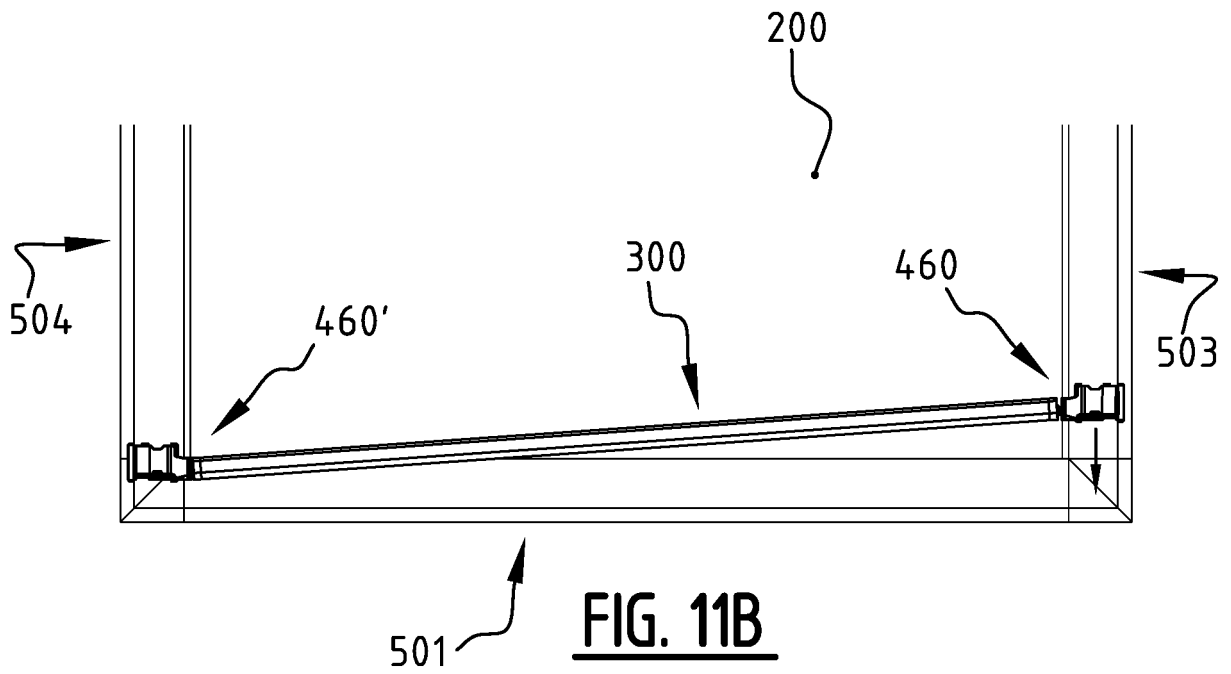
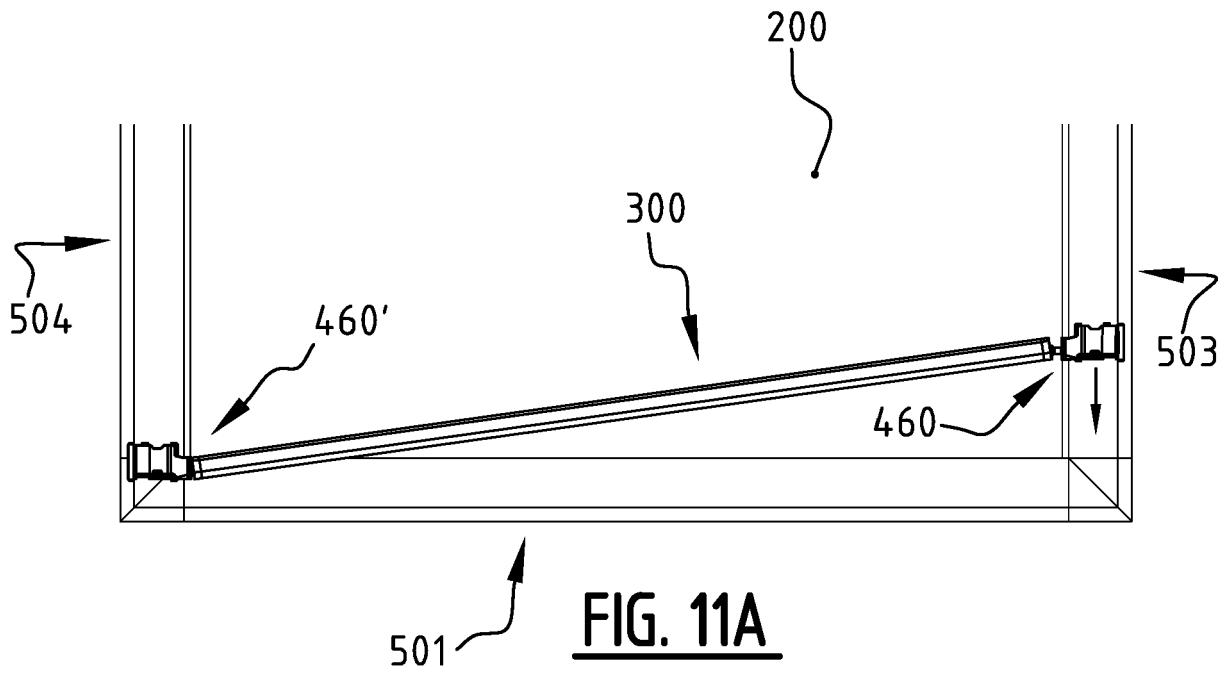


FIG. 10



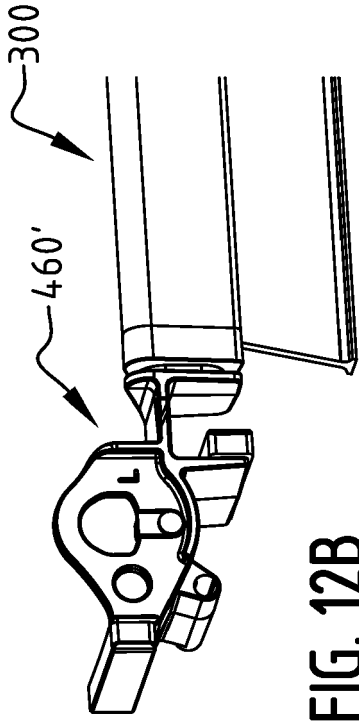


FIG. 12A

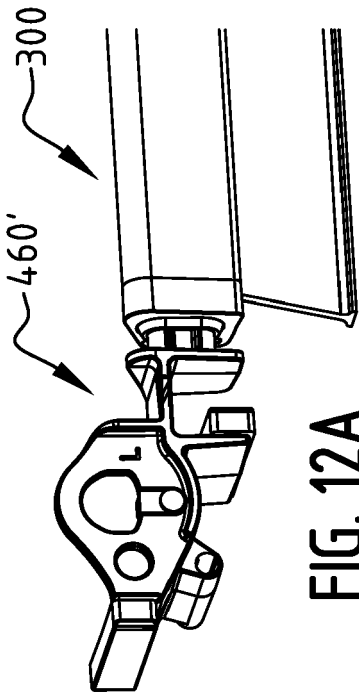


FIG. 12B

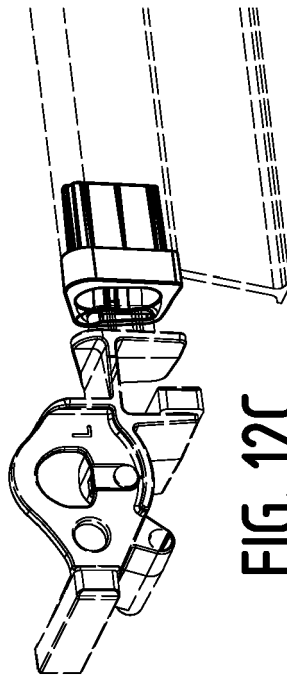


FIG. 12C

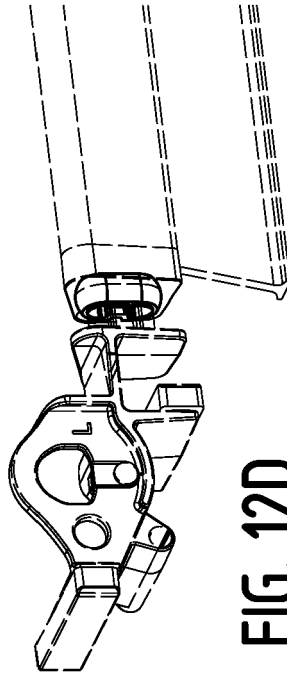


FIG. 12D

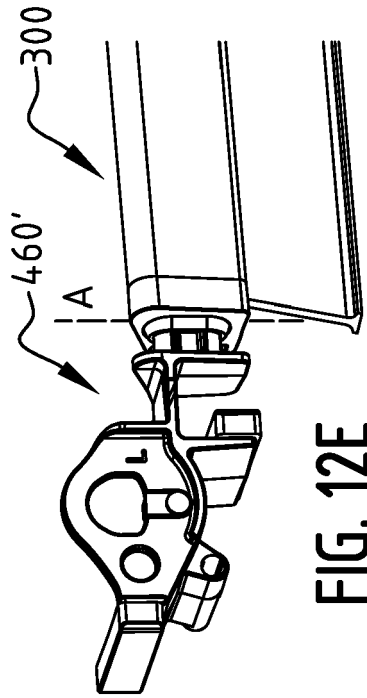


FIG. 12E

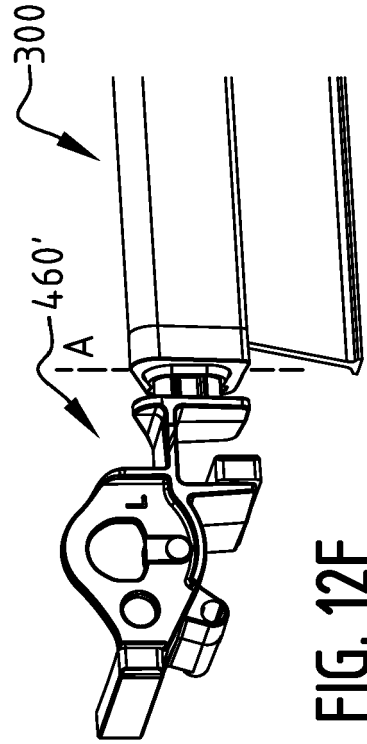
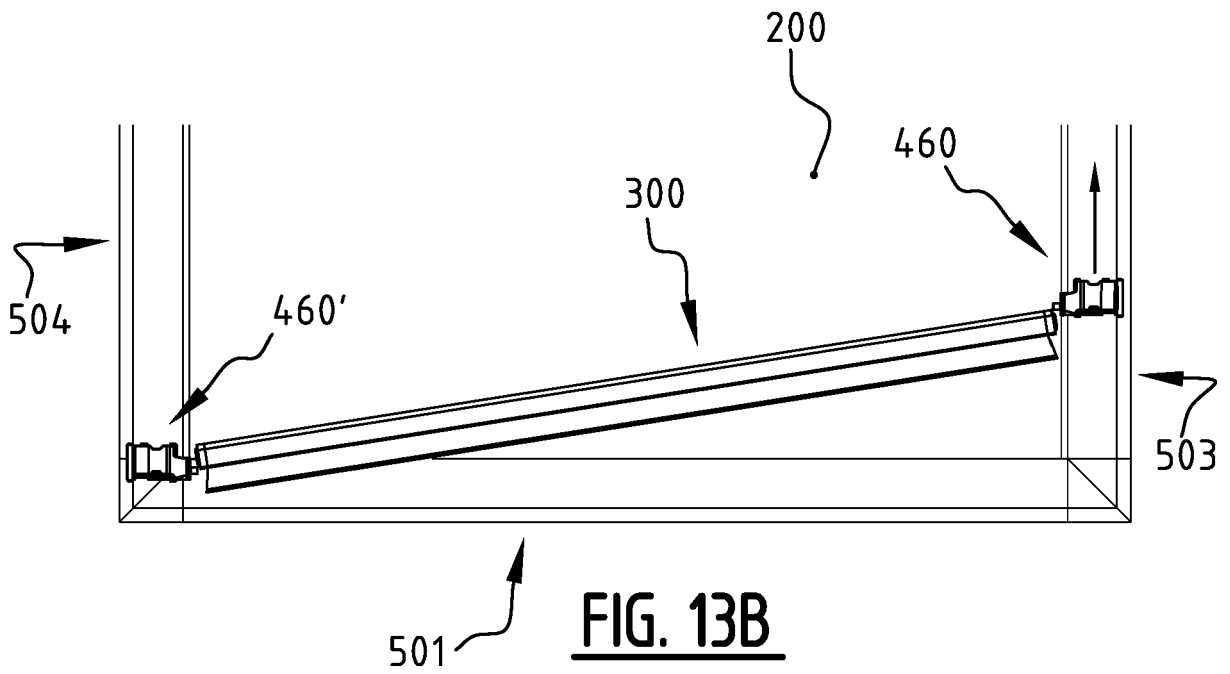
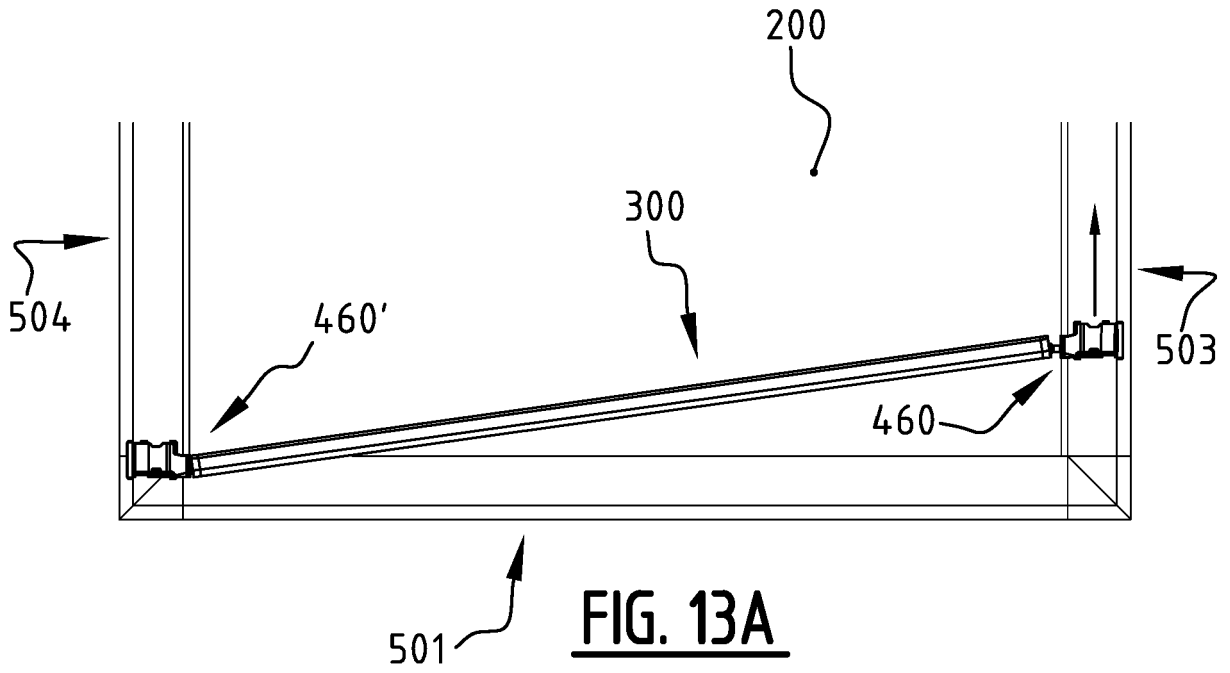


FIG. 12F





EUROPEAN SEARCH REPORT

Application Number
EP 18 18 0847

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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	JP H06 185174 A (MATSUSHITA ELECTRIC WORKS LTD) 5 July 1994 (1994-07-05) * the whole document * -----	1-15	INV. E04D13/03
X	JP H06 185175 A (MATSUSHITA ELECTRIC WORKS LTD) 5 July 1994 (1994-07-05) * the whole document * -----	1-15	
X	JP S61 64866 U ([JPN]) 2 May 1986 (1986-05-02) * the whole document * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E04D
Place of search		Date of completion of the search	Examiner
The Hague		20 November 2018	Lopes, Claudia
CATEGORY OF CITED DOCUMENTS			
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