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(54) **FITTING FOR A LIFTING-SLIDING ELEMENT**

(57) A sliding lifting fitting (12) comprises: a frame (14) and at least one leaf (16) which can move with respect to said frame (14) between a closed position and a sliding position in a sliding direction (18). The sliding lifting fitting (12) further comprises support means (20) for supporting said at least one leaf (16) while sliding on said frame (14); said support means (20) being designed to:
- allow a movement of the leaf (16) from the closed position to a locking position for the leaf (16) along a locking direction (22) substantially perpendicular to the sliding direction (18) when force (F) is applied in said locking direction;
- move the leaf (16) from the locking position to the closed position in said closing direction (22) after said force (F) has been applied.
The fitting (12) furthermore comprises locking means (24) for pushing the leaf (16) in the locking direction (22) from said closed position to said locking position.

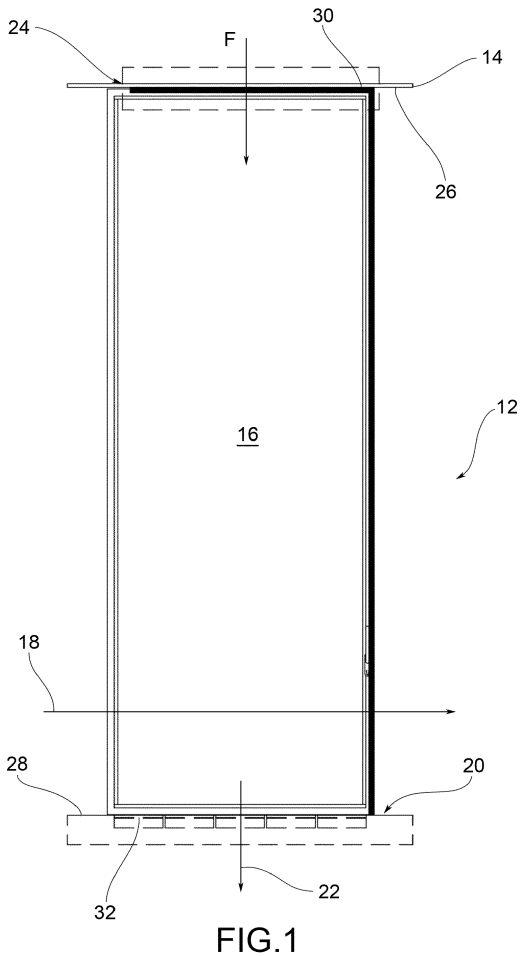

FIG.1

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Description

FIELD OF APPLICATION

[0001] The present invention refers to a sliding lifting fitting. In particular, the subject matter of the present invention is a mechanism for moving a leaf of a sliding lifting fitting for moving the leaf between a sliding position and a locking position.

PRIOR ART

[0002] As it is known, the sliding lifting fittings comprise a frame with one or more leafs sliding along opposing guides placed on the frame.

[0003] The sliding leaf can slide between an open position and a closed position. Generally, the sliding leaf can be locked when in the closed position. The locking takes place through a movement of the leaf from the sliding position to the locking position, which is generally lower than the sliding position. In this way, in addition to locking the door against opening, it is possible, for example, to improve insulation by providing gaskets adapted to work in the locking position.

[0004] In the systems of the prior art, the lifting and lowering mechanism comprises carriages positioned on the lower guide supporting the entire weight of the leaf. By acting on the handle, the carriages push the leaf upward and lift it from the floor level (locking position) to the sliding level (sliding position) .

[0005] While this type of mechanism is quite popular and widely used, it does have some drawbacks.

[0006] Indeed, the carriages are subjected to the weight of the leaf during the opening phase. The force required to actuate the handle to lift the carriages is therefore significant since it is needed to oppose the force from the weight of the leaf.

[0007] There are also known sliding lifting fittings in which the sliding leaf moves supported by magnetic guides.

[0008] In this type of fitting, the lower edge of the sliding leaf and the corresponding guide on the frame comprise magnetic elements positioned in such a way that there is a force of repulsion between them.

[0009] To allow the leaf to move between the sliding position and the locking position, there is a system to move the magnet on the guide. The magnet drive system, either by a rotational or linear movement, moves the magnet in such a way that it cannot interact with the corresponding magnet on the edge of the leaf.

[0010] In this way, the leaf is lifted to the sliding position when there is interaction between the two magnets, whereas it is lowered into the locking position when there is no interaction between the two magnets.

[0011] This system as well is not free of drawbacks. First, magnets need to be placed on the edge of the leaf and on the frame, in which one of the magnets must be moved between an interaction position and a non-interaction position with the corresponding magnet.

[0012] In addition, moving the magnet on the frame requires electronic devices connected to an actuator, which complicates the fitting structure from a construction standpoint.

[0013] Furthermore, if there is a system malfunction, the servicing and possible replacement of parts is not easy because the electronic and mechanical parts required for drive purposes are contained inside the guide used by the leaf.

PRESENTATION OF THE INVENTION

[0014] The purpose of this invention is to at least partially overcome the drawbacks of the prior art.

[0015] Consequently, a first task of the present invention is to provide a sliding lifting fitting wherein, during the leaf locking and unlocking phases, less effort is required by the user compared to sliding lifting fittings of the prior art.

[0016] One objective of this invention is to provide a sliding lifting fitting wherein the movements of the leaf to and from the locking position are lightened by the force of the leaf's weight. In particular, one objective of this invention is to make the actuation by the user independent of the force of the weight exerted by the leaf.

[0017] In addition, another objective of this invention is to provide a sliding lifting fitting wherein the sliding of the leaf is fluid between the closed position and the open position.

[0018] Yet another objective of this invention is to make the guides on the fitting frame less complex.

[0019] The purpose and objectives are achieved by a sliding lifting fitting according to claim 1.

DESCRIPTION OF THE DRAWINGS

[0020] Further features and benefits of the present invention will be understood more clearly from the following description of its preferred and non-limiting embodiments, in which:

- figure 1 shows a schematic view of a sliding lifting fitting according to an embodiment of this invention;
- figures 2 and 3 show schematic views, one in a front view and the other in a perspective view, of a possible embodiment of some parts of a sliding lifting fitting according to an embodiment of this invention, in a first usage configuration;
- figures 4 and 5 show schematic views, one in a front view and the other in a perspective view, of the parts in figures 2 and 3 in a second usage configuration;
- figure 6 shows a schematic view of a portion of a sliding lifting fitting in a cross-sectional view according to an embodiment of this invention;
- figure 7 shows a schematic view of a portion of a sliding lifting fitting according to an embodiment of this invention;

- figure 8 shows a schematic front-view of the detail of the parts in figures 2 and 3;
- figure 9 shows a schematic view of a portion of a sliding lifting fitting according to an alternative embodiment of this invention, in a first usage configuration;
- figure 10 shows a schematic view of a portion of a sliding lifting fitting according to the embodiment shown in figure 9, in a second usage configuration; and
- figure 11 shows a schematic a partial cross-sectional view of a portion of a sliding lifting fitting according to the present invention.

[0021] The elements or parts of elements that are in common between the embodiments described below will be indicated with the same reference numbers.

DETAILED DESCRIPTION

[0022] Figure 1 shows a sliding lifting fitting according to an embodiment of this invention, which is indicated as item 12.

[0023] The fitting 12 comprises a frame 14 and at least one leaf 16, which can move with respect to frame 14 between a sliding position and a closed position in a sliding direction 18.

[0024] In accordance with one possible embodiment, not shown in the enclosed figures, the fitting can also comprise at least one fixed leaf.

[0025] In addition, the fitting 12 can also comprise more than one leaf 16, movable with respect to the frame, such as fitting 12 which can be made with two movable leafs 16.

[0026] The fitting 12 comprises support means 20 for supporting at least one leaf 16 while sliding on frame 14. In particular, support means 20 are capable of:

[0027] - allowing a movement of leaf 16 from the closed position to a locking position for leaf 16 along a locking direction 22 substantially perpendicular to sliding direction 18 when a force F is applied in said locking direction 22; and

[0028] - moving leaf 16 in said locking direction 22 from the locking position to the closed position after said force F has been applied.

[0029] The fitting 12 further comprises locking means 24 for pushing leaf 16 in locking direction 22 from the closed position to the locking position.

[0030] In this text, the closed position is understood as the position in which leaf 16 is closed but can slide.

[0031] According to one possible embodiment, frame 14 comprises an upper guide 26 for an upper profile 30 of leaf 16 and/or a lower guide 28 for a lower profile 32 of leaf 16. Guides 26 and 28 are adapted to allow leaf 16 to slide in sliding direction 18.

[0032] In this text, the terms upper and lower are understood as the positions of two opposing edges of the leaf or frame with respect to the plane on which the fitting sits.

[0033] In the embodiment shown in figures 2, 4, and 6, frame 14 comprises an upper guide 26 for an upper profile 30.

[0034] According to one possible alternative embodiment, not shown in the enclosed figures, support means 20 may comprise two permanent magnets in which: a first permanent magnet is placed at lower profile 32 of leaf 16 and a second permanent magnet is placed at lower guide 28 of frame 14 so that their poles align and repel each other. In this case leaf 16 stays lifted by the guide on the frame thanks to the magnetic force of repulsion.

[0035] Alternatively, other types of magnetic levitation supports may be used for this purpose, such as active magnetic levitation, dynamic magnetic levitation, or passive magnetic levitation based on permanent magnets using attraction or repulsion.

[0036] In yet another alternative embodiment, not shown in the enclosed figures, support means 20 can comprise at least one support carriage designed to slide on a corresponding lower guide and to resiliently support the leaf. In this regard, the carriage can be installed with springs that allow for movement in the locking direction. The springs can be: helical springs, air springs, or other resilient elements.

[0037] In alternative embodiments, support means 20 can be of the pneumatically actuated type.

[0038] In the embodiment shown in figures 2, 4, and 6, frame 14 comprises an upper guide 26 for an upper profile 30.

[0039] In reference to figure 6, upper guide 26 can have an upside-down-U cross-section designed to contain at least partially upper profile 30 of said leaf. According to a possible embodiment, the upper profile of the leaf can comprise an element 31, for example a box structure, designed to contain support means 20 at least partially. Between element 31 in the form of, for example, a box and the guide with an upside-down-U cross-section gaskets 33 and 35 may be placed.

[0040] According to alternative embodiments, box element 31 can have shapes other than that shown, for example it may be an element provided with a certain thickness in which a recess may be placed to accommodate the elements indicated above.

[0041] According to a possible embodiment, element 31 can be made, for example, of wood, PVC, aluminum, steel, etc.

[0042] According to a possible embodiment, upper profile 30 of leaf 16 can be installed with at least one carriage 48, adapted to be contained at least partially in said lower guide 26 shaped like an upside-down-U.

[0043] According to a possible embodiment, locking means 24 can be arranged on upper profile 30 or on the lower profile of said leaf 16. In the embodiments shown in the enclosed figures, locking means 24 are installed at upper profile 30.

[0044] In particular, locking means 24 can be adapted

to increase the distance between upper guide 26 placed on frame 14 and corresponding upper profile 30 of leaf 16.

[0045] According to a possible embodiment of this invention, locking means 24 comprise at least one carriage 48 designed to slide on upper guide 26 of frame 14. Carriage 48 is connected to a control bracket 50 by means of arm 52. Control bracket 50 can move in a direction parallel to upper profile 30 of leaf 16.

[0046] Locking means 24 further comprise a fixed bracket 54 on which is placed a wedge element 56 designed to interact with carriage 48 to vary the distance of carriage 48 from upper profile 30 of leaf 16.

[0047] According to a possible embodiment, carriage 48 can comprise a lifting wheel 62, designed to roll on wedge 56 as a result of a movement of control bracket 50 with respect to fixed bracket 54.

[0048] According to a possible embodiment of this invention, carriage 48 can comprise two guide wheels 58 and 60 designed to roll with respect to upper guide 26 of frame 14. Guide wheels 58, 60 can be aligned in the direction of upper profile 30 of leaf 16.

[0049] According to a possible embodiment, guide wheels 58, 60 can have a shape so as to conform to a corresponding rail 582 on upper guide 26. For example, as shown in the embodiment of figure 11, the wheel can have a curved concave shape so as to conform to a convex rail designed to be received at least partially by the curved convex shape of the wheel.

[0050] Advantageously, lifting wheel 62 can be aligned with guide wheels 58, 60 and placed between them.

[0051] According to a possible embodiment of this invention, wedge element 56 can comprise a sloped surface 64 between:

- a first height at which carriage 48 is close to upper profile 30 of leaf 16, thus defining the sliding position for leaf 16; and
- a second height at which carriage 48 is far from upper profile 30 of leaf 16, thus defining the locking position for leaf 16.

[0052] In reference to figure 8, sloped surface 64 of wedge 56 can comprise two sections:

- a first section 66 having an angle α with respect to upper profile 30 of leaf 16; and
- a second section 68 having an angle $\beta < \alpha$ with respect to upper profile 30 of leaf 16.

[0053] According to a possible embodiment, slope α can be between 35° and 55°, advantageously in the vicinity of 45°. According to a possible embodiment, slope β can be between 10° and 20°, advantageously in the vicinity of 15.5°. First section 66 defines the travel of carriage 48 from a position of rest to a position of contact with upper guide 26 of frame 14.

[0054] According to a possible embodiment, control bracket 50 can be actuated by means of a hardware mechanisms 70 of fitting 12, which can be actuated by a casement bolt.

[0055] As can be seen in the embodiment shown in figures 9 and 10, carriage 48 can be moved by means of an articulated mechanism 482.

[0056] In this embodiment wedge element 56 is secured at upper profile 30 of leaf 16. Carriage 48 is connected at one end to an arm of mechanism 484 which is in turn connected to crank 486. Crank 486 is connected by means of a hinge to actuation element 488 adapted to move along a lateral edge of the leaf.

[0057] The operation of the articulated mechanism makes it possible, through a movement of actuation element 488, to move carriage 48 along the upper profile of the leaf in a similar way as seen earlier.

[0058] In particular, according to a possible embodiment, actuation element 488 is moved downward, that is, away from wedge 56, crank 486 follows the movement of actuation element 488 and aligns with it, moving carriage 48 along the upper profile of the leaf and therefore the lifting wheel along wedge element 56.

[0059] According to a possible embodiment of the present invention, locking means 24 can comprise a plurality of carriages 48 and corresponding wedge elements 56, aligned and distributed along said upper profile 30 of leaf 16.

[0060] According to alternative embodiments, the locking means can be motorized and actuated by means of a switch.

[0061] In alternative embodiments, locking means 24 can be placed at lower profile 32 of leaf 16 and be designed to interact with lower guide 26 of frame 14. In this embodiment, support means 20 can be placed at upper guide 26 of frame 14.

[0062] The advantages that are possible with the sliding lifting fitting according to the present invention are now obvious.

[0063] The sliding lifting fitting reduces the effort required to actuate the system compared to systems of the prior art.

[0064] Its operation consists in moving the leaf from an initial closed position to a final locking position, at a lower level than the initial level, thus ensuring proper operation of the gaskets.

[0065] Advantageously, the movement for locking takes place by means of suitable devices secured to the leaf, which, by acting with an opposing vertical force against the frame, exert a downward vertical thrust, moving the leaf in a vertical direction with respect to the state of equilibrium corresponding to a lifted leaf, allowing the desired closed position of the leaf to be reached.

[0066] In a preferred embodiment, this mechanism is activated by means of a casement bolt that converts the rotary motion of the handle into a linear motion of the strip hardware. The combination of the lengthwise hardware, angle transmissions, and extensions placed in the slot of the leaf profile transfers the motion of the casement bolt to the devices exerting the lowering force on the leaf.

[0067] According to a possible embodiment of this invention, hardware mechanism 70 can also serve the function of moving a set of perimeter pawls secured to the hardware which, by means of their engaging with special gripping indentations made in the frame, lock the leaf.

[0068] According to other embodiments, the devices exerting the downward force can be activated by controlled mechatronic systems, pneumatic pistons, or other manually- or automatically-controlled actuation systems.

[0069] The movement of carriage 48 raises the level of the carriage which, going against the upper frame by means of its two end wheels, generates a thrust that causes the desired vertical movement of the leaf.

[0070] In a preferred embodiment, the sloped surface on which the center wheel of the carriage runs is made with a dual slope: the first section with a marked slope so as to complete the distance between the rest position and the position of the carriage in contact with the upper frame, with a short travel of the handle; the second section with a milder slope so that the increase in height, and the corresponding thrust of the upper frame, is gradual and does not excessively stress the mechanisms of the hardware, so as to minimize the force required to draw the carriage.

[0071] In addition, with the system of this invention a reduction of the force required to actuate the locking movement is achieved.

[0072] Actuation of the handle results in a lowering/locking of the leaf, contrary to what happens in a sliding lifting fitting of the prior art. It follows that, depending on the mechanical feature of the resilient support, the force required to move the leaf vertically by the required amount of travel is less than the force of the weight of the entire leaf.

[0073] In the case of a sliding lifting fitting with a support system using magnetic levitation, the force needed on the handle to move the door from the closed position to the locking position is substantially less compared to systems of the prior art thanks to the particular resilient curve of the system which reduces the force for the required section of travel.

[0074] This makes it possible to markedly improve the operator's perception and comfort when moving heavy leafs.

[0075] With respect to the embodiments described above, a person skilled in the art may, for the purpose of meeting specific requirements, modify or substitute the described items with equivalent items, without exceeding the scope of the enclosed claims.

Claims

1. Sliding lifting fitting (12) comprising
a frame (14) and at least one leaf (16) movable with respect to said frame (14) between a closed position and a sliding position, along a sliding direction (18); **characterized in that** it comprises:
support means (20) adapted to support said at least one leaf (16) while sliding on said frame (14); said support means (20) being adapted to:

    - allow a movement of the leaf (16) from the closed position to a locking position for the leaf (16) along a locking direction (22) substantially perpendicular to the sliding direction (18), during the application of a force (F) along said locking direction;
    - move the leaf (16) from the locking position to the closed position in said locking direction (22) after said force (F) has been applied;

said fitting (12) further comprising:
locking means (24) adapted to push the leaf (16) along the locking direction (22) from said closed position to said locking position.

2. Sliding lifting fitting (12) according to claim 1, **characterized in that** said frame (14) comprises an upper guide (26) for an upper profile (30) of said leaf (16) and/or a lower guide (28) for a lower profile (32) of said leaf (16), said guides being adapetd to allow said leaf (16) to slide in the sliding direction (18).

3. Sliding lifting fitting (12) according to the preceding claim, **characterized in that** said upper guide (26) is in the shape of an upside-down-U and can slidably contain at least one carriage (48) arranged on the upper profile (30) of said leaf (16).

4. Sliding lifting fitting (12) according to any one of the preceding claims, **characterized in that** said locking means (24) are arranged on the upper profile (30) and/or on the lower profile of said leaf (16).

5. Sliding lifting fitting (12) according to the preceding claim, **characterized in that** said locking means (24) are adapted to increase the distance between the upper guide (26) arranged on the frame (14) and the corresponding upper profile (30) of said leaf (16).

6. Sliding lifting fitting (12) according to any one of the preceding claims, **characterized in that** said closure means (24) comprise at least one carriage (48) adapted to slide along said upper guide (26) of said frame (14); said carriage (48) being connected to a control bracket (50) by means of an arm (52), said control bracket (50) being movable in a direction parallel to said upper profile (30) of said leaf (16); said locking means (24) further comprising a fixed bracket (54) on which is placed a wedge (56) designed to interact with said carriage (48) to vary the distance of said carriage (48) from the upper profile (30) of said leaf (16) .

7. Sliding lifting fitting (12) according to the preceding claim, **characterized in that** said carriage (48) comprises a lifting wheel (62) designed to roll on said wedge (56) as a result of a movement of said control bracket (50) with respect to said fixed bracket (54).

8. Sliding lifting fitting (12) according to any one of claims 1-5, **characterized in that** it comprises an articulated mechanism (482) arranged with a mechanism rod (484) connected to one end of the carriage (48), which is in turn connected to a crank (486), said crank (486) being connected by a hinge to an actuation element (488) which can move along the lateral edge of the leaf.

9. Sliding lifting fitting (12) according to the preceding claim, **characterized in that** the movement of said actuation element (488) along the lateral edge of the leaf away from the wedge element (56) causes movement of the crank (486), which is substantially aligned with the wedge element (56), moving the carriage (48) along the upper profile of the leaf in such a way that a lifting wheel (62) thereof can roll onto said wedge element (56) .

10. Sliding lifting fitting (12) according to any one of claims 6-9, **characterized in that** said at least one carriage (48) comprises two guide wheels (58, 60) adapted to roll in relation to said upper guide (26) of said frame (14); said guide wheels (58, 60) being aligned in the direction of the upper profile (30) of said leaf (16).

11. Sliding lifting fitting (12) according to the preceding claim, **characterized in that** the guide wheels (58, 60) have a shape designed to conform to a corresponding rail (582) provided on the upper guide (26).

12. Sliding lifting fitting (12) according to any one of claims 6-11, **characterized in that** said wedge element (56) comprises a sloped surface (64) between:

- a first height in which said carriage (48) is close to the upper profile (30) of said leaf (16), thus defining the sliding position for said leaf (16); and
- a second height in which said carriage (48) is far from said upper profile (30) of said leaf (16), thus defining the locking position for said leaf (16).

13. Sliding lifting fitting (12) according to the preceding claim, **characterized in that** said sloped surface (64) of said wedge element (56) comprises two sections:

- a first section (66) having an angle α with respect to the upper profile (30) of the leaf (16); and
- a second section (68) having an angle $\beta < \alpha$ with respect to the upper profile (30) of the leaf (16);

wherein the first section (66) defines the travel of the carriage from a position of rest to a position of contact with said upper guide (26) of said frame (14).

14. Sliding lifting fitting (12) according to any one of claims 6-13, **characterized in that** said control bracket (50) or said articulated mechanism (482) can be actuated by means of hardware mechanisms (70) of the fitting (12), which can be actuated by a casement bolt.

15. Sliding lifting fitting (12) according to any one of the preceding claims, **characterized in that** said locking means (24) comprise a plurality of carriages (48) and corresponding wedges (56) aligned and distributed along said upper profile (30) of said leaf (16).

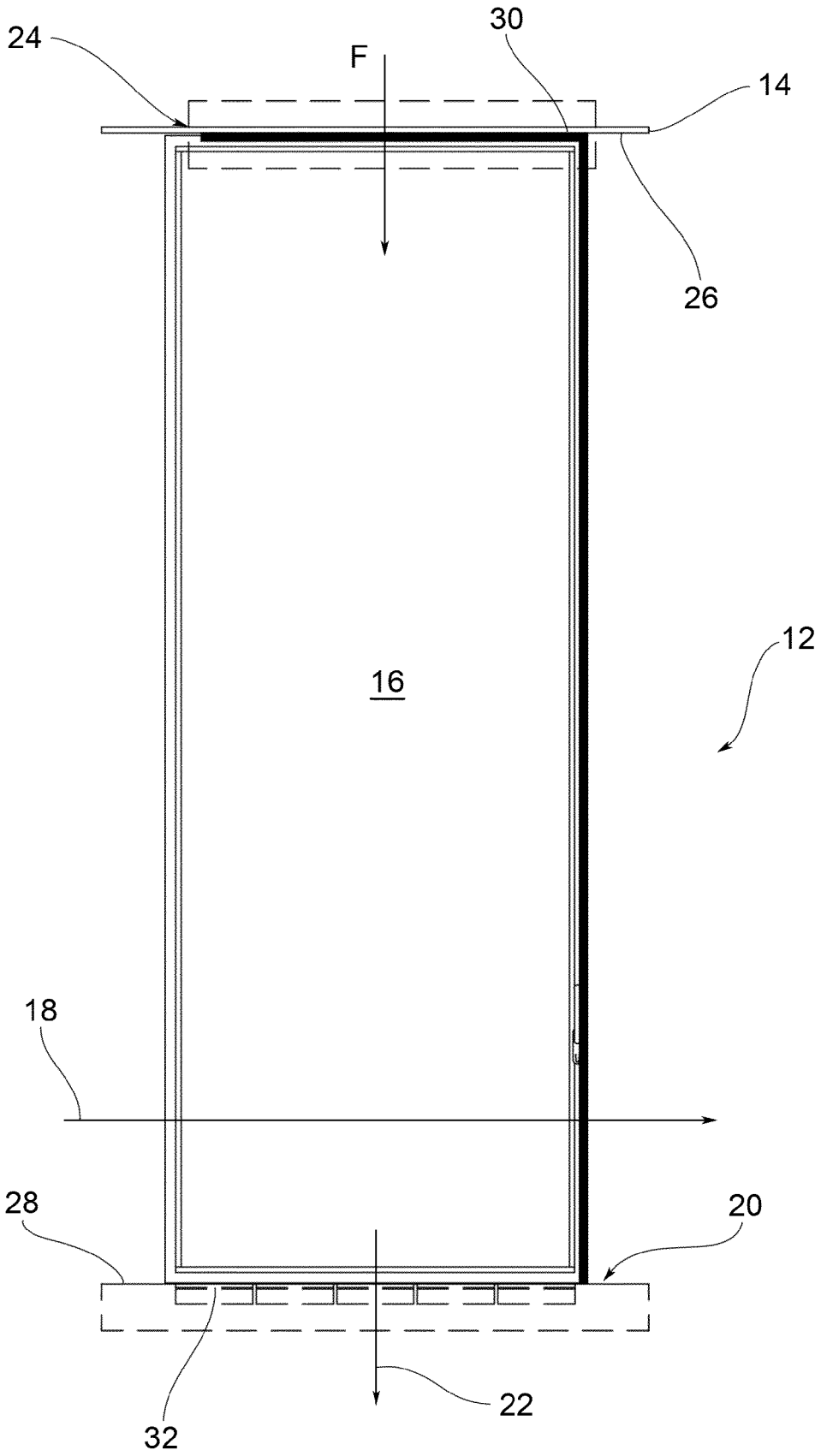

FIG.1

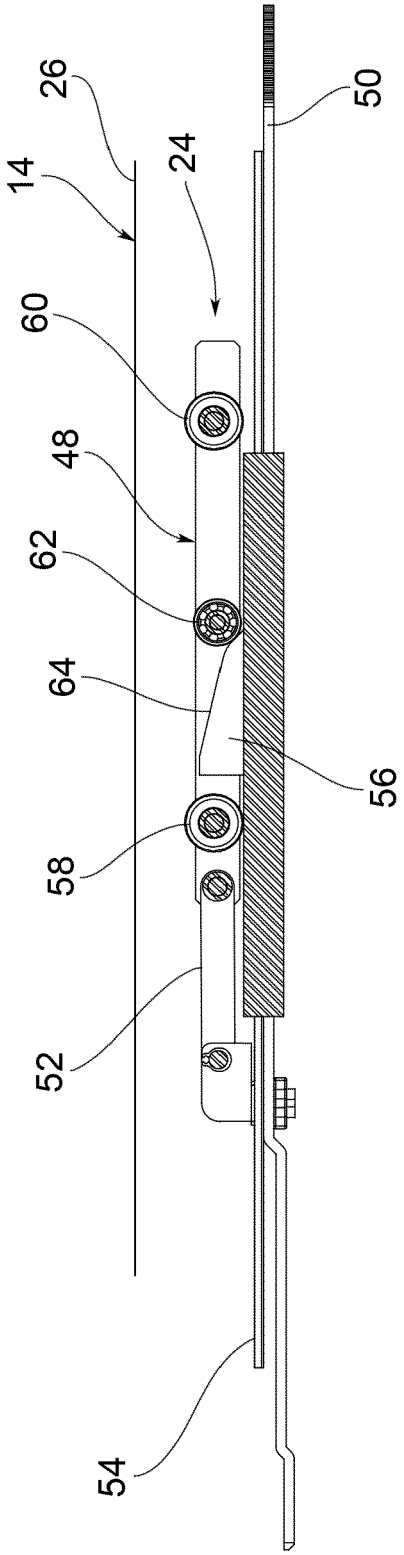

FIG.2

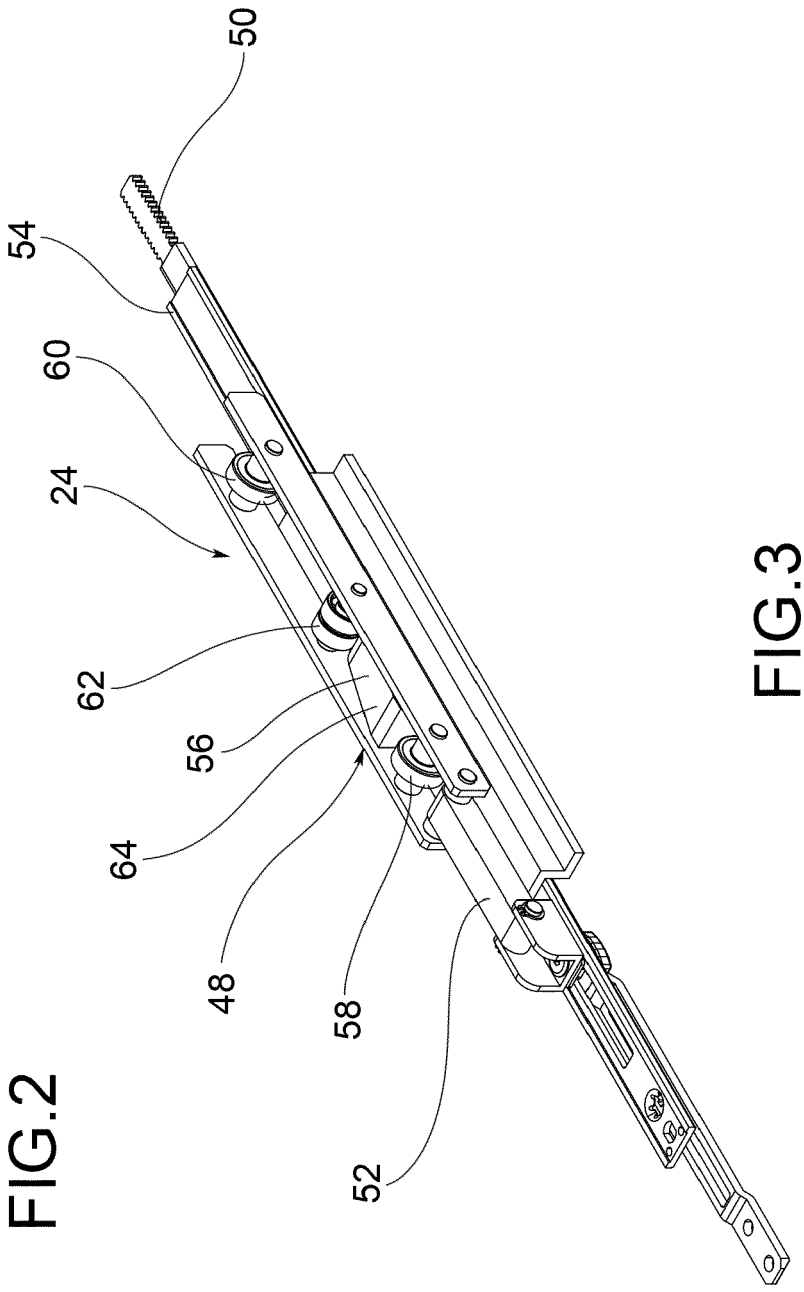

FIG.3

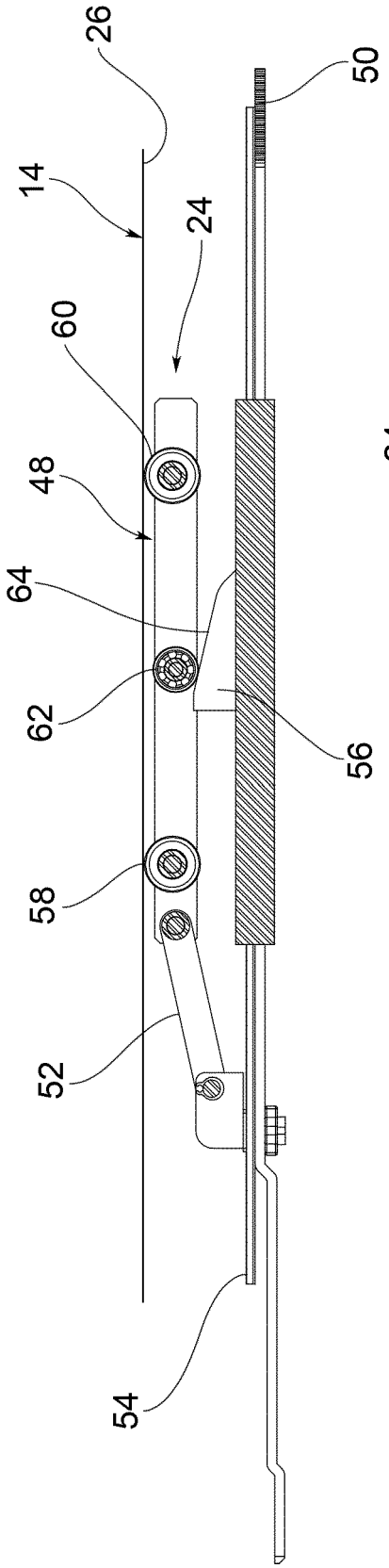

FIG.4

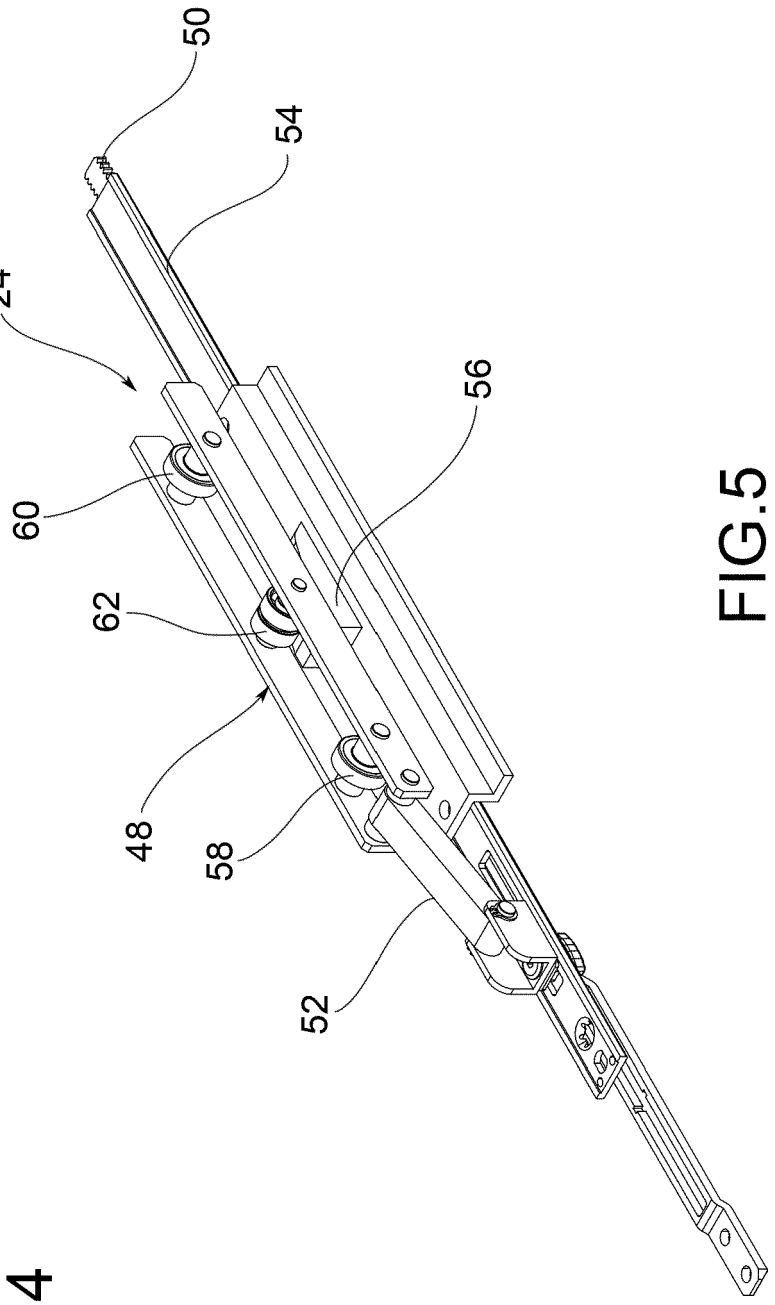

FIG.5

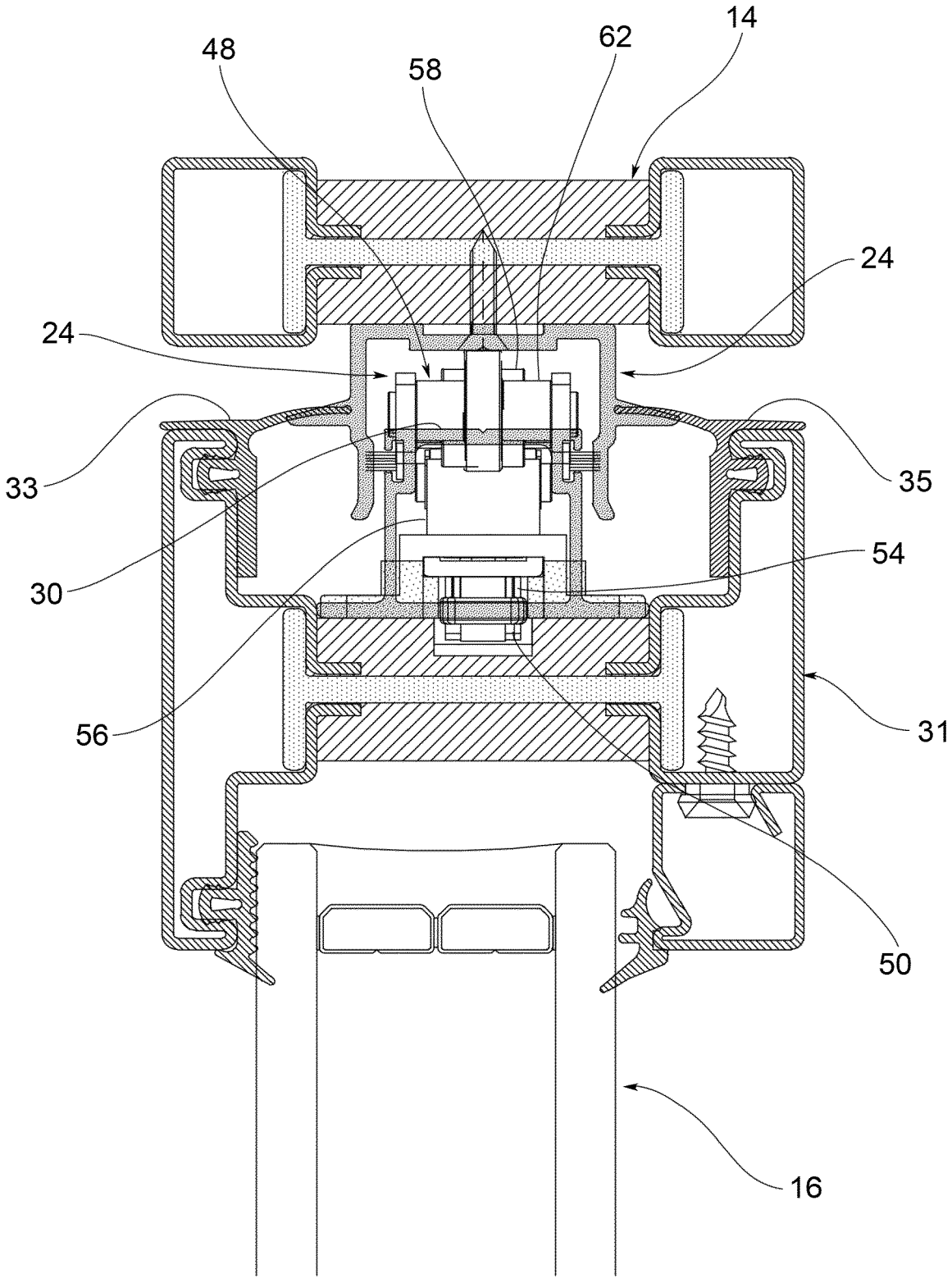

FIG.6

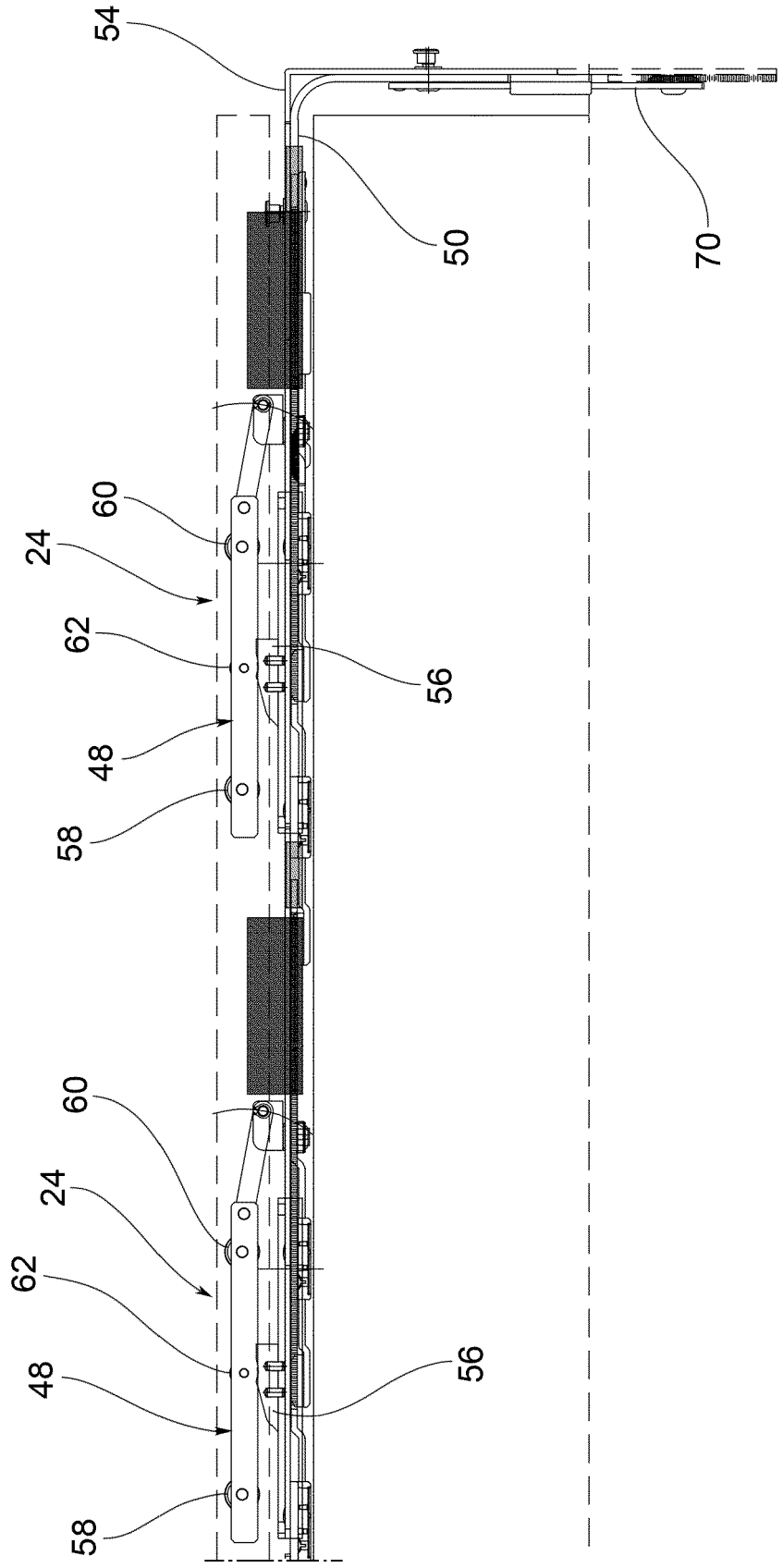

FIG.7

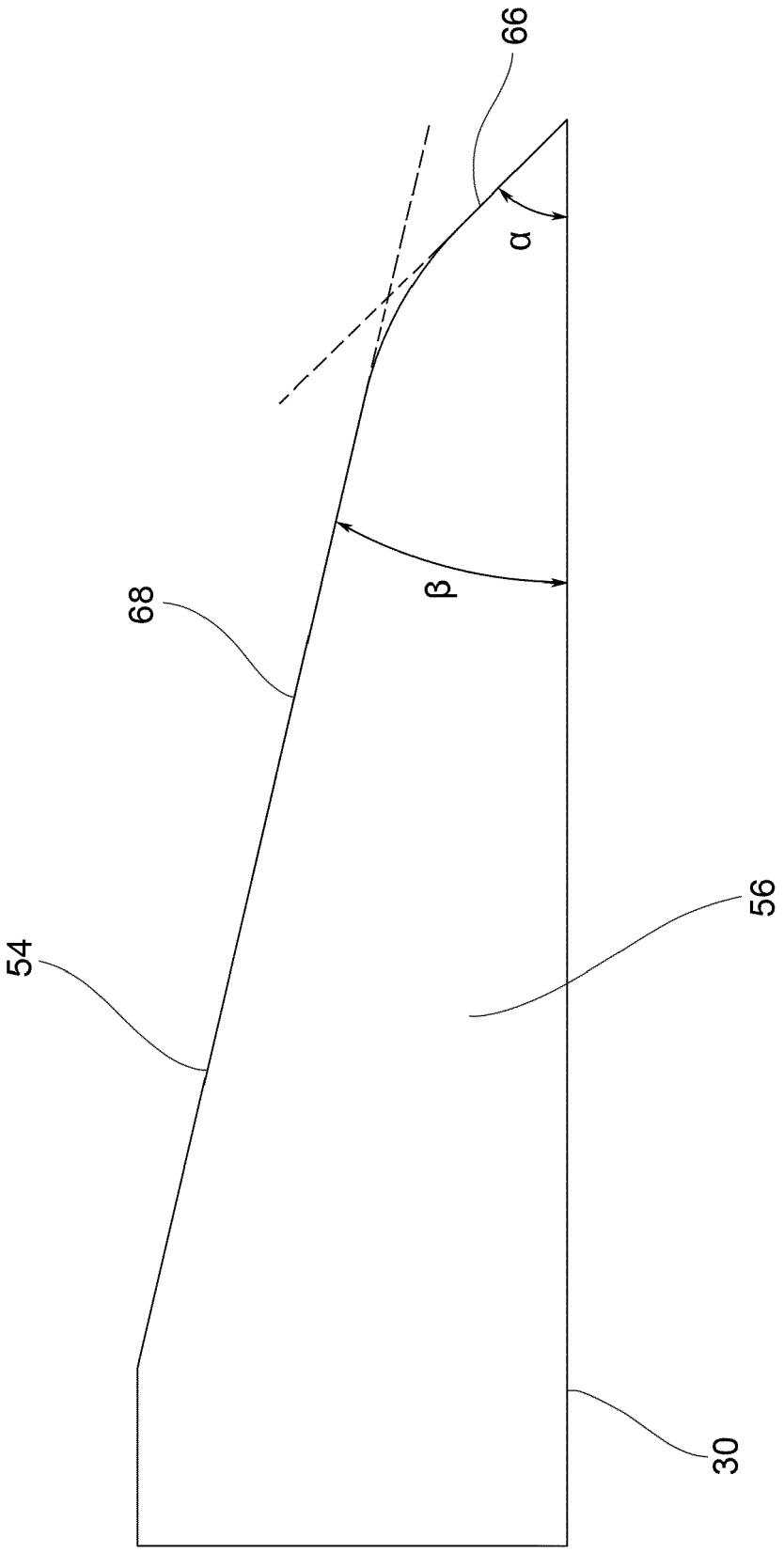

FIG.8

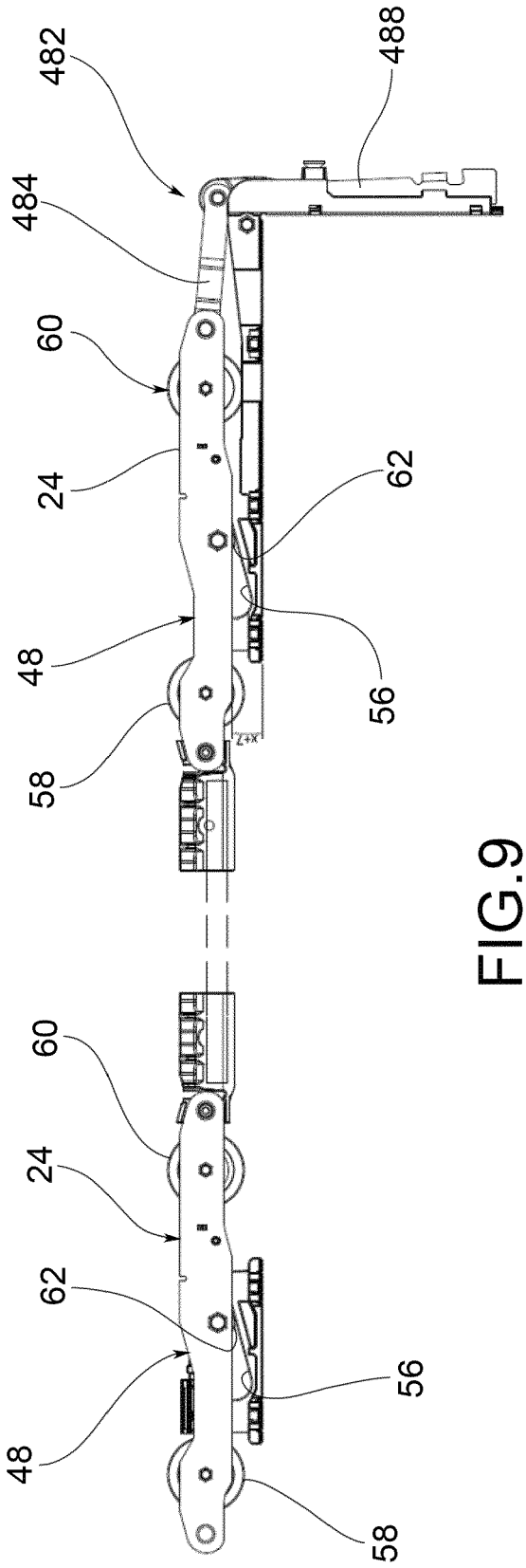
482
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FIG.9

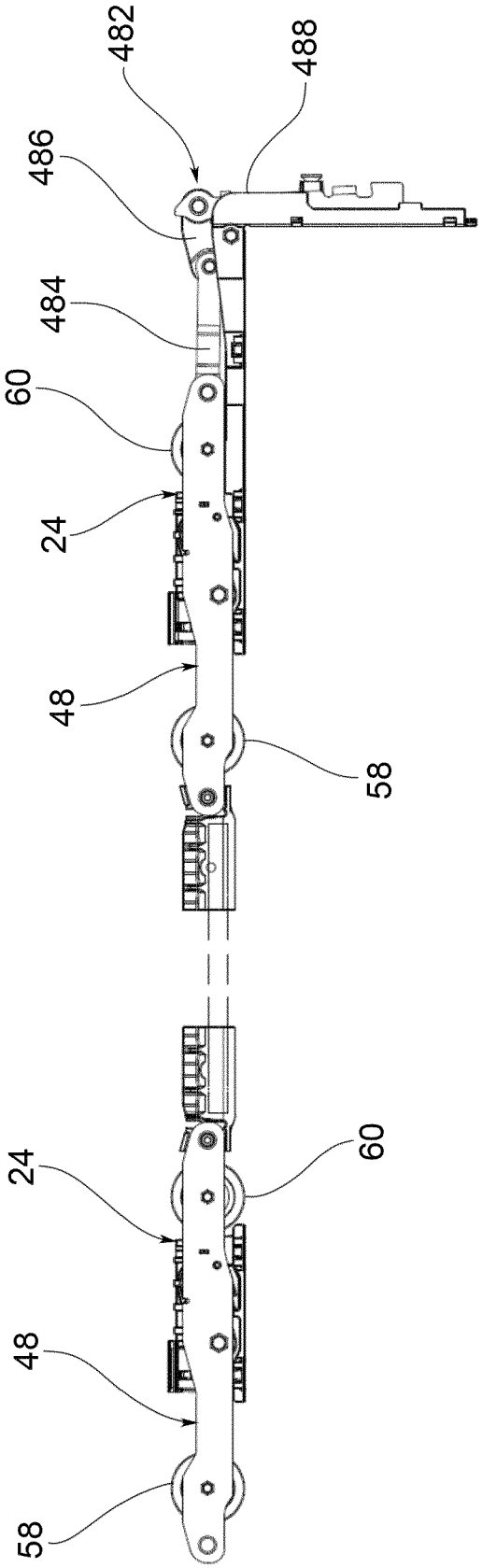
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FIG.10

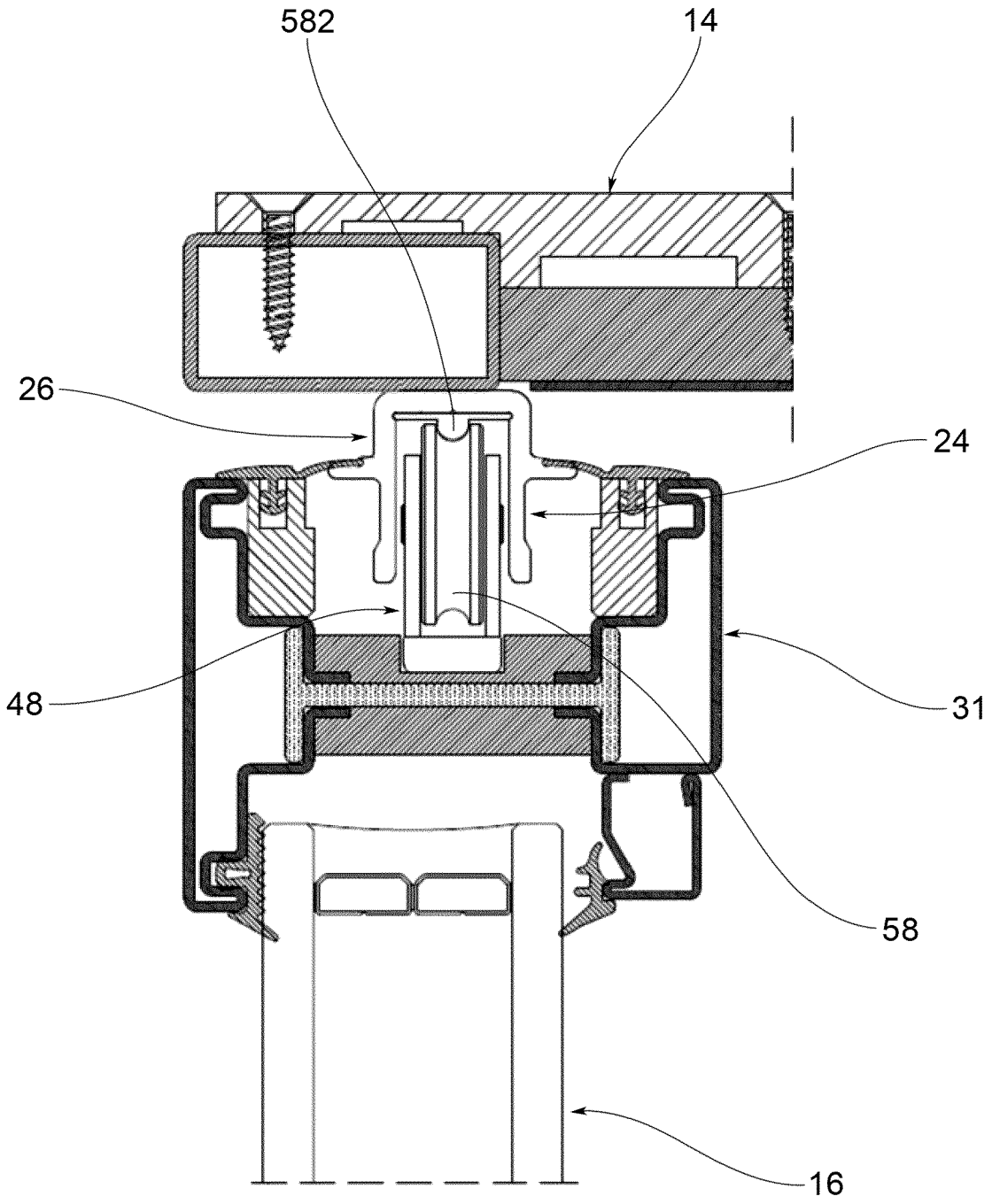

FIG.11

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 2577

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 A	EP 1 312 743 A2 (GRETSCH-UNITAS GMBH [DE]) 21 May 2003 (2003-05-21) * paragraphs [0007] - [0018] * * figures 1-5 * -----	1-9, 11-15 10	INV. E05D15/56
X A	EP 2 310 600 A1 (GSG INT SPA [IT]) 20 April 2011 (2011-04-20) * paragraphs [0015] - [0031] * * paragraphs [0043] - [0046] * * figures * -----	1-9, 11-15 10	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 July 2020	Mund, André

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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