

(19)



(11)

**EP 2 034 117 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**27.07.2016 Bulletin 2016/30**

(51) Int Cl.:  
**E05F 15/60** <sup>(2015.01)</sup> **E05F 15/605** <sup>(2015.01)</sup>  
**E05F 5/00** <sup>(2006.01)</sup>

(21) Application number: **07815054.7**

(86) International application number:  
**PCT/JP2007/061517**

(22) Date of filing: **07.06.2007**

(87) International publication number:  
**WO 2007/142284 (13.12.2007 Gazette 2007/50)**

(54) **DOOR DEVICE**

**TÜRVORRICHTUNG**

**SYSTÈME DE PORTE**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE  
SI SK TR**

(30) Priority: **09.06.2006 JP 2006161037**

(43) Date of publication of application:  
**11.03.2009 Bulletin 2009/11**

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**EP 2 034 117 B1**

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## Description

### Technical Field

**[0001]** The present invention relates to an opening/closing door unit such as a folding door unit and a balance door unit designed so as to perform opening/closing operation by turning and movement of a door body in a width direction of an opening part, and particularly relates to a preferable opening/closing door unit as a double-opening type folding door unit.

### Background Art

**[0002]** Conventionally, as the kind of invention, patent document 1 discloses a double opening and folding type revolving door including a folding door part (folding type revolving door 3) formed by connecting one door body (master door 5) to the other door body (slave door 4) so as to be turned in both directions; a support member (rotary axis 27) for turnably supporting a door-tail side of the folding door part; and a movement support part (hanger 37) for turnably hanging the door body (master door 5) at a door-end side and moving it in a width direction of an opening part. In the conventional technique, when the door bodies (the slave door 4 and the master door 5) are manually closed, the closing force is assisted by an energizing force of a spring of a returning means (6).

**[0003]** Meanwhile, as other conventional technique, according to the invention of patent document 2, a panel moving unit (22) is composed of two pulleys (28); a belt (29) hung over these pulleys; an arm (30) for connecting the belt (29) and a panel (18); and a drive unit (not shown) for driving the pulleys (28), and by the panel moving unit (22), the panel (18) is slid in an opening/closing directions. When a panel drive unit (22) of the patent document 2 is provided in the invention disclosed in the patent document 1, closing operation of the door bodies (the slave door 4 and the master door 5) is possible with lighter force, and the closing operation is possible by switching operation, and if reverse operation of the panel drive unit (22) is performed, similar operation is possible in the opening operation.

**[0004]** However, as described above, when the panel drive unit (22) described in the patent document 2 is provided in the invention disclosed in the patent document 1, relatively larger space is required for disposing the panel drive unit (22) in an upper side of the door bodies (the slave door 4 and the master door 5). In addition, according to a structure in which the panel drive unit (22) is provided for the folding type revolving door of the patent document 1, for example, when the door bodies (the slave door 4 and the master door 5) must be manually opened/closed due to electrical power failure, the manual opening/closing force receives a friction force generated between the pulleys (28) and the belt (29), and receives a resistance of the drive unit. Therefore, manual opening/closing operation is not easy. Patent document 1:

Japanese Patent Laid Open (JP-A) No.11-236787

Patent document 2: JP-A No.2000-274105

JP2002295118 discloses a door open/close device, having the features of the preamble of claim 1, by which the opening and closing of the door can be automated. One side of the door is turnably connected to a whirling arm, while the other side of the door is turnably connected to a moving body movable along a guide rail disposed on an upper edge of the opening. Magnetic attraction means generating magnetic attraction force between the door and the whirling arm are arranged at sites where the door and whirling arm are superposed mutually when the door is closing.

JP4353070 discloses a sliding door arrangement having a magnetic mechanism to provide a stable and sufficiently large door close holding force without requiring any external supplied energy. A cylindrical permanent magnet is provided and the position of the magnetic pole of the magnet is changed by rotating the position of the magnet at the time of opening the door to extinguish the magnetic force.

### Disclosure of the Invention

#### 25 Problem to be solved by the Invention

**[0005]** In view of the conventional circumstances, the present invention is provided, and an object of the present invention is to provide an excellent opening/closing door unit convenient in opening/closing operation, with a space saving constitution of a drive source.

#### (Means for Solving the Problem)

**[0006]** In order to solve the problem, a first aspect provides an opening/closing door unit and an immobile part, said door unit for disposal in an opening of a doorway in use, the opening have a lateral width, the immobile part being a frame member in which the opening/closing door unit is installed, said door unit comprising: a door body; a movement support part comprising an axial part for turnably hanging the door body at a door-end side, a supporting bracket fixed to the upper side of the axial part hangers turnably supported by the supporting bracket, and a guide rail for guiding the movement support part in a lateral width direction of the opening relative to the immobile part in use; the door body supported by the movement support part in such a manner so that the door body is moved in the lateral width direction of the opening while being turned in an axial direction to intersect the opening, with the opening opened and closed by the movement and the turning of the door body, and wherein the door unit further comprises a linear motor for moving the movement support part in the lateral width direction of the opening along the guide rail in use, said linear motor including a stator located in the immobile part and a movable element provided in the movement support part; characterised in that a magnetic attractor is fixed to

the immobile part, on a door end direction side from the movement support part when the door body is almost fully closed, and the movement support part is attracted to said magnetic attractor, and wherein a gap is provided between the magnetic attractor and the supporting bracket when the door body is fully closed, so that an attraction force of the magnetic attractor can act, and that no part of the magnetic attractor contacts the movement support part when the door body is fully closed.

**[0007]** The opening/closing door unit includes a balance door and a folding door, etc, but does not include a slide door (sliding door) and a revolving door, etc.

**[0008]** Also, the door body includes a hanging type door body which is hung from an upper side to perform the opening/closing operation, because easiness of passage is improved with no irregularities required on a floor surface, etc.

**[0009]** In addition, the immobile part includes, a frame member around the door body and a skeleton, being the object in which the opening/closing door unit is installed.

**[0010]** In addition, the width direction of the opening part is a lateral width direction of the opening part opened and closed by the door body, and is not an axial direction of turning in the door body.

**[0011]** As a specific means for moving the movement support part relative to the immobile part in the width direction of the opening part, a rail member along the width direction of the opening part is provided at the immobile part side or at the door body side, and the movement support part moves along the rail member.

**[0012]** Preferably the linear motor is a general linear motor designed to impel the movable element by a magnetic field generated from the stator. Note that the movable element may be constituted of a permanent magnet, and also may be constituted of an electromagnet, and the former case is preferable, because electric wire, etc, can be omitted.

**[0013]** The movement support part and the linear motor are preferably provided in the upper side of the door bodies. However, it is also possible to provide them in the lower side of the door bodies. In addition, the position of the linear motor in a thickness direction of the door body is largely spaced from a movement locus of the movement support part, and is arbitrarily set unless an impelling force for moving the movement support part is obtained, and is preferably set at a position on a locus of the movement support part.

**[0014]** In addition, a second embodiment the opening/closing door unit includes a sensor for sensing one or both of a state in which the door body performs a predetermined amount of opening operation from a fully-closed position, and a state in which the door body performs a predetermined amount of closing operation from a fully-opened position, wherein according to a sensed signal of the sensor, the linear motor is set in a power supply state from a power non-supply state, to continue the movement of the movement support part.

**[0015]** Here, preferably the sensor can sense the mov-

able element and a part that moves integrally with the movable element, and the sensor includes, for example, a contact sensor such as a limit switch or a micro switch, and a non-contact sensor such as a proximity switch or a photoelectric switch. The sensor may be provided in singular or plural numbers. Namely, the sensor for sensing a state in which the door body performs a predetermined amount of opening operation from the fully-closed position, and the sensor for sensing a state in which the door body performs a predetermined amount of closed operation from the fully-opened position, may be the same single sensor or may be plural separate sensors.

**[0016]** In addition, according to a third embodiment, plural door bodies are continuously connected to each other in the width direction of the opening part, and out of these plural door bodies, one of the adjacent door bodies is connected to the other one so as to turn in both directions, then the door body at a door-end side is supported by the movement support part, and the door body at a door-tail side is turnably supported to the immobile part, thereby constituting a double-opening type folding door part.

**[0017]** In addition, according to one embodiment, the movable element is provided so as to protrude from the movement support part toward a moving direction at the time of a closing operation of the door body.

**[0018]** In addition, according to a fifth embodiment, when the door body is fully-closed, the fully-closed state is maintained by a drive force of the linear motor.

**[0019]** In addition, according to a sixth embodiment, a controller part of the linear motor is disposed, outside of a moving range of the movement support part.

**[0020]** Here, the controller part includes a control circuit having a function of controlling the linear motor part, and electric wiring is formed over the stator.

**[0021]** In addition, according to a seventh embodiment, when the door member is set at the fully-closed position or the fully-opened position, the stator is disposed closer to a center side in the moving range of the movement support part, so that the stator and the movable element are not opposed to each other.

**[0022]** Namely, according to the seventh embodiment, a length of the stator becomes shorter than the length of the moving range of the movement support part, and the stator is disposed closer to the center side in the moving range of the movement support part.

**[0023]** According to an eighth embodiment, when the movement support member is positioned in a predetermined range during closing operation of the door member, power control is applied to the linear motor so as to decrease a speed of the movable element.

**[0024]** Here, out of the moving range of the movement support member, the predetermined range is a specific range set at the side of a direction in which the movement support member moves along with the closing operation of the door member. As a preferable specific example, out of the moving range of the movement support member, the predetermined range is set in a range slightly on

the front side of a part where the door member during closing operation is almost fully-closed.

**[0025]** In addition, a power control of the linear motor for decreasing a speed of the movable element includes a means for lowering a voltage of a power supply to the linear motor and lowering a frequency of the power supply.

**[0026]** In addition, a ninth embodiment provides the opening/closing door unit according to any one of claims 1 to 8, wherein when the door member reaches a predetermined position in the predetermined range, a damper unit is provided to further decrease the speed of the movable element.

**[0027]** Here, the damper unit has a structure of decreasing the speed of the movable element, and the damper unit may be constituted in such a way that the movable element or a member integral with the movable element is elastically received by a repulsive force of an energizing member and a compressive fluid, and the door-tail side of the door body is incorporated in a pivotably-supporting part that supports the door-tail side, and turn of the door body is alleviated by the energizing force, etc., of the energizing member. Further, as the damper unit, it is also possible to simply give resistance to the movement of the movable element by friction, etc.

#### Effect of the Invention

**[0028]** The present invention is constituted as described above, and therefore an action effect as described below is exhibited.

According to the first aspect, by moving the movement support part by the linear motor, the door body performs opening/closing operation. Therefore, it is sufficient to provide a small space for including the drive mechanism, compared with a conventional technique including pulleys, the belt, and the drive unit, etc., and eventually, the size of the opening/closing door unit can be reduced.

Also, for example, even when the power supply to the linear motor is shut off due to power failure, etc., the door body can be opened/closed by relatively lighter manual opening/closing force.

In addition, for example, even when the door body during closing operation is manually stopped, the manual stop operation can be easily performed. Further, even if the door body during closing operation abuts on an object, etc., that passes through the opening part, an impact under abutment can be relatively relieved. Therefore, with a space-saving constitution of a drive source, an opening/closing door unit convenient in the opening/closing operation can be provided.

**[0029]** Further, according to the second embodiment, by performing a predetermined amount of opening operation by manually operating the door body at a fully-closed position, or by performing a predetermined amount of closing operation by manually operating the door body at a fully-opened position, the operation of the door body thereafter can be continued by a drive of the

linear motor, even if the operation is cancelled. Namely, according to the present invention, by the operation of slightly manually opening the door body at the fully-closed position, the door body can be automatically opened, and by the operation of slightly manually closing the door body at the fully-opened position, the door body can be automatically closed.

**[0030]** Further, according to the third embodiment, with the space-saving constitution of the drive source, convenience in the opening/closing operation can be improved.

**[0031]** Further, according to the fourth embodiment, in the fully-opened state of the door body, the movable element and the stator are not disposed in a part at the door-tail side, and therefore maintainability can be improved.

**[0032]** Further, according to the fifth embodiment, there is no necessity for including a lock structure, etc., for maintaining the fully-opened state of the door body, and therefore closing performance at the time of full-closing the door body can be favourably secured by the drive force of the linear motor.

**[0033]** Further according to the sixth embodiment, it is possible to prevent the movement of the movement support part in the width direction of the opening part, from being interrupted by a controller part.

**[0034]** Further, according to the seventh embodiment, the stator and the movable element are not opposed to each other, when the door body is set at the fully-opened position or the fully-closed position. Therefore even if power is supplied to the linear motor, a stop state of the movement support part (in other words, the stop state of the door body) can be maintained. When the door body performs slightly opening operation from the fully-closed position, or performs slightly closing operation from the fully-opened position, the stator and the movable element are set in a relation of being opposed to each other, by the movement of the movement support part accompanying such operations of the door body. Therefore, by continuously moving the movement support part by the drive force of the linear motor, the closing operation or the opening operation of the door body can be performed. Therefore, according to one embodiment, the sensor for sensing slightly opening operation of the door body at the fully-closed position and the sensor for sensing slightly closing operation of the door body at the fully-opened position are not separately provided, and the door body slightly opened manually can be automatically opened as it is, and the door body slightly closed manually can be automatically closed as it is.

**[0035]** Further, according to the eighth embodiment, when the door body approaches the fully-opened position, the speed of the movable element is decreased by power control of the linear motor, and with the decrease of the speed of the movable element, the moving speed of the movable element at the door-end side of the door body is adjusted to a suitable speed.

Namely, usually, the moving speed of the movable ele-

ment at the door-end side of the door member during closing operation is accelerated as the door member approaches the fully-closed position, by composite motion of a motion in the width direction of the opening part and a turning motion. However, according to the present invention, acceleration of the speed at the door-end side as described above can be prevented, and consequently it is possible to prevent the door body during closing operation from exceeding the fully-closed position (in the case of the double-opening type), or possible to prevent the door body from strongly colliding with an abutting body at the fully-closed position (in the case of single-opening type), and further it is possible to alleviate an impact when the door body abuts on an object, etc.

**[0036]** Further, according to the ninth embodiment, the impact of the door member at the time of the fully-closed state can be effectively prevented by the damper unit.

(Brief Description of the Drawings)

**[0037]**

Fig. 1 is a front view illustrating an example of an opening/closing door unit according to the present invention, and illustrating an essential cutout part;

Fig. 2 is a block diagram of the essential part of the opening/closing door unit, Fig. 2(a) illustrates a state in which a folding door part is almost fully-closed, and Fig. 2 (b) illustrates a state in which the folding door part is almost fully-opened;

Fig. 3 is a view illustrating an operation of the folding door part in the opening/closing door unit viewed from the upper side;

Fig. 4 is a block diagram of the essential part illustrating other example of the opening/closing door unit according to the present invention, Fig. 4(a) illustrates a state in which the folding door part is almost fully-closed, and Fig. 4 (b) illustrates a state in which the folding door part is almost fully-opened;

Fig. 5 is a block diagram of the essential part illustrating other example of the opening/closing door unit according to the present invention, Fig. 5(a) illustrates a state in which the folding door part is almost fully-closed, and Fig. 5 (b) illustrates a state in which the folding door part is almost fully-opened;

Fig. 6 is a block diagram of the essential part illustrating other example of the opening/closing door unit according to the present invention, Fig. 6(a) illustrates a state in which the folding door part is almost fully-closed, and Fig. 6 (b) illustrates a state in which the folding door part is almost fully-opened;

Fig. 7 is a flowchart explaining a control operation for making the folding door part perform closing operation, in the opening/closing door unit; and

Fig. 8 is a block diagram of the essential part illustrating other example of the opening/closing door unit according to the present invention, Fig. 8(a) illustrates a state in which the folding door part is al-

most fully-closed, and Fig. 8(b) illustrates a state in which the folding door part is almost fully-opened.

Best Mode for Carrying out the Invention

**[0038]** Embodiments of the present invention will be described hereunder, based on the drawings.

The opening/closing door unit according to the present invention is disposed in a doorway opened and closed in a construction/structure such as a house and a building, a warehouse, a factory, an underground shopping center, a tunnel, and a load-carrying platform of a vehicle, and can be applied as a balance door unit and a folding door unit, etc, that perform opening/closing operation by turning of the opening/closing body. An example constituted as a double-opening type folding door unit will be described as a particularly preferable aspect of the present invention.

**[0039]** As shown in Fig. 1, the opening/closing door unit 1 includes a folding door part 10 constituted of a plurality of continuously connected door bodies 11 and 12 for performing opening/closing operation; a frame body 20 that surrounds the folding door part 10 from right and left directions and from upper side; an axial end portion 30 that turnably supports the door-tail side (right side in Fig. 1) of the folding door part 10; and a movement support mechanism 40 that supports a door body 11 at the door-end side of the folding door part 10 so as to move in the turning direction and in the width direction of the opening part (in the right and left directions in Fig. 1), thus making the folding door part 10 perform opening/closing operation by a linear motor 49 provided in the movement support mechanism 40.

**[0040]** The folding door part 10 is constituted so as to be double-opened, by continuously connecting plural door bodies 11, 12 and connecting one of the adjacent door bodies 11 and 12 to other door body turnably in both directions. Note that according to an example shown in the figure, although the folding door part 10 is constituted of two door bodies 11 and 12, three or more door bodies may be connected to each other similarly as described above.

In addition, it is also possible to use a single door body, and the folding door unit is constituted as the balance door unit.

**[0041]** The door body 11 at the door-end side can be moved in the width direction (right and left direction in Fig. 1), by hanging an upper end portion thereof by a movement support part 41 of the movement support mechanism 40 as will be described later, and is supported so as to turn in both directions to intersect the opening part X.

**[0042]** A handle part 11a is provided in the front part and/or rear part at the door-end side of the door body 11. The handle part 11a is composed of an approximately cylindrical grip part 11a1 disposed so as to be spaced apart from the door body 11, and support members 11a2, 11a2 fixed to the surface of the door body 11 and une-

venly and loosely engaged with upper and lower both end sides of the grip part 11a1, and a grip part 11a2 is turnably held by the handle part 11a.

**[0043]** According to the handle part 11 a, an operator who performs opening/closing operation of the door body 11 can turn the door body 11 while turning the grip part 11a1 without turning the wrist, and therefore operability of the door body 11 is excellent. In addition, an end portion at the door-tail side of the door body 11 is turnably connected to an end portion of the door-end side of the door body 12, via a turning mechanism of a hinge, a gear, and a link member, etc.

Note that a symbol 11a3 in the figure indicates a window part made of a transparent member such as glass and a transparent synthetic resin material, etc.

Also, symbols 13 in the figure indicate interposing prevention members 13 provided in each of the door-tail side end portion of the door body 11 and the door-end side end portion of the door body 12, for preventing an object, etc, from being interposed between these door bodies 11 and 12, and these interposing prevention members 13 are formed of rubber and an elastic resin material, etc, in a hollow shape.

**[0044]** In addition, the door body 12 at the door-tail side includes an axial end portion 30 at the end portion of its door-tail side, and is supported turnably in both directions by the axial end portion 30.

**[0045]** In addition, the frame body 20 is constituted in an approximately U-shape, including a door-end side frame part 21 opposed to a door-end part 10a of the folding door part 10 in the fully-closed state; a door-tail side vertical frame part 22 opposed to the door end part 10b of the folding door part 10 in the fully-closed state, and an upper frame part 23 to connect these vertical frame members 21 and 22 at its upper end side. Then, the movement support mechanism 40 and a full closure assisting means, etc, as will be described later are constituted in the hollow-shaped upper frame part 23.

Note that according to the example shown in the figure, although the lower side of the folding door part 10 is formed in a floor surface or a ground surface, etc, it may also be formed in a lower frame part extending between both vertical frame parts 21 and 22.

**[0046]** In addition, the axial end portion 30 is constituted of an upper side pivotally supporting member 31 for turnably supporting the upper end side at the door-tail side of the folding door part 10, and a lower side pivotally supporting member 32 for turnably supporting the lower end side at the door-tail side.

A part of the upper end side of the upper side pivotally supporting member 31 is fixed to the upper frame part 23, and a part of the lower end side thereof is turnably engaged with the door body 12.

Similarly, a part of the lower end side of the lower side pivotally supporting member 32 is fixed to the floor surface or the ground surface, and a part of the upper end side thereof is turnably engaged with the door body 12.

**[0047]** In addition, the movement support mechanism

40 is provided so as to move in the width direction of the opening part, including a movement support part 41 for turnably hanging the door body 11 at the door-end side; a guide rail 42 for guiding the movement support part 41 in the width direction of the opening part; and a linear motor 49 for moving the movement support part 41 in the width direction of the opening part along the guide rail 42.

**[0048]** The movement support part 41 is constituted of an axial part 41a (see Fig. 2) for turnably hanging the door body 11 at the door-end side, a supporting bracket 41b fixed to the upper side of the axial part 41a; and hangers 41c, 41c turnably supported by the supporting bracket 41b. Note that the axial part 41 a is mounted on the door body 11 so as not to move in the width direction thereof.

**[0049]** The axial part 41a turnably supports the door body 11 so as to be opened and closed via a bearing, etc.

**[0050]** The supporting bracket 41b fixes the axial part 41 a to a lower side thereof, and supports the hanger 41c to the upper side so as to turn along the width direction of the opening part.

The supporting bracket 41b is formed of a magnetic metal material, and therefore functions as an attraction object magnetically attracted by a magnetic attractor 43 as will be described later.

Note that as other example of the attraction object, it may be also preferable that the supporting bracket 41b itself is formed into a magnet in an attracting state with the magnetic attractor 43, or the magnet is provided in a part opposed to the magnetic attractor 43 of the supporting bracket 41b in the attracting state with the magnetic attractor 43.

**[0051]** In addition, the hanger 41c is supported by the supporting bracket 41b so as to roll on the guide rail 42, and according to a preferable example shown in the figure, the number of disposed hangers is set at two. However, it is also possible to provide a single hanger or three or more hangers.

**[0052]** Further, the guide rail 42 is disposed so as to receive the hanger 41c from the lower side and guide the hanger 41c in the width direction of the opening part, and is fixed to the upper frame part 23.

**[0053]** In addition, the magnetic attractor 43 is provided at the door-end direction side (left direction side in Fig. 2) from the supporting bracket 41b in approximately the fully-closed state of the folding door part 10.

The magnetic attractor 43 is a so-called permanent magnet, and is disposed so as to oppose to the end portion of the door-end direction side of the supporting bracket 41b, and is fixed to the upper frame part 23, being an immobile part, via a bracket, etc.

**[0054]** Note that a symbol 44 in Fig. 2 indicates an abutted part on which the supporting bracket 41b is abutted, with the door body 11 set in the almost fully-opened state, and in the abutment part 44, a cushioning material such as an elastic body is fixed to an abutment surface, so as to alleviate the impact under the abutment.

**[0055]** In addition, the linear motor 49 is constituted of

a stator 49a fixed to the upper frame part 23, being the immobile part, a movable element 49b fixed to the movement support part 41, and a controller part 49c for supplying power to the stator 49a to control the power.

**[0056]** The stator 49a is a coil unit including a coil for giving an impelling force to the movable element 49b in the width direction of the opening part, and the power is supplied to the coil from the controller part 49c outside of the stator 49a.

The stator 49a is formed in a long shape extending in the width direction of the opening part, and is fixed to the upper frame part 23 in such a manner that one end side portion thereof is opposed to the movable element 49b, with the folding door part 10 set in the almost fully-closed state (state shown in Fig. 2(a)), and the other end side portion is opposed to the movable element 49b, with the folding door part 10 set in approximately the opened state (state shown in Fig. 2(b)).

**[0057]** Singular or plural sensors 49a1 capable of sensing a movable element 49b are included, at a longitudinal intermediate position of the stator 49a.

The sensor 49a1 is a proximity switch for sensing the movable element 49b when the door body 11 performs predetermined amount of opening operation from the fully-opened position and when the door body 11 performs a predetermined amount of closing operation from the fully-opened position. Then, the sensed signal is transmitted to the controller part 49c.

By providing a single sensor 49a1 in approximately longitudinal center of the stator 49a, it may be possible to sense both states of a state in which the door body 11 performs the predetermined amount of closing operation from the fully-opened position, and a state in which the door body 11 performs the predetermined amount of opening operation from the fully-closed position, at the same place. Alternately, by providing plural sensors 49a1 in a longitudinal intermediate place of the stator 49a, each one of the states may be sensed at separate places.

In addition, it may be also possible to replace the sensor 49a1, with a non-contact sensor other than the proximity switch (such as a photoelectric switch), and a contact switch (such as a limit switch) designed to sense a member (such as a supporting bracket 41b) integral with the movable element 49b in a contact state.

**[0058]** The movable element 49b is a stator of a linear motor constituted of a permanent magnet, and is fixed to the upper end of the supporting bracket 41b so as to extend in the width direction of the opening part, in such a manner as securing a suitable clearance between the movable element 49b and the stator 49a, when opposed to the stator 49a. Note that as the clearance is smaller, a greater drive force by the linear motor is obtained, and therefore by suitably adjusting the clearance, consumption of a power for a necessary drive force can be suppressed.

**[0059]** In addition, the controller part 49c includes a control circuit (not shown) including a plurality of electronic components and an integrated circuit board, etc,

and controls a power supplied from outside and outputs the power to the stator 49a.

More specifically, output power of the controller part 49c is controlled, so that moving speeds of the movable element 49a and the movement supporting part 41 are suitably maintained, and the moving direction of the movable element 49b is changed, or the movement of the movable element 49b is stopped.

**[0060]** Then, the controller part 49c having the structure is disposed outside of a moving range of the movement support part 41 so as not to inhibit the movement of the movement support part 41, and is fixed to the upper frame part 23 at the door-end side of the stator 49a and the guide rail 42, according to an example shown in the figure.

**[0061]** Next, characteristics of the opening/closing operation of the opening/closing door unit 1 will be described in detail, based on Fig. 2 and Fig. 3.

First, when slightly closing operation of the folding door part 10 set in the fully-opened state is performed by manual operation, etc, of a user, by the movement of the movement support part 41 and the movable element 49b accompanied by the slightly closing operation, the sensor 49a1 in the stator 49a senses the movable element 49b. Then, according to the sensed signal, the controller part 49c supplies the power to the stator 49a, so as to impel the stator 49a.

Accordingly, the closing operation of the folding door part 10 is continued by the drive of the linear motor 49.

When the folding door part 10 is fully-closed, the controller part 49c stops the supply of the power to the stator 49a. Note that a means for sensing a state in which the folding door part 10 is fully-closed, may be constituted to sense the state by the contact or non-contact sensor not shown, or may be constituted to recognize a state in which a current value of electricity supplied to the stator 49a exceeds a predetermined value.

**[0062]** Then, the fully-closed state of the folding door part 10 is maintained by attracting the supporting bracket 41 b by the magnetic attractor 43.

**[0063]** In addition, when slightly opening operation of the folding door part 10 set in the fully-closed state is performed by the user, etc, by the movement of the movement support part 41 and the movable element 49b accompanied the movement of the folding door part 10, the sensor 49a1 in the stator 49a senses the movable element 49b. Then, according to the sensed signal, the controller part 49c supplies power to the stator 49a, so as to impel the movable element 49b in an opposite direction to the direction in the case of closing the door body.

Accordingly, the opening operation of the folding door part 10 is continued by the drive of the linear motor 49.

**[0064]** When the folding door part 10 is almost fully-opened by abutment of the movement support part 41 on the abutted part 44, the controller part 49c stops the supply of the power to the stator 49a.

Note that the means for sensing the state in which the folding door part 10 is fully-opened may be constituted

to sense the state by the contact or non-contact sensor not shown. Alternately, the means may be constituted to recognize the state in which the current value of the stator 49a exceeds the predetermined value.

In addition, in order to change an impelling direction of the movable element 49b, a means for changing the impelling direction in a general linear motor may be used. However, according to the embodiment, a phase of the power supplied to the stator 49a from the controller part 49c is changed.

Note that the phase may be changed at a timing when the folding door part 10 is set in the fully-opened state or set in the fully-closed state. However, the timing can be delayed by using a timer, etc.

**[0065]** Thus, according to the opening/closing door unit 1 having the structure, the opening/closing operation of the folding door part 10 is performed by using the linear motor 49. Therefore, a space for including the drive source is saved, compared with a mechanism, etc, provided with pulleys, the belt, and the drive unit, etc. This eventually realizes reduction of the size of the upper frame part 23.

In addition, even when the supply power to the linear motor 49 is shut off due to power failure, etc, the resistance at the drive source side is relatively small, and therefore the opening/closing operation of the folding door part 10 can be easily performed manually. Moreover, the folding door part 10 during the closing operation by the linear motor 49 can be stopped with a relatively light force, and also the impact generated if the folding door part 10 during the closing operation abuts on an object, etc, can be relative small.

**[0066]** Next, other example of the opening/closing door unit according to the present invention will be described. Note that the opening/closing door unit shown hereunder is constituted by partially changing the opening/closing door unit 1. Therefore, by assigning the same symbols to approximately the same place, overlapped detailed explanation is not repeated.

**[0067]** The opening/closing door unit 2 shown in Fig. 4 is constituted in such a manner that the movable element 49b is protruded in the moving direction (left direction according to Fig. 4) from the movement support part 41 to the opening/closing door unit 1, in the case of closing the door body, and the stator 49a is disposed closer to a protruding direction of the movable element 49b.

More specifically, the movable element 49b in the opening/closing door unit 2 is disposed so as to protrude in the moving direction from the supporting bracket 41b in the case of closing the door body, by being fixed to the supporting bracket 41b via other bracket, etc.

As shown in Fig. 4, a protruding amount of the movable element 49b may be an amount so that an entire body of the movable element 49b is positioned at a moving direction side from the supporting bracket 41b in the case of closing the door body, or the movable element 49b may be further protruded.

Then, the stator 49a is disposed so as to correspond to

the moving range of the movable element 49b. Accordingly, the stator 49a and the movable element 49b are not positioned in a space S at the door-tail side in the upper frame part 23.

**[0068]** Thus, according to the opening/closing door unit 2, the stator 49a and the movable element 49b are not positioned in the space S at the door-tail side. Therefore, maintenance work, etc, for these stator 49a and the movable element 49b can be easily performed.

Namely, for example, as shown in Fig. 4(b), even in a state in which the folding door part 10 is set in an almost fully-opened state, the stator 49a and the movable element 49b are not positioned in the upper part of the folding door part 10 and the movement support part 41. Therefore, good maintenance work is performed for these stator 49a and the movable element 49b.

**[0069]** In addition, the structure of an opening/closing door unit 4 shown in Fig. 5 is different from the structure of the opening/closing door unit 1 in the point that by replacing the stator 49a with a stator 49a', the stator 49a' and the movable element 49b are not opposed to each other when the door body 11 is set at the fully-closed position and the fully-opened position, and the sensor 49a1 is omitted.

More specifically, the stator 49a' is constituted to be shorter than the stator 49a in the opening/closing door unit 1, so that the stator 49a' is not opposed to the movable element 49b when the door body 11 is set at the fully-closed position or the fully-opened position, and is disposed closer to the center side in the moving range of the movement support part 41.

**[0070]** Namely, when the door body 11 is set at the fully-closed position or the fully-opened position, the stator 49a' is not positioned in the upper part of the movable element 49b, and when the door body 11 is set at a position other than the fully-closed position or the fully-opened position, the stator 49a' and the movable element 49b are set in a relation that the stator 49a' is positioned in the upper part of the movable element 49b.

Then, a drive power to the stator 49a' from the controller part 49c is always supplied to the stator 49a', regardless of whether or not the door body 11 is set at the fully-closed position or the fully-opened position.

In addition, when the door body 11 is set at the fully-opened position, supply of the drive power is switched so that the movable element 49b is impelled to the door-end direction (left direction of Fig. 5), and when the door body 11 is set at the fully-closed position, the supply of the drive power is switched so that the movable element 49b is impelled to the door-tail direction (right direction of Fig. 5).

**[0071]** Thus, according to the opening/closing door unit 4 shown in Fig. 5, for example, when the folding door part 10 set at the fully-closed position is opened, the movement support part 41 and the movable element 49b are moved in a door-tail direction along with the opening operation of the door body 11, if the door body 11 is slightly opened manually.



Then, when the movable element 49b is moved to a position opposed to the stator 49a', the movable element 49b further continues to move by an electromagnetical impelling force received from the stator 49a'.

Then, when the folding door part 10 is set at the fully-opened position, the movable element 49b and the stator 49a' are not opposed to each other any more. Therefore, the movable element 49b does not receive the electromagnetical impelling force any more from the stator 49a'.

**[0072]** In addition, when the folding door part 10 set at the fully-opened position is fully-closed, the movable element 49b is moved to the position opposed to the stator 49a' along with a manual closing operation, and the movable element 49b further continues to move by the electromagnetical impelling force received from the stator 49a', if the door body 11 is slightly closed manually by an action opposite to the action. Then, when the folding door part 10 is set at the fully-closed position, the movable element 49b and the stator 49a' are not opposed to each other any more. Therefore, the movable element 49b does not receive the impelling force any more from the stator 49a'.

**[0073]** Note that in the opening/closing door unit 4, the stator 49a' is always supplied with power. However, it is also possible to control in such manner that the sensor, etc, senses a state in which the stator 49a' and the movable element 49b are opposed to each other, and only when the sensed signal is given, the stator 49a' is set in a power-supply state.

**[0074]** In addition, according to the opening/closing unit 4 shown in Fig. 5, when the door body 11 is set at the fully-closed position and the fully-opened position, the stator 49a' and the movable element 49b are set not opposed to each other. However, as other example, it is also possible that when the door body 11 is set at either one of the fully-closed position or the fully-opened position, the stator 49a' and the movable element 49b are set not opposed to each other.

In this case, when the door body 11 is set in the fully-opened state or set in the fully-closed state, in order to change the impelling direction of the movable element 49b, the phase of the power supplied to the stator 49a is changed at a timing when the folding door part 10 is set in the fully-opened state or set in the fully-closed state. However, the timing can be delayed by using the timer, etc.

**[0075]** In addition, in the opening/closing door unit 5 shown in Fig. 6 according to the opening/closing unit 1, the sensor 49a1 is used as a means for sensing a state in which the movement support part 41 during being impelled in the door-tail direction is positioned within a predetermined range W of the door-end side (left side of Fig. 6), and according to the sensed signal of the sensor part 49a1, an impelling speed of the movable element 49b is decreased.

In the opening/closing door unit 5, the sensor 49a1 is disposed at a position away from the door-end side end portion in the stator 49a' by a predetermined distance

(predetermined range W) to the door-tail side (right side in Fig. 6).

The predetermined range W is suitably set so as to decelerate the closing operation of the folding door part 10 at a position closer to the fully-closed position.

Note that it is possible that the sensor 49a1 has two functions such as a function of sensing the movable element 49b when a manual opening operation and a manual closing operation are performed, and a function of sensing a state in which the movable element 49b during being impelled to the door-tail direction is positioned within a predetermined range W, or it is also possible that a plurality of sensors 49a1 are provided and the functions are allocated to each one of them.

In addition, to which one of the door-end direction and the door-tail direction, the folding door part 10 and the movement support part 41 are impelled, may be judged by a driving direction of the linear motor 49, which is judged from the power phase or from the sensed signal obtained by the sensor, etc.

**[0076]** Fig. 7 is a flow chart showing a control operation performed by the controller part 49c during closing operation of the folding door part 10, in the opening/closing door unit 5.

In step 1 in the flowchart, whether or not the movement support part 41 is positioned within the predetermined range W is judged during the closing operation of the door body 11. When the movement support part 41 is positioned within the predetermined range W, the processing is moved to the next step 2, and otherwise, the processing is awaited until the movement support part 41 is positioned within the predetermined range W. Namely, according to the step 1, when the movement support part 41 and the movable element 49b are impelled in the door-end direction along with the closing operation of the door body 11, whether or not the movable element 49b is sensed by the sensor 49a1, is judged.

**[0077]** Then, in step 2, by the power control performed by the controller part 49c, the impelling speed of the movable element 49b is decreased.

Specifically, regarding the power supplied to the stator 49a from the controller part 49c, by controlling the voltage and/or the frequency, the impelling speed of the movable element 49b is decreased.

**[0078]** Next, in step 3, whether or not the door body 11 is fully closed is judged, and when the door body 11 is fully-closed, the processing is moved to the next step 4, and the linear motor 49 is set in a non-power supply state. Otherwise, the processing of the step 3 is repeated until the door body 11 is fully-closed.

As the means for sensing the state in which the door body 11 is fully-closed, it is possible that the movement support part 41 or a member integral with the movement support part 41 at the time of full closure is sensed by using the contact or non-contact sensor not shown, for example, or it is also possible to recognize a state in which the current value at the time of full closure exceeds a predetermined value.

**[0079]** Thus, according to the opening/closing door unit 5, when the door body 11 approaches the fully-closed position, the speed of the movable element 49b is decreased by the power control performed to the linear motor 49. Therefore, with decrease of the speed of the movable element 49b, the moving speed of the door-end part 10a of the door body 11 is adjusted to a suitable speed. Namely, as shown in Fig. 3, usually the speed of the door-end part 10a is accelerated, as the door body 11 during closing operation approaches the fully-closed position by composite motion of a motion in the width direction of the opening part and a rotating motion. However, according to the present invention, the acceleration of the door-end part 10a can be prevented, and eventually it is also possible to prevent a state in which the door body 11 during closing operation exceeds the fully-closed position, and further it is possible to alleviate the impact of the abutment, even if the door-end part 10a abuts on the object, etc.

**[0080]** Next, an opening/closing door unit 6 shown in Fig. 8 will be described.

A different point of the opening/closing unit 6 from the opening/closing unit 5 is that a mechanical type damper unit 50 is added in the opening/closing door unit 6.

The damper unit 50 is a well-known mechanism in which a piston part 51 is energized in a stretching direction. According to an example shown in the figure, the piston part 51 is energized in the stretching direction by a spring 52. However, as other example, a well-known structure is also possible, such that the piston part 51 is energized by a repulsiveness of a gas in a cylinder part 53.

Then, the damper unit 50 is fixed to the upper frame part 23, so as to receive the movement support part 41 by a protruded end portion of the piston part 51 from its door-end side, slightly before almost full closure of the folding door part 10.

**[0081]** According to the opening/closing door unit 6, in approximately the same way as the opening/closing door unit 5, the speeds of the movement support part 41 and the movable element 49b are decreased by the power control of the controller part 49c, slightly before the full closure of the folding door part 10. Further, by receiving the movement support part 41 by the piston part 51 also, the closing operation of the folding door part 10 is decelerated.

Then, the fully-closed state of the folding door part 10 in the case of the full closure is maintained, when the supporting bracket 41b is attracted by the magnetic attractor 43. In addition, when the opening operation of the folding door part 10 in the fully-closed state is performed, the door body 11 is slightly moved in the opening direction manually by the user. Then, an initial drive force by the linear motor 49 is assisted by a repulsive force of the damper unit 50, and the movement of the movement support part 41 and the movable element 49b is smoothly continued in the door-tail direction (right direction in Fig. 8).

**[0082]** Note that in the opening/closing door unit 6, it

is also possible that the control of decreasing the speed of the movable element 49b that is impelled in the door-end direction is omitted, and the speed of the folding door part 10 in the case of the closing operation is decreased by an action of only the damper unit 50, slightly before the full closure.

**[0083]** In addition, according to the opening/closing door units 1, 2, 4, 5 and 6 (see Figs. 2, 4, 5, 6 and 8), the supporting bracket 41b is attracted by the magnetic attractor 43, in the fully-closed state of the folding door part 10. In the fully-closed state of the folding door part 10, a gap is provided between the supporting bracket 41b and the magnetic attractor 43, so that an attraction force of the magnetic attractor 43 can act.

**[0084]** In addition, as a structure added to the embodiment, it is also preferable that when the folding door part 10 during closing operation abuts on the object, etc., the folding door part 10 is made to perform reverse operation (opening operation) or stop. Specifically, the folding door part 10 during closing operation abuts on the object, etc., and this is recognized from the change of the current value of the linear motor 49, and the folding door part 10 is made to perform reverse operation or stop.

With the structure, even if the folding door part 10 during closing operation abuts on the object, etc., the impact generated under the abutment can be alleviated and also it is possible to prevent a state in which the object, etc., is sandwiched between the door-end of the folding door part 10 and the door-end side vertical frame part 21.

**[0085]** In addition, according to the embodiment, when the slightly closing operation of the folding door part 10 in the case of a fully-opened state is performed manually, the closing operation of the folding door part 10 is performed. However, as other example, it may be also preferable that the folding door part 10 in the case of the fully-opened state is automatically closed after a predetermined time.

**[0086]** In addition, as a structure added to the embodiment, it is also possible that when the folding door part 10 is maintained in a manually partly-open state, the partly-open state is maintained.

**[0087]** As other structure, it is also possible that an operation pattern of the folding door part 10 is suitably changed by the change of the controller part 49c on a control circuit.

**[0088]** In addition, according to each aspect shown in Figs. 2, 4, 6 and 8, slight movement of the folding door part 10 set in the fully-opened state or fully-closed state is sensed by the sensor 49a1 by manual operation, etc. However, as other example, it is also preferable that by detecting an induced electromotive force generated by a coil of the stator 49a in the non-power supply state, with the movement of the movable element 49b, the sensor 49a1 senses a state in which the movable element 49b is moved by an external force, namely a state in which the folding door part 10 set in the fully-opened state or set in the fully-closed state is slightly moved by manual operation, etc., and according to the sensed signal, the

power is supplied to the stator 49a.

According to the structure, regardless of the position where the movement support part 41 starts to move by the external force, in other words, regardless of the position where the folding door part 10 starts the opening operation or the closing operation by the external force, namely regardless of any position, the change of the state is sensed and the linear motor can be activated.

**[0089]** In addition, according to each one of the aspects, the opening operation and the closing operation of the folding door part 10 are performed by the linear motor 49. However, only one of the operations can be performed by the linear motor 49 and the other operation can be made the operation performed by manual operation or performed by energizing means.

Moreover, the operation by the linear motor 49 may be performed in almost an entire area of the opening/closing range by the folding door part 10, or may be a partial area within the same opening/closing range.

## Claims

1. An opening/closing door unit (1) and an immobile part (23), said door unit (1) for disposal in an opening (X) of a doorway in use, the opening having a lateral width, the immobile part (23) being a frame member in which the opening/closing door unit (1) is installed, said door unit (1) comprising:

a door body (11);

a movement support part (41) comprising an axial part 41a for turnably hanging the door body (11) at a door-end side, a supporting bracket 41b fixed to the upper side of the axial part 41a, hangers 41c turnably supported by the supporting bracket 41b, and a guide rail (42) for guiding the movement support part (41) in a lateral width direction of the opening (X) relative to the immobile part (23) in use;

the door body (11) supported by the movement support part (41) in such a manner so that the door body (11) is moved in the lateral width direction of the opening while being turned in an axial direction to intersect the opening (X), with the opening (X) opened and closed by the movement and the turn of the door body (11),

and wherein the door unit (1) further comprises a linear motor (49) for moving the movement support part in the lateral width direction of the opening along the guide rail (42) in use, said linear motor including a stator (49a) located in the immobile part (23) and a movable element (49b) provided in the movement support part (41); and furthermore comprising a magnetic attractor (43) for holding the door body (11) closed;

**characterised in that**

the magnetic attractor (43) is fixed to the im-

mobile part (23), on a door-end direction side from the movement support part (41) when the door body (11) is almost fully-closed, and the movement support part (41) is attracted to said magnetic attractor, and wherein

a gap is provided between the magnetic attractor (43) and the supporting bracket (41b) when the door body (11) is fully-closed, so that an attraction force of the magnetic attractor (43) can act, and that no part of the magnetic attractor (43) contacts the movement support part (41) when the door body (11) is fully-closed.

2. The opening/closing door unit (1) and the immobile part (23) according to claim 1, wherein a plurality of door bodies (11 and 12) are continuously connected to each other in the lateral width direction of the opening part (X), and out of the plurality of door bodies (11 and 12), at least a first door body (11) is connected adjacent at least a second door body (12), said at least first (11) and second (12) door bodies being turnable in both directions, and

by supporting the at least first door body (11) at a door-end side by the movement support part (41), and also by turnably supporting the at least second door body (12) at a door-tail side relative to the immobile part (23), the at least first door body (11) at the door-end side is turnable in both directions intersecting the opening part (X).

3. The opening/closing door unit (1) and the immobile part (23) according to claim 1, wherein when the door body (11) is set at a fully-closed position and set at a fully-opened position, or when the door body (11) is set at either one of the fully-closed position or the fully-opened position, the stator (49a) and the movable element (49b) are disposed in such a manner as not being opposed to each other so that the movable element (49b) does not receive an impelling force from the stator (49a).
4. The opening/closing door unit (1) and the immobile part (23) according to claim 3, wherein a drive power supplied to the stator (49a) is switched, so that an impelling direction of the movable element (49b) is set in a door-end direction when the door body (11) is set at the fully-opened position, and the impelling direction of the movable element (49b) is set in a door-tail direction when the door body (11) is set at the fully closed position.
5. The opening/closing door unit (1) and the immobile part (23) according to claim 4, wherein the timing of switching the drive power is delayed from the time point when the door body (11) is set in a fully-opened state or the time point when the door body (11) is set in a fully-closed state.

6. The opening/closing door unit and the immobile part (23) according to claim 5, wherein only when a sensor (49a1) senses a state in which the stator (49a) and the movable element (49b) are opposed to each other, the stator (49a) is set in a power-supply state. 5
7. The opening/closing door unit (1) and the immobile part (23) according to claim 1, wherein a sensor (49a1) senses a state in which the movable element (49b) is moved, by detecting an induced electromotive force generated by the stator (49a) in a non-power supply state, and according to the sensed signal, power is supplied to the stator (49a). 10
8. The opening/closing door unit (1) and the immobile part (23) according to claim 1, wherein when the door body (11) is set at a fully-closed position and set at a fully-opened position, the stator (49a) and the movable element (49b) are disposed in such a manner as not opposing to each other so that the movable element (49b) does not receive an impelling force from the stator (49a). 15 20
9. The opening/closing unit (1) and the immobile part (23) according to claim 1, wherein a drive power supplied to the stator (49a) is switched so that when the door body (11) is set at a fully-opened position, an impelling direction of the movable element (49b) is set in the door-end direction, and when the door body (11) is set at a fully-closed position, the impelling direction of the movable element (49b) is set in the door-tail direction. 25 30
10. The opening/closing door unit (1) and the immobile part (23) according to claim 1, wherein a drive power supplied to the stator (49a) is switched so that when the door body (11) is set at a fully-opened position, an impelling direction of the movable element (49b) is set in the door-end direction, and when the door body is set at a fully-closed position, the impelling direction of the movable element (49b) is set in the door-tail direction, and 35 40
- a timing for switching the drive power is delayed from the time point when the door body (11) is set in the fully-opened state, or the time point when the door body (11) is set in the fully-closed state. 45
11. The opening/closing door unit (1) and the immobile part (23) according to claim 1, wherein when the door body (11) is set at the fully-closed position and set at the fully-opened position, or when the door body (11) is set at either one of the fully-closed position or the fully-opened position, the stator (49a) and the movable element (49b) are disposed in such a manner as not opposing to each other so that the movable element (49b) does not receive an impelling force 50 55

from the stator (49a),

and only when a sensor (49a1) senses a state in which the stator (49a) and the movable element (49b) are opposed to each other, the stator (49a) is set in the power-supply state.

## Patentansprüche

1. Öffnende/schließende Türeinheit (1) und einen unbeweglichen Teil (23), wobei die genannte Türeinheit (1) im Gebrauch zur Anordnung in einer Öffnung (X) eines Eingangs ist, wobei die Öffnung eine laterale Breite hat, wobei der unbewegliche Teil (23) ein Rahmenelement ist, in dem die öffnende/schließende Türeinheit (1) eingebaut ist, wobei die genannte Türeinheit (1) Folgendes aufweist:

einen Türkörper (11);  
einen Bewegungsträger (41), der einen axialen Teil (41a) zum drehbaren Aufhängen des Türkörpers (11) an einer Türendseite, eine an der Oberseite des axialen Teils (41a) befestigte Halterung (41b), von der Halterung (41b) drehbar getragene Aufhängungen (41c) und eine Führungsschiene (42) zum Führen des Bewegungsträgers (41) im Gebrauch in einer Richtung der lateralen Breite der Öffnung (X) relativ zum unbeweglichen Teil (23) aufweist;  
wobei der Türkörper (11) vom Bewegungsträger (41) so getragen wird, dass der Türkörper (11) in der Richtung der lateralen Breite der Öffnung bewegt wird, während er in einer axialen Richtung gedreht wird, um die Öffnung (X) zu schneiden, wobei die Öffnung (X) durch die Bewegung und die Drehung des Türkörpers (11) geöffnet und geschlossen wird,  
und wobei die Türeinheit (1) ferner einen linearen Motor (49) zum Bewegen des Bewegungsträgers (41) im Gebrauch in der Richtung der lateralen Breite der Öffnung an der Führungsschiene (42) entlang aufweist, wobei der genannte lineare Motor einen Stator (49a), der sich im unbeweglichen Teil (23) befindet, und ein bewegliches Element (49b), das im Bewegungsträger (41) bereitgestellt ist, beinhaltet, und darüber hinaus eine magnetische Anziehungseinheit (43) zum Geschlossenhalten des Türkörpers (11) aufweist; **dadurch gekennzeichnet, dass**  
die magnetische Anziehungseinheit (43) auf einer Seite in Türenderichtung von dem Bewegungsträger (41) an dem unbeweglichen Teil (23) befestigt ist, wenn der Türkörper (11) fast ganz geschlossen ist, und der Bewegungsträger (41) zur genannten magnetischen Anziehungseinheit hin angezogen wird, und wobei

- zwischen der magnetischen Anziehungseinheit (43) und der Halterung (41b) ein Spalt bereitgestellt ist, wenn der Türkörper (11) ganz geschlossen ist, so dass eine Anziehungskraft der magnetischen Anziehungseinheit (43) wirken kann und so dass kein Teil der magnetischen Anziehungseinheit (43) den Bewegungsträgerteil (41) berührt, wenn der Türkörper (11) ganz geschlossen ist.
2. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 1, wobei mehrere Türkörper (11 und 12) in der Richtung der lateralen Breite des Öffnungsteils (X) kontinuierlich miteinander verbunden sind und aus den mehreren Türkörpern (11 und 12) wenigstens ein erster Türkörper (11) an wenigstens einen zweiten Türkörper (12) angrenzend verbunden ist, wobei der genannte wenigstens erste (11) und zweite (12) Türkörper in beide Richtungen drehbar sind, und durch Tragen des wenigstens ersten Türkörpers (11) an einer Türendseite durch den Bewegungsträgerteil (41) und auch durch drehbares Tragen des wenigstens zweiten Türkörpers (12) an einer hinteren Türseite relativ zum unbeweglichen Teil (23) ist der wenigstens erste Türkörper (11) an der Türendseite in beiden Richtungen, die den Öffnungsteil (X) schneiden, drehbar.
3. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 1, wobei, wenn der Türkörper (11) auf eine ganz geschlossene Stellung eingestellt ist und auf eine ganz geöffnete Stellung eingestellt ist oder wenn der Türkörper (11) auf die ganz geschlossene oder die ganz geöffnete Stellung eingestellt ist, der Stator (49a) und das bewegliche Element (49b) so angeordnet sind, dass sie einander nicht entgegengesetzt sind, so dass das bewegliche Element (49b) keine antreibende Kraft vom Stator (49a) erhält.
4. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 3, wobei eine dem Stator (49a) zugeführte Antriebsenergie geschaltet wird, so dass eine Treibrichtung des beweglichen Elements (49b) auf eine Türenderichtung eingestellt ist, wenn der Türkörper (11) auf die ganz geöffnete Stellung eingestellt ist, und die Treibrichtung des beweglichen Elements (49b) auf eine Türnachlaufrichtung eingestellt ist, wenn der Türkörper (11) auf die ganz geschlossene Stellung eingestellt ist.
5. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 4, wobei die zeitliche Steuerung des Schaltens der Antriebsenergie von dem Zeitpunkt, an dem der Türkörper (11) auf einen ganz geöffneten Zustand eingestellt ist, oder dem Zeitpunkt, an dem der Türkörper (11) auf einen ganz geschlossenen Zustand eingestellt ist, verzögert wird.
6. Öffnende/schließende Türeinheit und unbeweglicher Teil (23) nach Anspruch 5, wobei der Stator (49a) nur, wenn ein Sensor (49a1) einen Zustand erfasst, in dem der Stator (49a) und das bewegliche Element (49b) einander entgegengesetzt sind, auf einen Energieversorgungszustand eingestellt wird.
7. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 1, wobei ein Sensor (49a1) einen Zustand, in dem das bewegliche Element (49b) bewegt wird, durch Detektieren einer induzierten elektromotorischen Kraft, die von dem Stator (49a) in einem Zustand ohne Energieversorgung erzeugt wird, erfasst und der Stator (49a) entsprechend dem erfassten Signal mit Energie versorgt wird.
8. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 1, wobei, wenn der Türkörper (11) auf eine ganz geschlossene Stellung eingestellt ist und auf eine ganz geöffnete Stellung eingestellt ist, der Stator (49a) und das bewegliche Element (49b) so angeordnet sind, dass sie einander nicht entgegengesetzt sind, so dass das bewegliche Element (49b) keine antreibende Kraft vom Stator (49a) erhält.
9. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 1, wobei eine dem Stator (49a) zugeführte Antriebsenergie geschaltet wird, so dass eine Treibrichtung des beweglichen Elements (49b) auf die Türenderichtung eingestellt ist, wenn der Türkörper (11) auf eine ganz geöffnete Stellung eingestellt ist, und die Treibrichtung des beweglichen Elements (49b) auf die Türnachlaufrichtung eingestellt ist, wenn der Türkörper (11) auf eine ganz geschlossene Stellung eingestellt ist.
10. Öffnende/schließende Türeinheit (1) und unbeweglicher Teil (23) nach Anspruch 1, wobei eine dem Stator (49a) zugeführte Antriebsenergie geschaltet wird, so dass eine Treibrichtung des beweglichen Elements (49b) auf die Türenderichtung eingestellt wird, wenn der Türkörper (11) auf eine ganz geöffnete Stellung eingestellt ist, und die Treibrichtung des beweglichen Elements (49b) auf die Türnachlaufrichtung eingestellt ist, wenn der Türkörper auf eine ganz geschlossene Stellung eingestellt ist, und eine zeitliche Steuerung für das Schalten der Antriebsenergie von dem Zeitpunkt, an dem der Türkörper (11) auf den ganz geöffneten Zustand eingestellt ist, oder dem Zeitpunkt, an dem der Türkörper (11) auf den ganz geschlossenen Zustand eingestellt ist, verzögert ist.

11. Öffnende/schließende Türeinheit (11) und unbeweglicher Teil (23) nach Anspruch 1, wobei, wenn der Türkörper (11) auf die ganz geschlossene Stellung eingestellt ist und auf die ganz geöffnete Stellung eingestellt ist oder wenn der Türkörper (11) auf die ganz geschlossene oder die ganz geöffnete Stellung eingestellt ist, der Stator (49a) und das bewegliche Element (49b) so angeordnet werden, dass sie einander nicht entgegengesetzt sind, so dass das bewegliche Element (49b) keine antreibende Kraft vom Stator (49a) erhält, und der Stator (49a) nur, wenn ein Sensor (49a1) einen Zustand erfasst, in dem der Stator (49a) und das bewegliche Element (49b) einander entgegengesetzt sind, auf den Energieversorgungszustand eingestellt ist.

## Revendications

1. Unité porte à ouverture / fermeture (1) et partie immobile (23), ladite unité porte (1) étant destinée à être disposée dans une ouverture (X) d'une baie de porte en utilisation, l'ouverture présentant une largeur latérale, la partie immobile (23) étant un élément cadre dans lequel l'unité porte à ouverture / fermeture (1) est installée, ladite unité porte (1) comprenant :
- un corps de porte (11) ;
  - une partie de support de mouvements (41) comprenant une partie axiale (41a) pour suspendre de façon tournante le corps de porte (11) au niveau d'un côté extrémité de porte, une console de support (41b) fixée sur le côté supérieur de la partie axiale (41a), des éléments de suspension (41c) soutenus de façon tournante par la console de support (41b), et un rail de guidage (42) pour guider la partie de support de mouvements (41) suivant un sens latéral de la largeur de l'ouverture (X) par rapport à la partie immobile (23) en utilisation ;
  - le corps de porte (11) étant soutenu par la partie de support de mouvements (41) de manière à ce que le corps de porte (11) soit déplacé suivant le sens latéral de la largeur de l'ouverture pendant qu'il est tourné suivant un sens axial pour être en intersection avec l'ouverture (X), l'ouverture (X) étant ouverte et fermée grâce au mouvement et à la rotation du corps de porte (11), et cas dans lequel l'unité porte (1) comporte en outre un moteur linéaire (49) pour déplacer la partie de support de mouvements suivant le sens latéral de la largeur de l'ouverture le long du rail de guidage (42) en utilisation, ledit moteur linéaire incluant un stator (49a) positionné dans la partie immobile (23) et un élément mobile (49b) prévu dans la partie de support de mou-

vements (41) ; et comprenant en outre un dispositif d'attraction magnétique (43) pour maintenir le corps de porte (11) fermé ; **caractérisée en ce que**

le dispositif d'attraction magnétique (43) est fixé sur la partie immobile (23), sur un côté du sens extrémité de porte à partir de la partie de support de mouvements (41) lorsque le corps de porte (11) est pratiquement entièrement fermé, et la partie de support de mouvements (41) est attirée vers ledit dispositif d'attraction magnétique, et cas dans lequel

un intervalle est prévu entre le dispositif d'attraction magnétique (43) et la console de support (41b) lorsque le corps de porte (11) est entièrement fermé, de sorte qu'une force d'attraction du dispositif d'attraction magnétique (43) puisse agir, et qu'aucune partie du dispositif d'attraction magnétique (43) ne soit au contact de la partie de support de mouvements (41) lorsque le corps de porte (11) est entièrement fermé.

2. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 1, une pluralité de corps de porte (11 et 12) étant raccordés en continu les uns avec les autres suivant le sens latéral de la largeur de la partie ouverture (X), et parmi la pluralité de corps de porte (11 et 12), au moins un premier corps de porte (11) est raccordé en position adjacente à au moins un deuxième corps de porte (12), lesdits au moins premier (11) et deuxième (12) corps de porte étant aptes à tourner dans les deux sens, et en faisant soutenir ledit au moins premier corps de porte (11) au niveau d'un côté extrémité de porte par la partie de support de mouvements (41), et également en soutenant de façon tournante ledit au moins deuxième corps de porte (12) au niveau d'un côté arrière de porte par rapport à la partie immobile (23), ledit au moins premier corps de porte (11) au niveau du côté extrémité de porte est apte à tourner dans les deux sens en intersection avec la partie ouverture (X).
3. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 1, lorsque le corps de corps (11) est réglé sur une position entièrement fermée et réglé sur une position entièrement ouverte, ou lorsque le corps de porte (11) est réglé sur l'une des positions, soit la position entièrement fermée soit la position entièrement ouverte, le stator (49a) et l'élément mobile (49b) étant disposés de telle manière à ne pas être opposés l'un à l'autre de sorte que l'élément mobile (49b) ne reçoive pas une force propulsive en provenance du stator (49a).
4. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 3, une énergie d'entraînement fournie au stator (49a) étant commu-

- tée de sorte qu'un sens de propulsion de l'élément mobile (49b) soit réglé dans un sens extrémité de porte lorsque le corps de porte (11) est réglé sur la position entièrement ouverte, et le sens de propulsion de l'élément mobile (49b) soit réglé dans le sens section arrière de porte, lorsque le corps de porte (11) est réglé sur la position entièrement fermée.
- 5
5. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 4, la temporisation de la commutation de l'énergie d'entraînement étant retardée à partir du moment temporel auquel le corps de porte (11) est réglé sur un état entièrement ouvert, ou le moment temporel auquel le corps de porte (11) est réglé sur un état entièrement fermé.
- 10
6. Unité porte à ouverture / fermeture et partie immobile (23) selon la revendication 5, le stator (49a) étant mis dans un état d'alimentation en énergie seulement lorsqu'un capteur (49a1) détecte un état dans lequel le stator (49a) et l'élément mobile (49b) sont opposés l'un à l'autre.
- 15
7. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 1, un capteur (49a1) détectant un état dans lequel l'élément mobile (49b) est déplacé, grâce à la détection d'une force électromotrice induite générée par le stator (49a) dans un état de non alimentation d'énergie, et en fonction du signal capté, l'énergie est fournie au stator (49a).
- 20
8. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 1, lorsque le corps de porte (11) est réglé sur une position entièrement fermée et réglé sur une position entièrement ouverte, le stator (49a) et l'élément mobile (49b) étant disposés de manière à ne pas être opposés l'un à l'autre de sorte que l'élément mobile (49b) ne reçoive pas une force propulsive en provenance du stator (49a).
- 25
9. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 1, une énergie d'entraînement fournie au stator (49a) étant commutée de sorte que, lorsque le corps de porte (11) est réglé sur une position entièrement ouverte, un sens de propulsion de l'élément mobile (49b) soit réglé dans le sens extrémité de porte, et lorsque le corps de porte (11) est réglé sur une position entièrement fermée, le sens de propulsion de l'élément mobile (49b) soit réglé dans le sens section arrière de porte.
- 30
10. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 1, une énergie d'entraînement fournie au stator (49a) étant commutée de sorte que, lorsque le corps de porte (11) est réglé sur une position entièrement ouverte, un sens de propulsion de l'élément mobile (49b) soit réglé dans le sens extrémité de porte, et lorsque le corps de porte (11) est réglé sur une position entièrement fermée, le sens de propulsion de l'élément mobile (49b) soit réglé dans le sens section arrière de porte, et une temporisation pour commuter l'énergie d'entraînement étant retardée à partir du moment temporel auquel le corps de porte (11) est réglé sur l'état entièrement ouvert, ou le moment temporel auquel le corps de porte (11) est réglé sur l'état entièrement fermé.
- 35
11. Unité porte à ouverture / fermeture (1) et partie immobile (23) selon la revendication 1, lorsque le corps de porte (11) est réglé sur la position entièrement fermée et réglé sur la position entièrement ouverte, ou lorsque le corps de porte (11) est réglé sur l'une des positions, soit la position entièrement fermée soit la position entièrement ouverte, le stator (49a) et l'élément mobile (49b) étant disposés de telle manière à ne pas être opposés l'un à l'autre de sorte que l'élément mobile (49b) ne reçoive pas une force propulsive en provenance du stator (49a), et le stator (49a) étant mis dans l'état d'alimentation en énergie seulement lorsqu'un capteur (49a1) détecte un état dans lequel le stator (49a) et l'élément mobile (49b) sont opposés l'un à l'autre.
- 40
- 45
- 50
- 55

FIG. 1

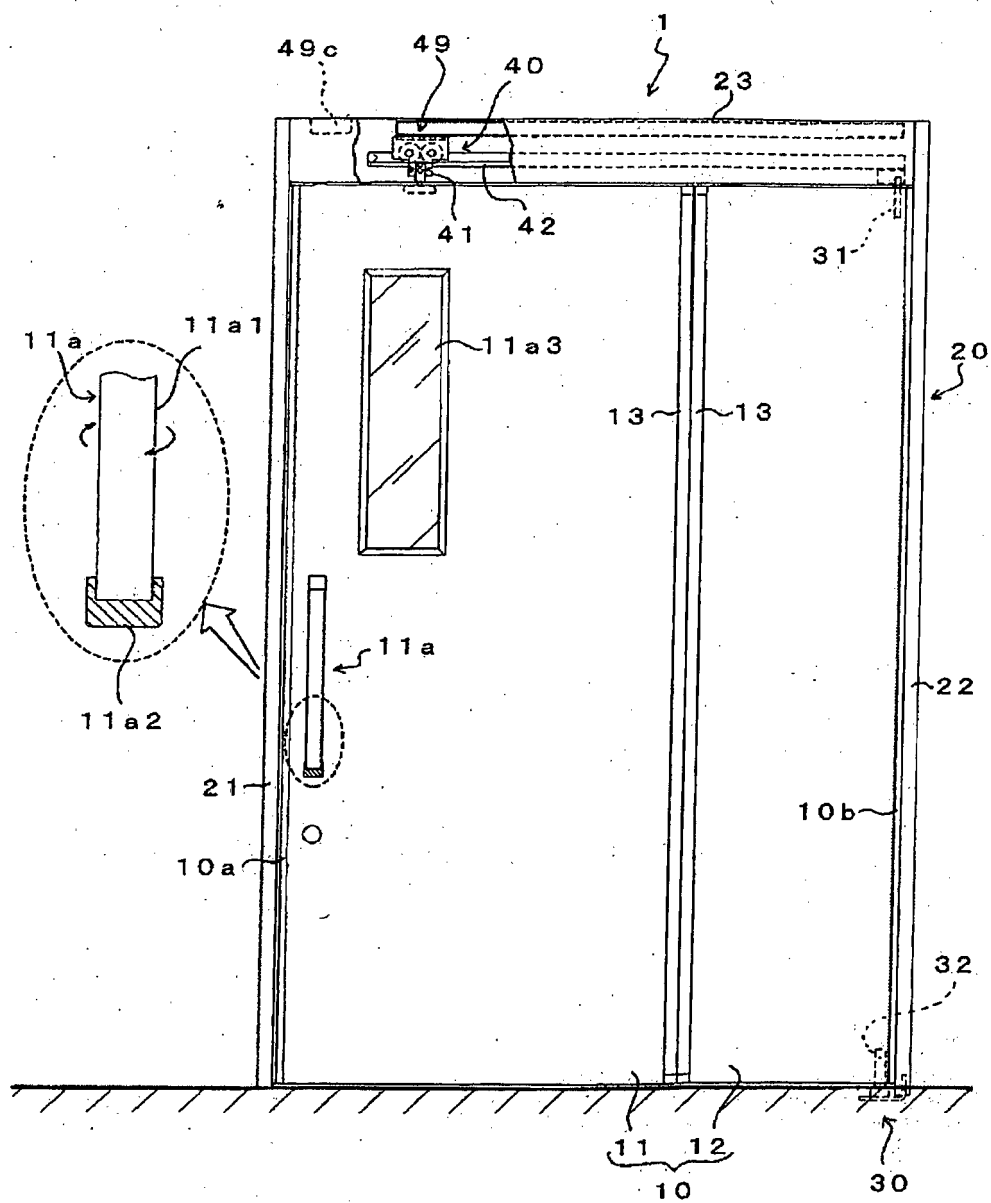




FIG.2

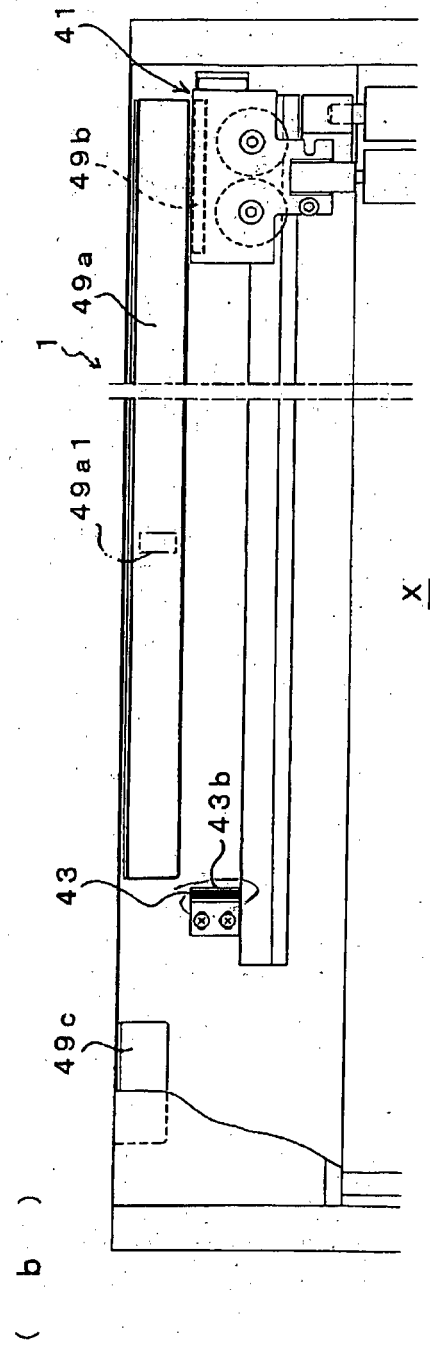
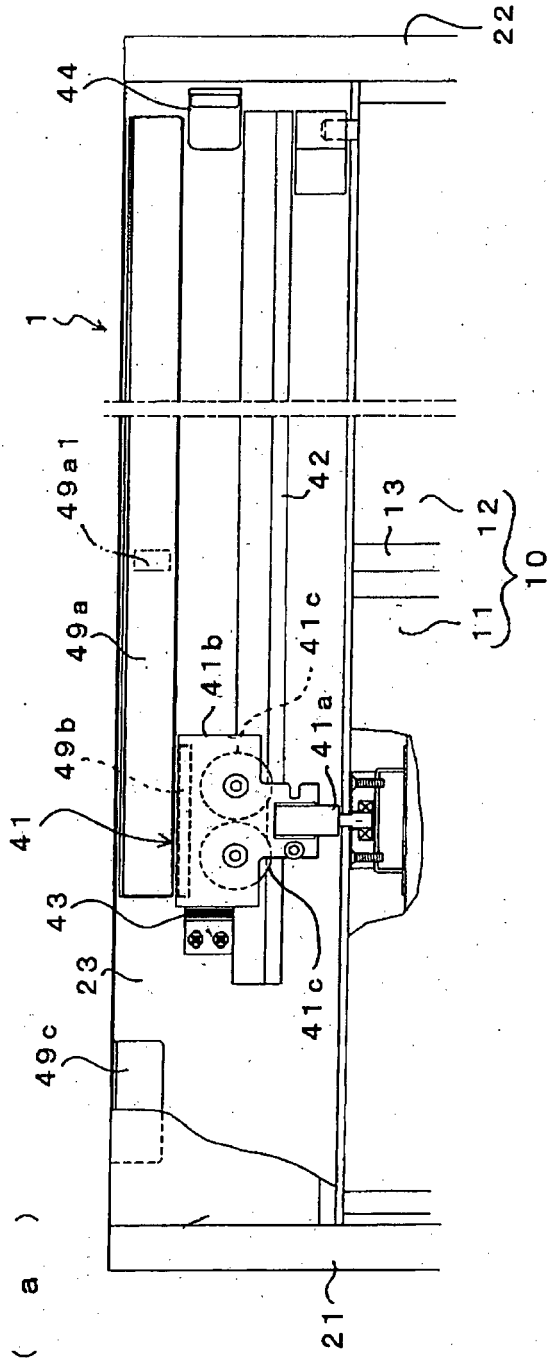


FIG.3

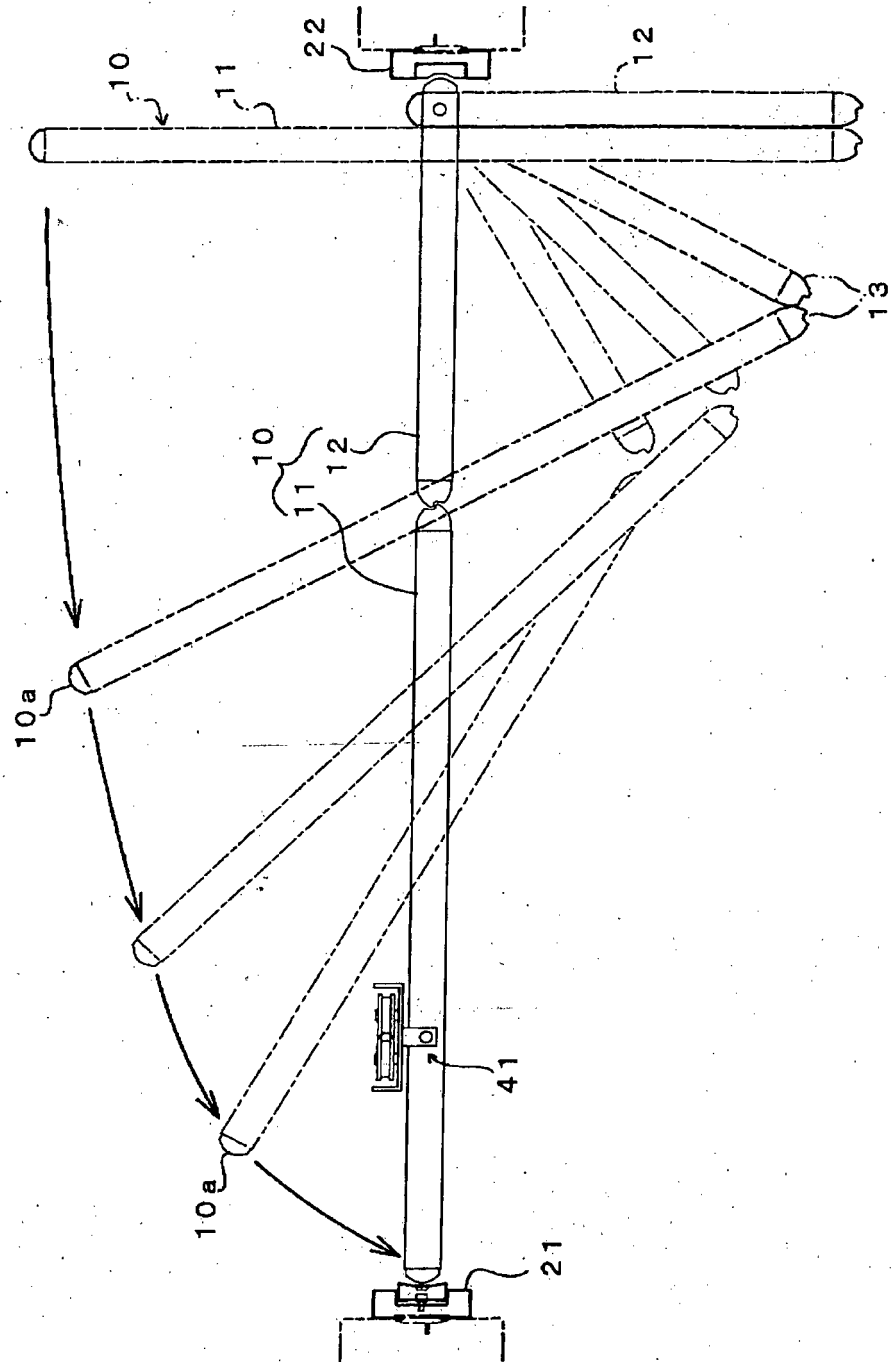


FIG.4

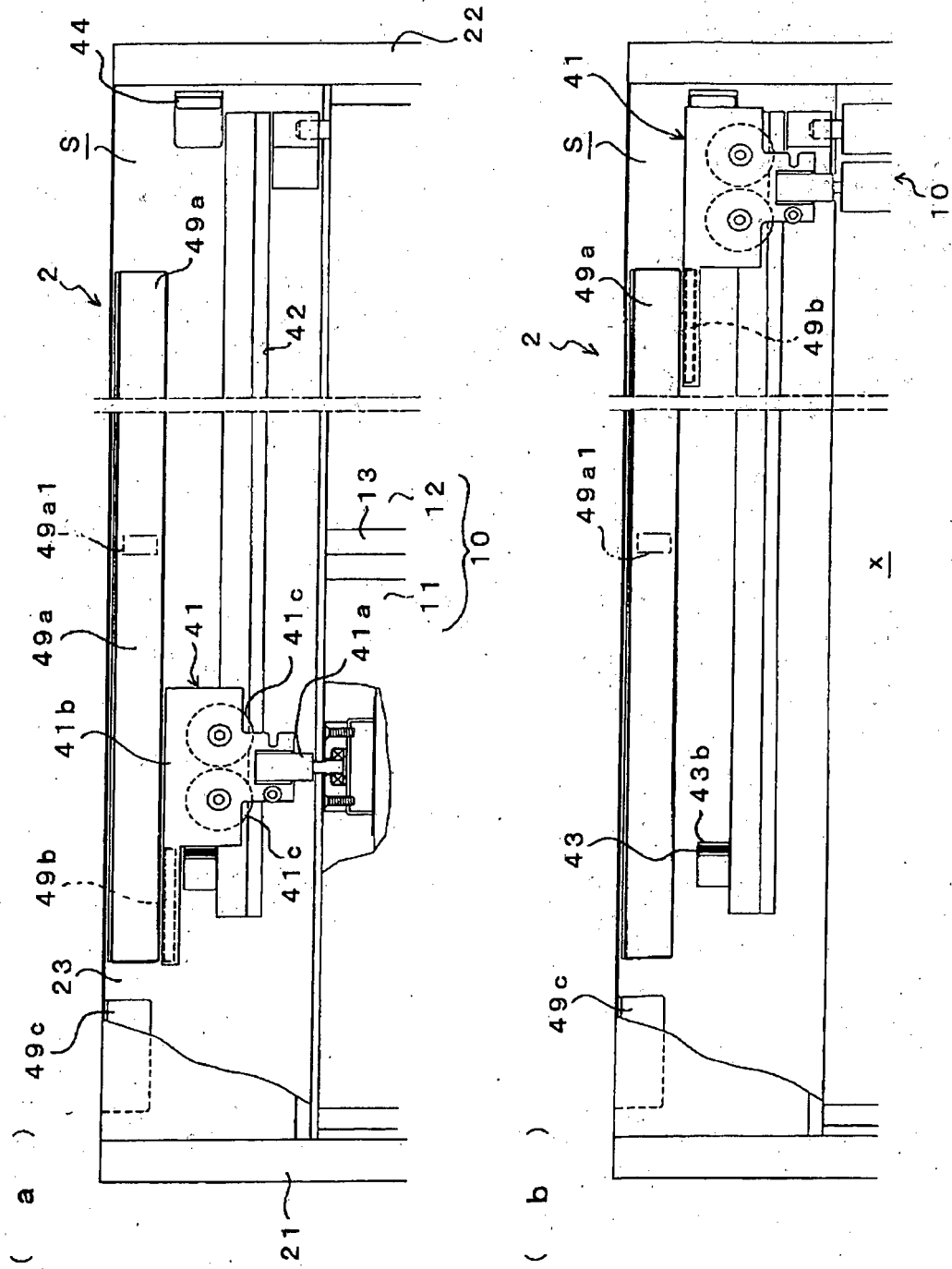


FIG. 5

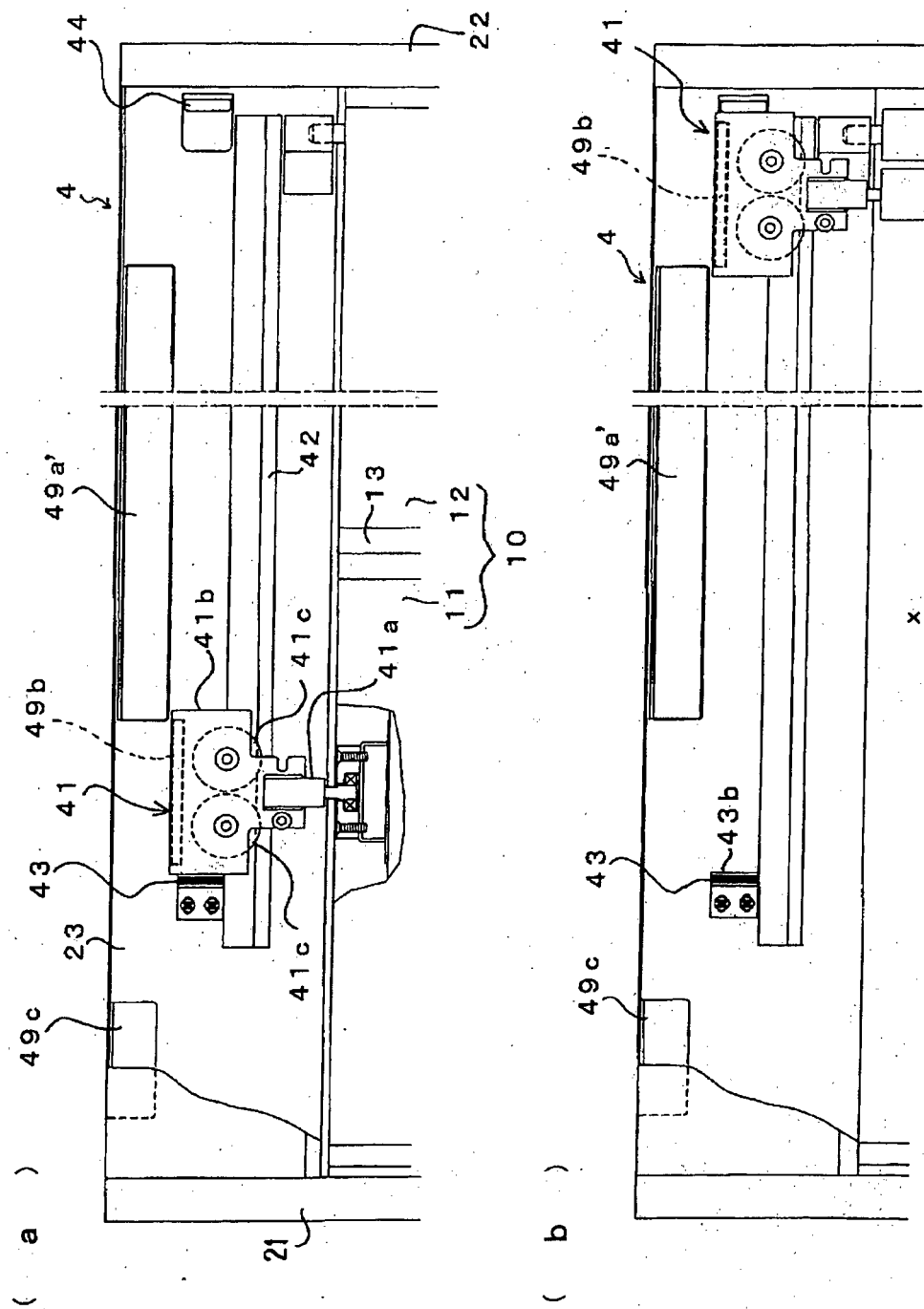


FIG. 6

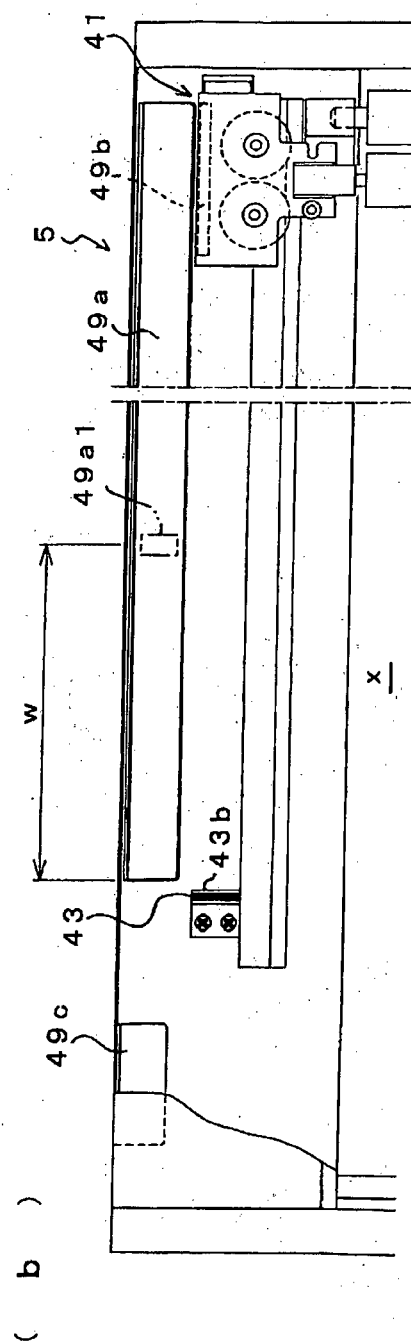
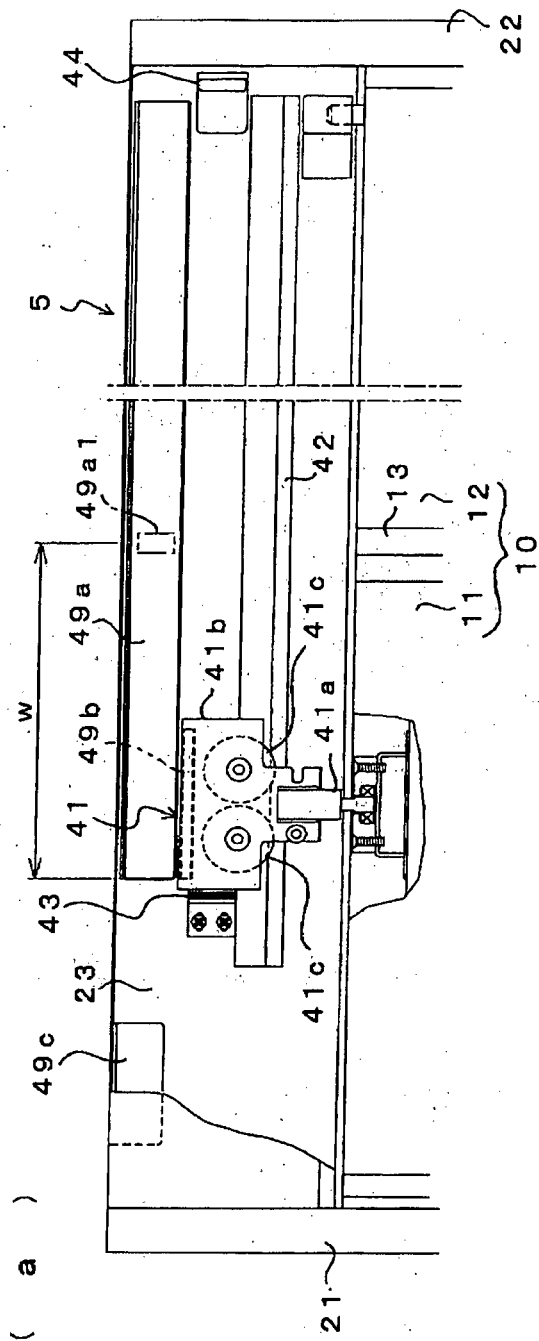


FIG. 7

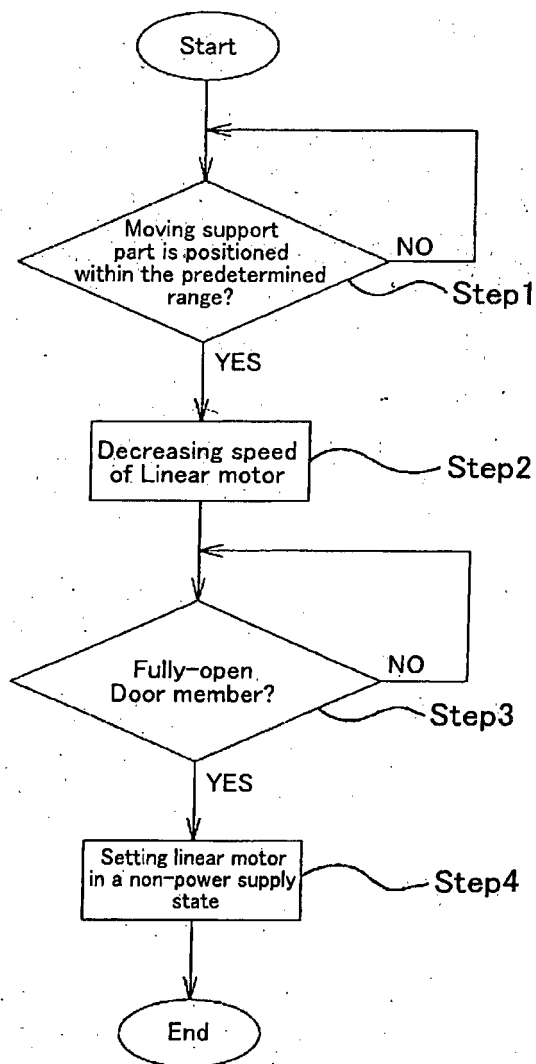
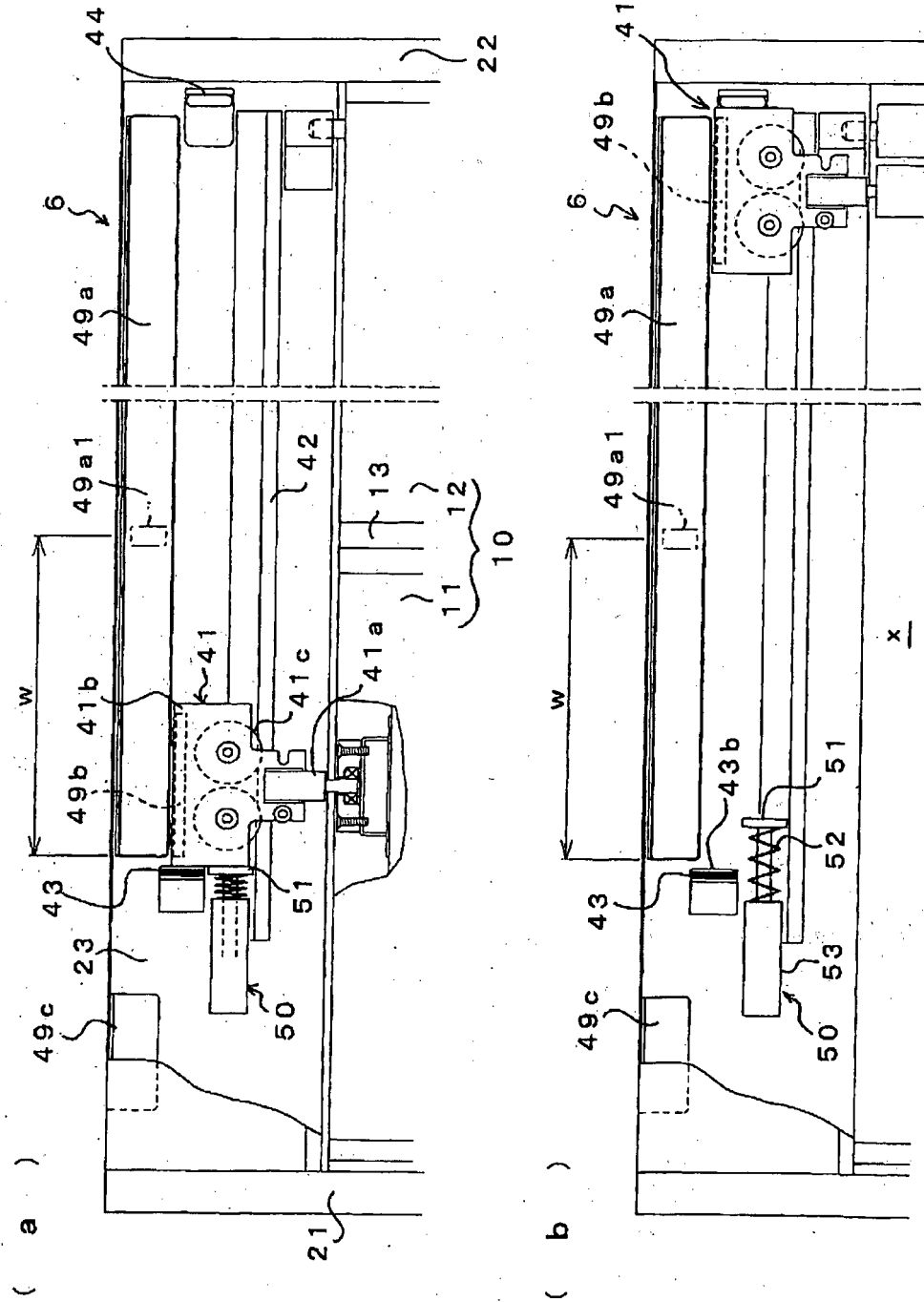


FIG. 8



**REFERENCES CITED IN THE DESCRIPTION**

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