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(54) **Self-closing device for a sliding door**

Selbstschließende Vorrichtung für eine Schiebetür

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Description

[0001] The present invention refers to a sliding door with a self-closing device, particularly, a door with a self-closing device suitable for a manual linear sliding door, e.g. a sliding door for toilet modules of railway vehicles.

BACKGROUND OF THE INVENTION

[0002] In the toilet modules of railway vehicles linear sliding doors are usually used, because these doors have the advantage with respect to the hinged doors that make easier the use of the internal space of said modules.

[0003] The linear sliding doors are mounted on an upper guide and a lower guide, through sliders. The upper guide guides the door and also has a support function of the door leaf and its sliding mechanisms.

[0004] One of the main problems arisen from the use of linear sliding doors in toilet modules of railway vehicles is to guarantee that the door is always closed after the use of the toilet, even if the user does not close it voluntarily.

[0005] To solve this problem, there are in the market a lot of self-closing devices that can be applied to sliding doors. Some of these devices use a spring, or a cylinder pre-loaded with gas that acts as a shock-absorbing spring, that is installed in the upper guide, parallel to the path of the door. When the door is opened, the spring or gas charged cylinder is compressed and its recovering force is used to close the door.

[0006] Said self-closing devices have the drawback that the closing force of the door is not constant, being also very difficult to regulate the closing speed at the last closing stretch of the door.

[0007] The regulation of the closing speed of the door at the last stretch is essential to prevent impacts and the trapping danger of the user hands. However, it is important to stress that the closing speed in this last stretch must be enough to guarantee the complete closing of the door. Furthermore, once the door is completely closed, it is desirable that the self-closing device presses the upright of the door to prevent the accelerations or decelerations of the railway vehicle to produce undesired apertures or closings of the door.

[0008] In the prior art, self-closing devices have been designed for sliding doors for solving the drawbacks of the self-closing devices previously described. DE 240 141 C, US6578320 and JP2006063719 discloses some of these devices.

[0009] The devices of said documents include closing means of the door provided with an actuator axis that is hingedly joined to a closing arm of the door that rotates driven by said actuator to close the door. In the specific case of JP2006063719, the device includes a closing guide of the door in which a first hinged end of said closing arm is mounted, said hinged end being susceptible of moving inside the closing guide when the opposed hinged end of the arm moves associated with the door guide to close said door.

[0010] In said documents, the rotation speed of the actuator axis that drives the closing arm can be regulated to regulate the closing speed of the door. However, the devices of these documents have the drawback that they provide a very limited closing path for the door. To prevent this, it is necessary to use very long closing arms which make difficult the installation and the operation of the device.

[0011] Another drawback of the devices of said documents is that the use of the reactive forces that act on the arm to exert the movement of the door changes a lot along the path, being difficult to guarantee a substantially constant closing force assuring the correct operation of the device (undesired apertures or closings by accelerations or decelerations of the vehicle) and, at the same time, being difficult to guarantee a smooth aperture of the door (under current regulations the aperture force must not exceed 60 N).

DESCRIPTION OF THE INVENTION

[0012] The object of the present invention is to solve said drawbacks, developing a sliding door with a self-closing device particularly a manual linear sliding doors of toilet modules of railway vehicles, having the main advantage that provides a suitable closing path, and also that obtains a substantially constant closing force of the door, that guarantees the optimal operation of the closing device and a smooth aperture of the door.

[0013] According to this object, the present invention provides a sliding door with a self-closing device, said device-comprising closing means of said door and a closing arm of said door that is associated to an actuator axis of said closing means, said device comprising also a closing guide of the door, a first hinged end of said closing arm being mounted associated with said closing guide, said first hinged end being susceptible of moving along said closing guide while a second opposed hinged end of said arm moves associated with a moving guide of the door to close said door, and it is characterized in that said closing means include a closing body provided with a spring that drives said actuator axis, the actuator axis being placed so that it permits said arm to pivot about a plane perpendicular to the door plane, and in that said closing guide is arranged along a direction forming an acute angle "α" with respect to the moving guide of the door itself, the direction of said closing guide permitting a movement of the arm providing a closing path "dAB" of the door additional to the path that provides the rotation of the arm itself on the same closing guide.

[0014] The present invention also provides a method for mounting a sliding door with a self-closing device, comprising

the steps of:

a) arranging the actuator axis of the closing body of the self-closing device substantially parallel to the door so that it permits the closing arm to pivot about a plane perpendicular to the door plane, and

b) arranging the closing guide of the door along a direction forming an acute angle (α) with respect to the guide of the door itself, so that said closing guide permits a movement of the arm providing a door closing path (dAB) additional to the path that provides the rotation of the arm itself in the same closing guide (10).

[0015] In the device and door of the present invention, the closing guide of the door is placed positioned or inclined forming an acute angle "α" with respect to the moving guide of the door itself. Thanks to this feature, the device provides a suitable closing path with no need of using a long closing arm. This is because the position of the guide permits a movement of the arm that provides a closing path "dAB" of the door additional to the path that provides the rotation of the closing guide itself.

[0016] Actually, in the present invention, as the length of the guide is in an inclined position, the total closing path of the door is not only because the rotation of the arm when it moves along the guide, but also because the "horizontal translation" of the arm itself when it moves from an initial point of position "A" to a final point or position "B" of the guide.

[0017] Another advantage of the device of the present invention is that permits to obtain a substantially constant closing force, because the inclined position of the guide permits an optimal use of the reactive forces acting on the arm, the variation of the angle forming the arm with respect to the moving guide of the door being very reduced. Thanks to this feature, the device can be designed guaranteeing a closing force at the end of the path that is suitable to keep the door closed and, at the same time, guaranteeing a closing force that is suitable to permit a smooth aperture (force not higher than 60N at the start of the closing path).

[0018] According to a preferred embodiment, said second hinged end of the closing arm is joined to the actuator axis of said closing means, said closing means being associated to the door guide, so that said closing means moves with said door.

[0019] In this embodiment, the closing means are associated with the door guide, mounted e.g. on the supports that hold the door through the sliders, so that they occupy a very reduced space.

[0020] Advantageously, said closing means are joined to a support of the leaf door that is associated with a slider of the guide of the door.

[0021] The closing body that includes the device can be easily found in the market, because they are usually used for hinged doors.

[0022] Advantageously, said closing means include means for regulating the rotation speed of the actuator axis and, preferably, said regulation means are hydraulic regulation means that permit to regulate the rotation speed of the axis of one or several stretches of the closing path of the door.

[0023] Thanks to this feature, two closing speed can be obtained: a quick closing speed of the door from the start and during the most of the path, and a slow speed when it arrives at 100 mm from the door upright, to prevent the hands to be trapped, but at the same time strong enough to guarantee the complete closure.

[0024] According to a first embodiment, said closing guide is straight, the line that joins the end points (A, B) of said straight guide forming said acute angle "α" with respect to the moving guide of the door.

[0025] Preferably, said closing guide is arranged along a direction forming an acute angle "α" lower that 90° with respect to the moving guide of the door and, advantageously, said angle "α" is an acute angle from 30° and 50°.

[0026] It has been observed that this range of angles is suitable to provide a suitable closing path for the door and a closing force that permits the optimal operation of the device.

[0027] Again preferably, said closing guide is placed at a distance from the moving guide of the door such that,

- at the starting position "A" of the closing guide, said closing arm is arranged along a direction forming an angle βA higher than 10° with respect to the door guide; and
- at the final position "B" of the closing guide, said closing arm is arranged along a direction forming and angle βB lower than 80° with respect to the guide of the door itself.

[0028] It has been observed that this range of angles permits an optimal use of the reaction forces acting on the closing arm, the closing force loss being very reduced along the closing path.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] For a better understanding of what has been disclosed, some drawings are attached, in which, diagrammatically and only as a non limitative example, a practical embodiment is shown.

[0030] In said drawings,

Fig. 1 is a perspective view of a self-closing device mounted on a manual lineal sliding door, in position of closed door;
Fig. 2 is a perspective view of the device of Fig. 1, in position of open door;
Fig. 3 is a plan view of a self-closing device mounted on a manual linear sliding door, in position of open door;
Fig. 4 is a plan view of the device of Fig. 3, in position of closed door;
Fig. 5 is a diagrammatical plan view of the device showing the two positions of the closing arm at the ends of the closing guide, graphically showing the additional closing path "dAB" that provides the device;
Fig. 6 is a plan view of Fig. 3 illustrating a diagrammatical development of the static forces acting on the device in the position of open door;
Fig. 7 is a plan view of Fig. 4 showing a diagrammatical development of the static forces acting on the device in the position of closed door.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0031] Hereinafter a preferred embodiment of a linear sliding door 2 with a self-closing device 1 of the present invention is disclosed.

[0032] As shown in Figs. 1 and 2, the disclosed self-closing device 1 is applied to a manual lineal sliding door 2 that is used in toilet modules of railway vehicles.

[0033] Said linear sliding doors 2 are mounted on an upper guide 3 and a lower guide 4, by sliders 5a, 5b that are joined to side supports 6a, 6b of the leaf 7 of the door 2.

[0034] In the disclosed embodiment, the self-closing device 1 includes closing means that are configured by a closing body 8 of commercial kind, provided with a spring that drives the actuator axis 9.

[0035] The closing body 8 is joined to the frontal support 6a of the door 2 so that said closing body 8 and its actuator axis 9 are susceptible of moving with the door 2 by the sliders 5a, 5b of the upper guide 3.

[0036] As shown in detail in Figs. 3 and 4, the device 1 includes a closing guide 10 and a closing arm 11 that is associated to the actuator axis 9 of the closing body 8, so that said arm 11 is susceptible of pivoting about a plane perpendicular to the door plane 2.

[0037] The closing arm 11 includes a first hinged end 11a mounted slidingly inside the closing guide 10, and a second hinged end 11b joined to said actuator axis 9 of the closing body 8. Said first hinged end 11a is susceptible of being moved inside the closing guide 10 while said second opposed end 11b moves associated to the upper guide 3 of the door 2 to close said door 2. Figs. 3 and 4 show the positions of the closing arm 11 when it moves to close the door 2, from a starting point or position "A" to a final point or position "B" of the closing guide 10.

[0038] The claimed closing device 1 is characterized in that the closing guide 10 is arranged along a direction forming an acute angle α lower than 90° with respect to the moving guide 3 of the door 2 itself.

[0039] As stated previously in the description of the invention, as the length "L" of the closing guide 10 is extended on an inclined position, the total closing path "dT" of the door 2 is incremented with respect to the path of the prior art devices, with no need of using a closing door 11 with a great length. This is because the inclined closing guide 10 provides a closing path "dAB" additional to the path that provides the rotation of the arm 10 itself at the same closing guide 11.

[0040] Fig. 5 shows graphically the additional closing path "dAB" that provides the horizontal translation of the arm 11 when it moves from the starting position "A" to the final position "B" of the closing guide 10. Thanks to said additional path "dAB", in the present invention, the total closing path "dT" of the door 2 is enough to guarantee, according the regulations, a useful aperture of said door 2 of at least 500 mm with a length "1" of the closing arm 11 lower than 400 mm.

[0041] Turning back to the closing arm 11, to take advantage of the reaction forces acting on this arm 11 to close the door 2, the closing guide 10 has been placed at a distance from the moving guide 3 of the door 2 so that it permits to arrange, at a starting point or position "A" of said closing guide 10, said closing arm 11 along a direction forming an angle βA higher than 10° with respect to the door guide 3 and to arrange, at a final point or position "B" of the same closing guide 10, said closing arm 11 along a direction forming a angle βB lower than 80° with respect to the same guide 3 of the door 2.

[0042] Said positions of the closing arm 11 have the advantage that minimize the residual reactive forces "FRr", or forces that not compensate the momentum acting on the closing arm 11. This contributes to keep a closing force substantially constant that guarantees a smooth aperture (force not higher than 60N at the path start) and, at the same time, a secure closure supporting the maximum unevenness of the vehicle, with no need of mechanical anchorages.

[0043] Figs. 6 and 7 show a diagrammatical development of the static forces acting on the device 1 at the open door 2 and closed door 2 positions. The design features of the device 1 of these Figs. 6 and 7 are:

- α= 40°
- βA = 15°
- βB = 69°

- closing arm 11 length "1" = 375 mm
- closing guide 10 length "L" = 387 mm.

[0044] Hereinafter the formulas for calculating the closing force of the door at the start of the path (open door position) and at the end of the path (closed door position) are detailed, making reference to the diagrammatical development of static forces shown in the embodiments of Figs. 6 and 7.

Formula for calculating the closing force

[0045]

➢ at the start of the path (open door position in Fig. 6)

$$FCPA = -FRu \cdot \sin \beta_A - FRr \cdot \cos \beta_A$$

being;

$$FRu = \frac{M_A}{l}$$

$$FRr = FRu \cdot tg(\alpha - \beta_A) = \frac{M_A}{l} \cdot tg(\alpha - \beta_A)$$

wherein;

FCPA is the closing force at the start of the path
FRu is the useful reactive force
FRr is the residual reactive force
M_A is the momentum of the actuator axis 9 at the open door 2 position
l is the length of the closing arm 11

➢ at the end of the path (closed door position in Fig. 7)

$$FCPB = -FRu \cdot \cos(90 - \beta_B) + FRr \cdot \cos \beta_B$$

being;

$$FRu = \frac{M_B}{l}$$

$$FRr = FRu \cdot tg(\alpha - \beta_B) = \frac{M_B}{l} \cdot tg(\alpha - \beta_B)$$

wherein;

FCPB is the closing force at the end of the path
FRu is the useful reactive force
FRr is the residual reactive force
M_B is the momentum of the actuator axis 9 in the closed door 2 position

l is the length of the closing arm 11

[0046] From the formulas and Figs. 6 and 7 attached it is clear that, in the present invention, at the start and the end of the path of the door 2, the useful reactive forces "FRu" that compensate the momentum of the actuator axis 9 are substantially greater than the residual reactive forces "FRr" or forces that do not compensate the momentum of the actuator axis 9. Furthermore, the horizontal component of the useful reactive forces "FRu" is kept substantially constant along the path, which contributes to keep substantially constant the closing force of the door 2. Thanks to this, differently from the prior art devices, with the claimed device it is possible to guarantee the correct closure of the door 2, preventing undesired apertures caused by accelerations or decelerations of the vehicle and, at the same time, guaranteeing a smooth aperture of the door 2 (aperture force at the start of the path lower than 60N).

[0047] As stated in the description of the invention, said residual reactive forces "FRr" can be minimized even more, providing a curved trajectory to the closing guide 10. Furthermore, it has been observed that, applying design features (α, $\beta\beta A$, βB, *l*, *L*) of the device similar to those shown in Figs. 6 and 7, the curved trajectory of the guide 10 contributes to make uniform more the closing forces, because the horizontal component of the residual reactive forces "FRr" on the curved guide reduces the closing force "FCPA" at the start of the path and, on the other hand, increases the closing force "FCPB" at the end of the path.

[0048] In the disclosed embodiment, the length "1" of the closing arm 11 and the length "L" of the closing guide 10, have been chosen 375 mm and 397 mm, respectively, because they are the lengths that has been considered more suitable for working with the commercial value chosen from the torsion momentum "MA/MB" of the actuator axis 9, and for providing a total closing path "dT" of the door 2 higher than 500 mm. However, these lengths can change if different working torsion momentum "MA/MB" and/or a different closing paths of the door 2 are changed.

[0049] On the other hand, in the disclosed embodiment, the closing arm 11 has been joined to the actuator axis 9 of the closing body 8, through a hole with a substantially square section, that has been arranged along a direction forming the line that defines a side of the square section an angle "χ" with respect to the line defining the length of the arm. This angle "χ" of the hole prevents the actuator axis 9 engaged to the arm 11 to reach its end or mechanical stop at the end of the path of the door 2, determining a "pre-charge" of the device 1 that guarantees to obtain an optimal torsion momentum "MB", at the end of the closing path, in the closed door 2 position.

[0050] Regarding the closing body 8 that drives the actuator axis 9, in the disclosed embodiment, this body 8 is provided with hydraulic means for regulating the rotation speed of the actuator axis 9.

[0051] As stated in the description of the invention, the regulation hydraulic means have the advantage that permit to regulate two closing speeds of the door 2; a first quick closing speed during the most part of the path, and a second slower closing speed, when it arrives at about 100 mm from the door 2 upright, to prevent the hands to be trapped. Another advantage of the regulation hydraulic means is that they exert a shock-absorbing effect of the impact of the door 2 against the upright, so that it prevents the use of additional shock-absorbing mechanisms.

[0052] Thanks to the described features, the claimed device 1 permits the self closing of a manual linear sliding door 2 of a toilet module of a railway vehicle, with no need of mechanical anchorages and meeting always the railway regulations of access doors, that requires a useful aperture also greater than 500 mm, a force not higher than 60N for the total opening of the door 2, and a force of 13N or lower in the impact of the door 2 against an object during the closing path.

[0053] Even though a specific embodiment of the present invention has been described and shown, it is apparent for a person skilled in the art that several variations and modifications can be introduced, or the details can be substituted by other technically equivalent ones, without departing from the scope of protection defined by the attached claims.

[0054] For example, even though reference has been made in the present specification to a linear sliding door 2 with a self-closing device 1 wherein the self-closing body 8 is associated with the moving guide 3 of the door 2, similar results could be obtained with a self closing device wherein the closing body 8 is associated with the closing guide 10, instead of the movement guide 3, and it would be moved along said closing guide 10. However, in this last case, the end of the closing arm 11 not associated with the actuator axis 9 of the closing body 8 would be mounted movable along the moving guide 3 of the door 2 to permit the closure of said door 2.

Claims

1. A sliding door (2) with a self-closing device (1), said sliding door (2) being suitable for toilet modules of railway vehicles, the device (1) comprising closing means (8) for said door (2) and a closing arm (11) of said door (2) that is associated with an actuator axis (9) of said closing means (8), said device (1) also comprising a closing guide (10) of the door (2), a first hinged end (11a) of said closing arm (11) being mounted associated with said closing guide (10), said first hinged end (11a) being susceptible of moving along said closing guide (10) while a second opposed hinged end (11b) of said arm (10) moves associated with a moving guide (3) of the door (2) to close said

door (2), wherein said closing means include a closing body (8) provided with a spring that drives said actuator axis (9), and said closing guide (10) is arranged along a direction forming an acute angle (α) with respect to the guide (3) of the door itself, the direction of said closing guide (10) permitting a movement of the arm (11) that provides a door closing path (dAB) additional to the path that provides the rotation of the arm (11) itself in the same closing guide (10), **characterized in that** said actuator axis (9) is placed so that it permits said arm (11) to pivot about a plane perpendicular to the door plane (2).

2. Device according to claim 1, wherein said second hinged end (11b) of the closing arm (11) is joined to the actuator axis (9) of said closing means (8), said closing means (8) being associated with the door guide (3), so that said closing means (8) moves with said door (2).

3. Device according to claim 2, wherein said closing means (8) are joined to a support (6a) of the leaf of the door (2) that is associated with a slider (5a) of the guide (3) of the door (2).

4. Device according to claim 1, wherein said closing body (8) includes regulation means of the rotation speed of the actuator axis (9).

5. Device according to claim 4, wherein said regulation means are hydraulic regulation means that permit to regulate the rotation speed of the axis (9) of one or more lengths of the closing path of the door (9).

6. Device according to anyone of the previous claims, wherein said closing guide (10) is straight, the line joining the end points (A, B) of said straight guide (10) forming said acute angle (α) with respect to the guide (3) of the door (2) itself.

7. Device according to anyone of the previous claims, wherein said acute angle (α) is an angle lower than 90°.

8. Device according to claim 7, wherein said angle (α) is an acute angle from 30° and 50°.

9. Device according to anyone of the previous claims, wherein said closing guide (10) is placed at a distance from the moving guide (3) of the door (2) so that,

- in an starting position (A) of the closing guide (10), said closing arm (11) is arranged along a direction forming an angle (βA) higher than 10° with respect to the guide (3) of the door (2), and
- in a final position (B) of the closing guide (10), said closing arm (11) is arranged along a direction forming an angle (βB) lower than 80° with respect to said guide (3) of the door (2).

10. Device according to anyone of the previous claims, wherein said sliding door is a manual linear sliding door (2) for toilet modules of railway vehicles.

11. A method for mounting a sliding door (2) with a self-closing device (1) according to any of claims 1 to 10, comprising the steps of:

a) arranging the actuator axis (9) of the closing body (8) of the self-closing device (1) substantially parallel to the door (2) so that it permits the closing arm (11) to pivot about a plane perpendicular to the door plane (2), and
b) arranging the closing guide (10) of the door (2) along a direction forming an acute angle (α) with respect to the guide (3) of the door (2) itself, so that said closing guide (10) permits a movement of the closing arm (11) providing a door closing path (dAB) additional to the path that provides the rotation of the arm (11) itself in the same closing guide (10).

Patentansprüche

1. Eine Schiebetür (2) mit einer Selbstschließvorrichtung (1), wobei die Schiebetür (2) für Toilettenmodule von Eisenbahnfahrzeugen geeignet ist, wobei die Vorrichtung (1) eine Schließeinrichtung (8) für die Tür (2) und einen Schließarm (11) der Tür (2), der einer Betätigungsgliedachse (9) der Schließeinrichtung (8) zugeordnet ist, aufweist, wobei die Vorrichtung (1) ferner eine Schließführung (10) der Tür (2) aufweist, wobei ein erstes angelenktes Ende (11a) des Schließarms (11) in Zuordnung zu der Schließführung (10) angeordnet ist, wobei das erste angelenkte Ende (11a) zu einer Bewegung entlang der Schließführung (10) fähig ist, während sich ein zweites gegenüberlie-

gendes angelenktes Ende (11 b) des Arms (10) in Zuordnung zu einer Bewegungsführung (3) der Tür (2) bewegt, um die Tür (2) zu schließen, wobei die Schließeinrichtung einen Schließkörper (8) umfasst, der mit einer Feder versehen ist, die die Betätigungsgliedachse (9) treibt, und die Schließführung (10) entlang einer Richtung angeordnet ist, die bezüglich der Führung (3) der Tür selbst einen spitzen Winkel (α) bildet, wobei die Richtung der Schließführung (10) eine Bewegung des Arms (11) ermöglicht, die zusätzlich zu dem Pfad, der die Drehung des Arms (11) selbst in derselben Schließführung (10) bereitstellt, einen Türschließpfad (dAB) bereitstellt, **dadurch gekennzeichnet, dass** die Betätigungsgliedachse (9) so platziert ist, dass sie ermöglicht, dass sich der Arm (11) um eine zu der Türebene (2) senkrechte Ebene dreht.

2. Vorrichtung gemäß Anspruch 1, bei der das zweite angelenkte Ende (11 b) des Schließarms (11) mit der Betätigungsgliedachse (9) der Schließeinrichtung (8) verbunden ist, wobei die Schließeinrichtung (8) der Türführung (3) zugeordnet ist, sodass sich die Schließeinrichtung (8) mit der Tür (2) bewegt.

3. Vorrichtung gemäß Anspruch 2, bei der die Schließeinrichtung (8) mit einer Halterung (6a) des Blattes der Tür (2) verbunden ist, das einem Schieber (5a) der Führung (3) der Tür (2) zugeordnet ist.

4. Vorrichtung gemäß Anspruch 1, bei der der Schließkörper (8) eine Regulierungseinrichtung der Drehgeschwindigkeit der Betätigungsgliedachse (9) umfasst.

5. Vorrichtung gemäß Anspruch 4, bei der die Regulierungseinrichtung eine hydraulische Regulierungseinrichtung ist, die ermöglicht, die Drehgeschwindigkeit der Achse (9) einer oder mehrerer Längen des Schließpfades der Tür (9) zu regulieren.

6. Vorrichtung gemäß einem der vorherigen Ansprüche, bei der die Schließführung (10) gerade ist, wobei die Linie, die die Endpunkte (A, B) der geraden Führung (10) verbindet, den spitzen Winkel (α) bezüglich der Führung (3) der Tür (2) selbst bildet.

7. Vorrichtung gemäß einem der vorherigen Ansprüche, bei der der spitze Winkel (α) ein Winkel unter 90° ist.

8. Vorrichtung gemäß Anspruch 7, bei der der Winkel (α) ein spitzer Winkel zwischen 30° und 50° ist.

9. Vorrichtung gemäß einem der vorherigen Ansprüche, bei der die Schließführung (10) in einem Abstand von der Bewegungsführung (3) der Tür (2) platziert ist, sodass

   - in einer Anfangsposition (A) der Schließführung (10) der Schließarm (11) entlang einer Richtung angeordnet ist, die bezüglich der Führung (3) der Tür (2) einen Winkel (βA) bildet, der mehr als 10° beträgt, und
   - in einer Endposition Position (B) der Schließführung (10) der Schließarm (11) entlang einer Richtung angeordnet ist, die bezüglich der Führung (3) der Tür (2) einen Winkel (βB) bildet, der weniger als 80° beträgt.

10. Vorrichtung gemäß einem der vorherigen Ansprüche, bei der die Schiebetür eine manuelle lineare Schiebetür (2) für Toilettenmodule von Eisenbahnfahrzeugen ist.

11. Ein Verfahren zum Anbringen einer Selbstschließvorrichtung (1) an einer Schiebetür (2) gemäß einem der Ansprüche 1 bis 10, das folgende Schritte aufweist:

    a) Anordnen der Betätigungsgliedachse (9) des Schließkörpers (8) der Selbstschließvorrichtung (1) im Wesentlichen parallel zu der Tür (2), sodass sie ermöglicht, dass sich der Schließarm (11) um eine zu der Türebene (2) senkrechte Ebene dreht, und
    b) Anordnen der Schließführung (10) der Tür (2) entlang einer Richtung, die einen spitzen Winkel (α) bezüglich der Führung (3) der Tür (2) selbst bildet, sodass die Schließführung (10) eine Bewegung des Schließarms (11) ermöglicht, die zusätzlich zu dem Pfad, der die Drehung des Arms (11) selbst in derselben Schließführung (10) bereitstellt, einen Türschließpfad (dAB) bereitstellt,

Revendications

1. Porte coulissante (2) comprenant un dispositif de fermeture automatique (1), ladite porte coulissante (2) étant appropriée pour des modules de toilettes de véhicules de chemin de fer, le dispositif (1) comprenant des moyens

de fermeture (8) pour ladite porte (2) et un bras de fermeture (11) de ladite porte (2) qui est associé à un axe d'actionneur (9) desdits moyens de fermeture (8), ledit dispositif (1) comprenant également un guide de fermeture (10) de la porte (2), une première extrémité articulée (11a) dudit bras de fermeture (11) étant montée en association avec ledit guide de fermeture (10), ladite première extrémité articulée (11a) étant susceptible de se déplacer le long dudit guide de fermeture (10) alors qu'une deuxième extrémité articulée opposée (11b) dudit bras (10) se déplace en association avec un guide mobile (3) de la porte (2) pour fermer ladite porte (2), dans laquelle lesdits moyens de fermeture comprennent un corps de fermeture (8) pourvu d'un ressort qui entraîne ledit axe d'actionneur (9) et ledit guide de fermeture (10) est agencé le long d'une direction formant un angle aigu (α) par rapport au guide (3) de la porte elle-même, la direction dudit guide de fermeture (10) permettant un déplacement du bras (11) qui fournit un chemin de fermeture de porte (dAB) supplémentaire au chemin qui permet la rotation du bras (11) lui-même dans le même guide de fermeture (10), **caractérisée en ce que** ledit axe d'actionneur (9) est placé de telle sorte qu'il permette audit bras (11) de pivoter autour d'un plan perpendiculaire au plan de la porte (2).

2. Dispositif selon la revendication 1, dans lequel ladite deuxième extrémité articulée (11b) du bras de fermeture (11) est jointe à l'axe d'actionneur (9) desdits moyens de fermeture (8), lesdits moyens de fermeture (8) étant associés au guide de porte (3), de telle sorte que lesdits moyens de fermeture (8) se déplacent avec ladite porte (2).

3. Dispositif selon la revendication 2, dans lequel lesdits moyens de fermeture (8) sont joints à un support (6a) du vantail de la porte (2) qui est associé à un coulisseau (5a) du guide (3) de la porte (2).

4. Dispositif selon la revendication 1, dans lequel ledit corps de fermeture (8) comprend des moyens de régulation de la vitesse de rotation de l'axe d'actionneur (9).

5. Dispositif selon la revendication 4, dans lequel lesdits moyens de régulation sont des moyens de régulation hydrauliques qui permettent de réguler la vitesse de rotation de l'axe d'actionneur (9) d'une ou de plusieurs longueur(s) du chemin de fermeture de la porte (2).

6. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit guide de fermeture (10) est droit, la ligne joignant les points d'extrémité (A, B) dudit guide droit (10) formant ledit angle aigu (α) par rapport au guide (3) de la porte (2) elle-même.

7. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit angle aigu (α) est un angle inférieur à 90°.

8. Dispositif selon la revendication 7, dans lequel ledit angle aigu (α) est un angle aigu compris entre 30° et 50°.

9. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit guide de fermeture (10) est placé à une distance du guide mobile (3) de la porte (2), de telle sorte que :

- dans une position de départ (A) du guide de fermeture (10), ledit bras de fermeture (11) soit agencé le long d'une direction formant un angle (βA) supérieur à 10° par rapport au guide (3) de la porte (2), et
- dans une position finale (B) du guide de fermeture (10), ledit bras de fermeture (11) soit agencé le long d'une direction formant un angle (βB) inférieur à 80° par rapport audit guide (3) de la porte (2).

10. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ladite porte coulissante est une porte coulissante linéaire manuelle (2) pour des modules de toilettes de véhicules de chemin de fer.

11. Procédé de montage d'une porte coulissante (2) avec un dispositif de fermeture automatique (1) selon l'une quelconque des revendications 1 à 10, comprenant les étapes suivantes :

a) agencer l'axe d'actionneur (9) du corps de fermeture (8) du dispositif de fermeture automatique (1) sensiblement parallèlement à la porte (2), de telle sorte qu'il permette au bras de fermeture (11) de pivoter autour d'un plan perpendiculaire au plan de la porte (2), et
b) agencer le guide de fermeture (10) de la porte (2) le long d'une direction formant un angle aigu (α) par rapport au guide (3) de la porte (2) elle-même, de telle sorte que ledit guide de fermeture (10) permette un déplacement du bras de fermeture (11), fournissant un chemin de fermeture de porte (dAB) supplémentaire au chemin qui permet la rotation du bras (11) lui-même dans le même guide de fermeture (10).

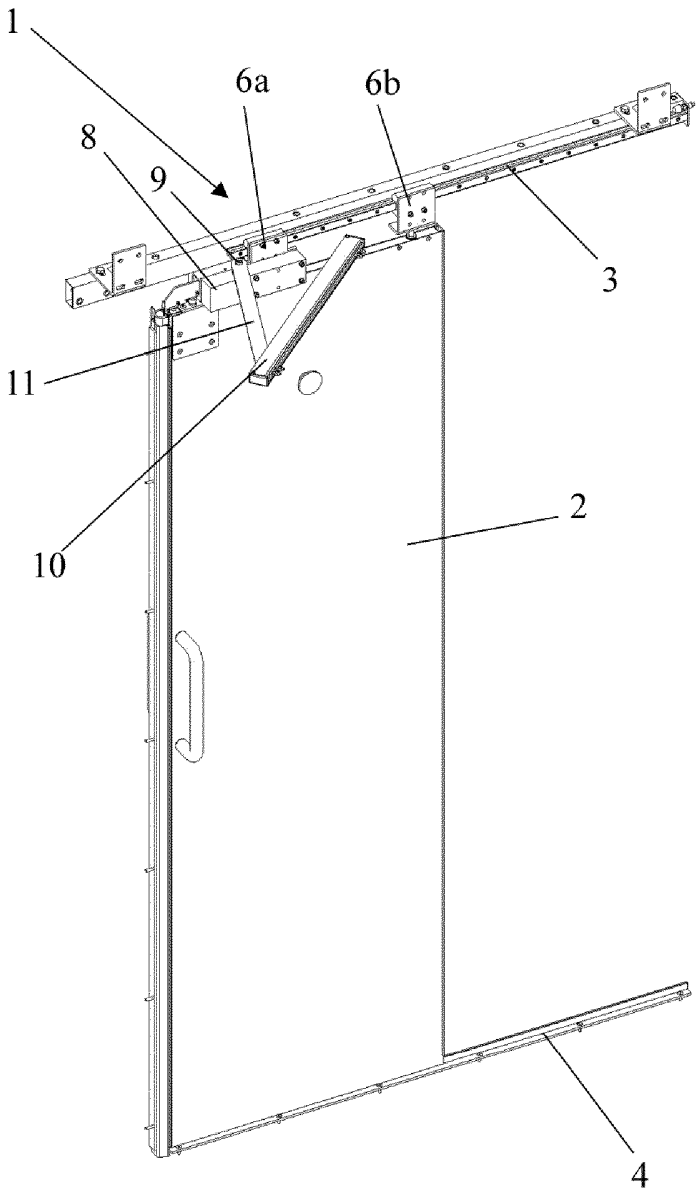


FIG. 1

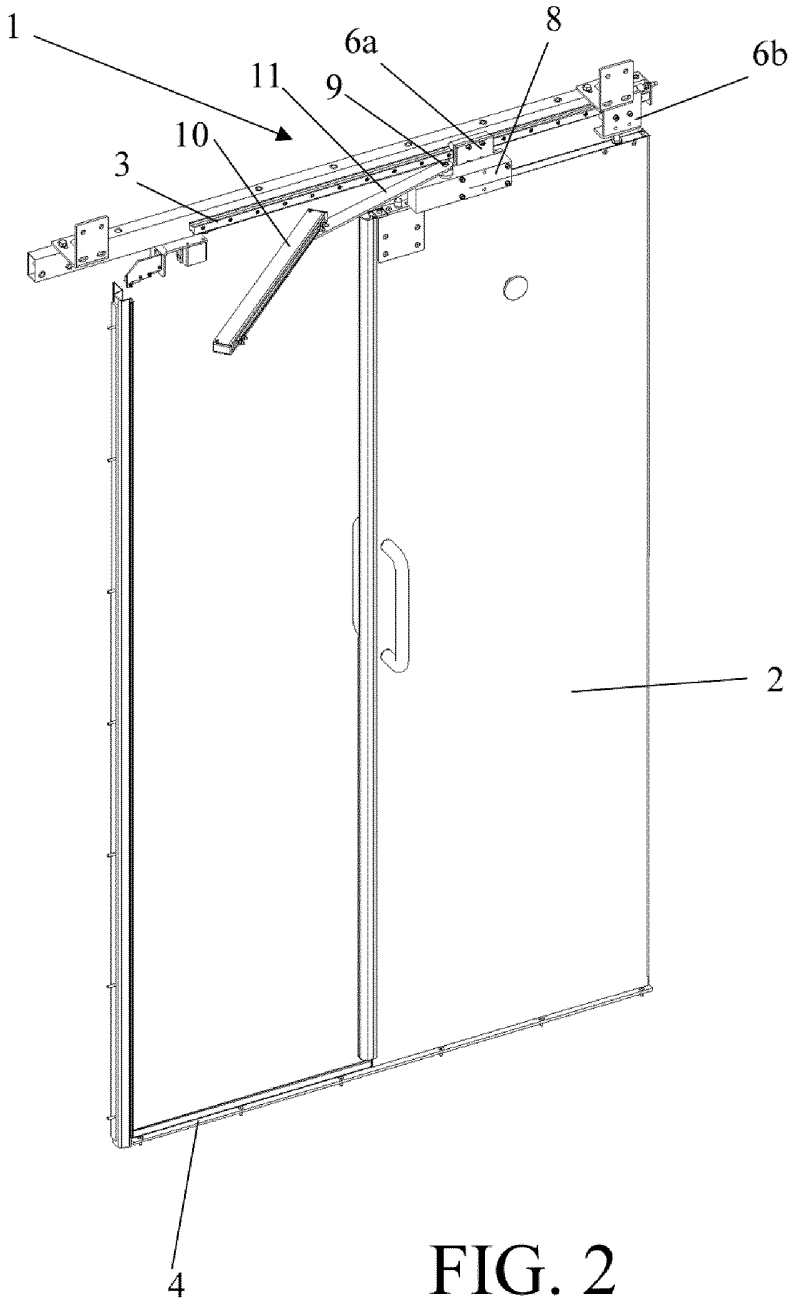


FIG. 2

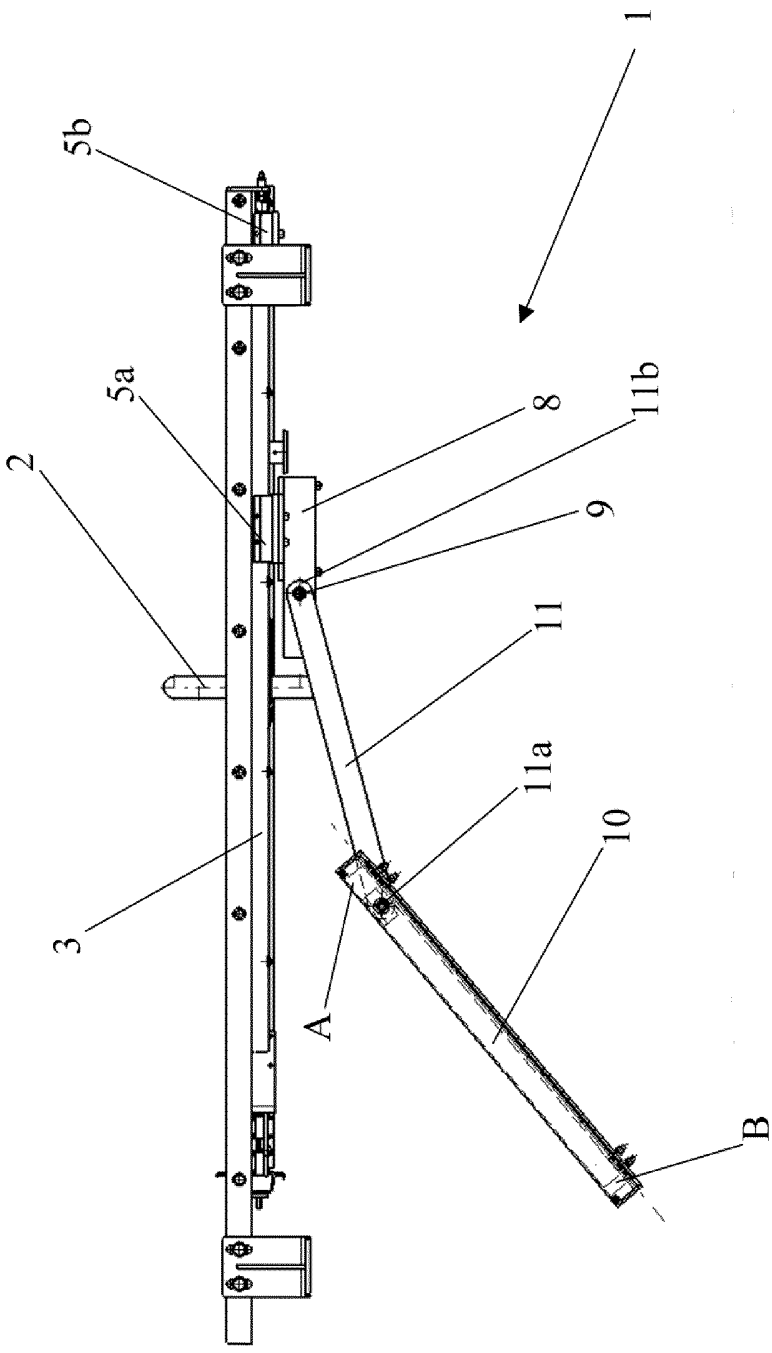


FIG. 3

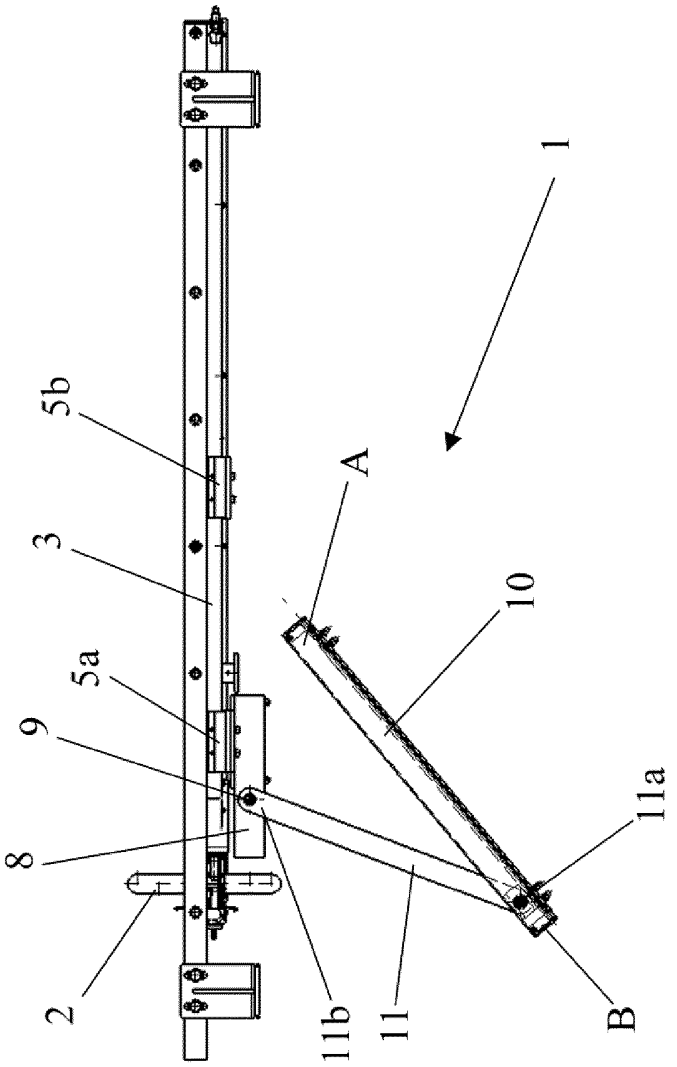


FIG. 4

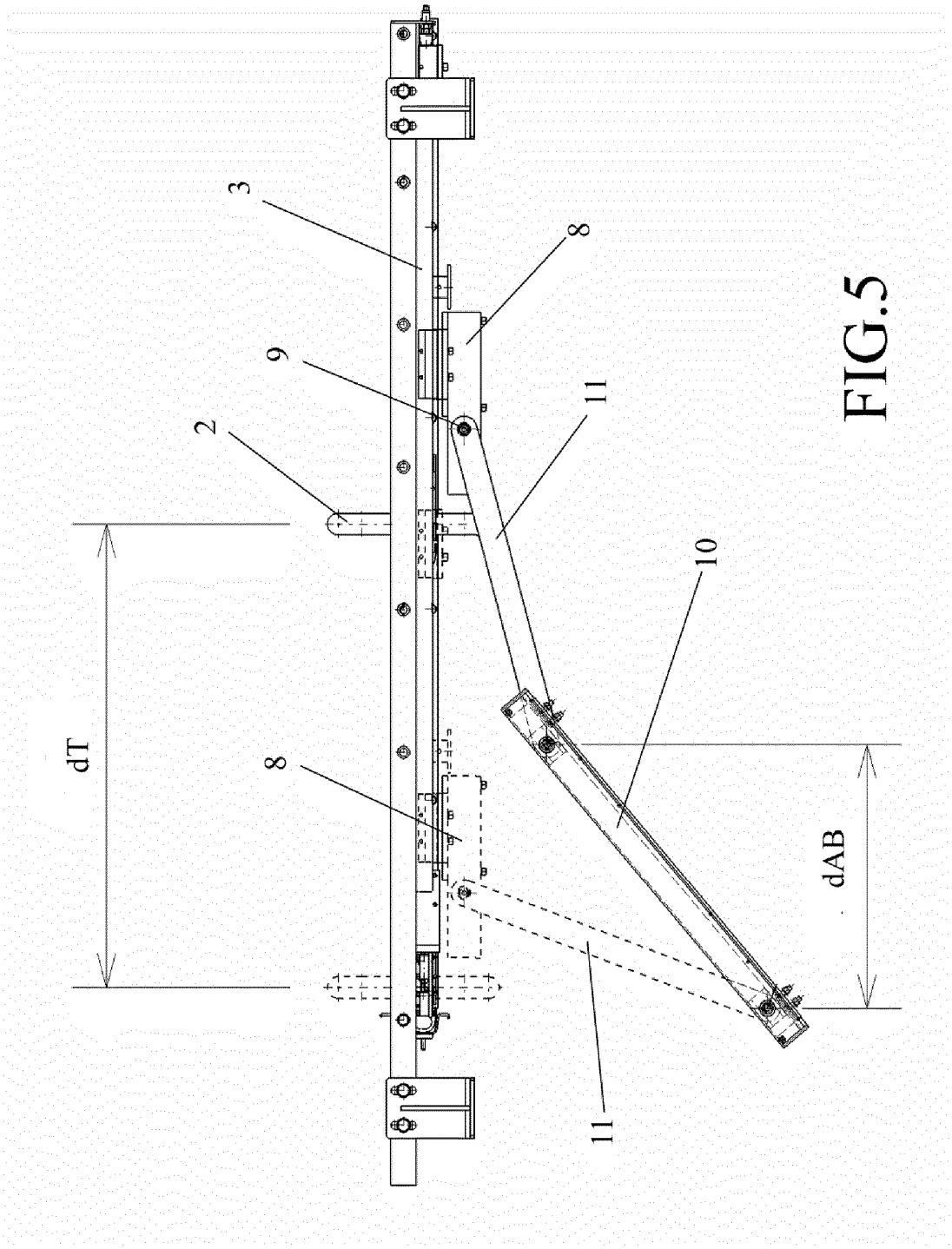


FIG.5

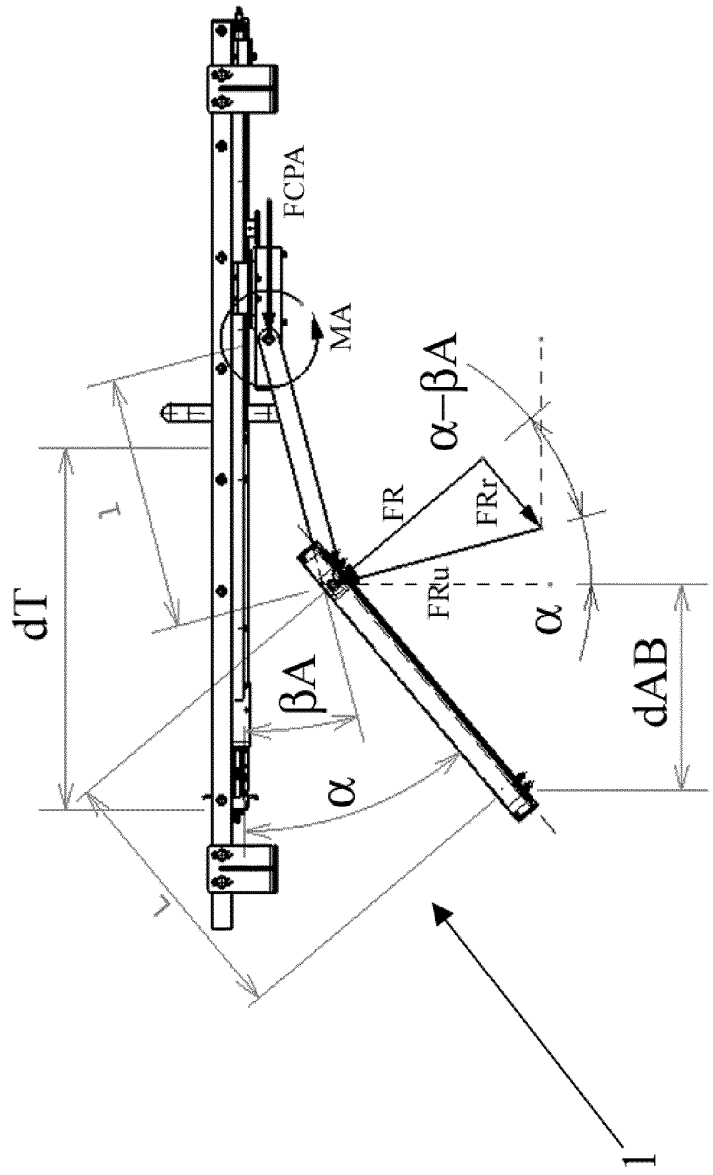


FIG. 6

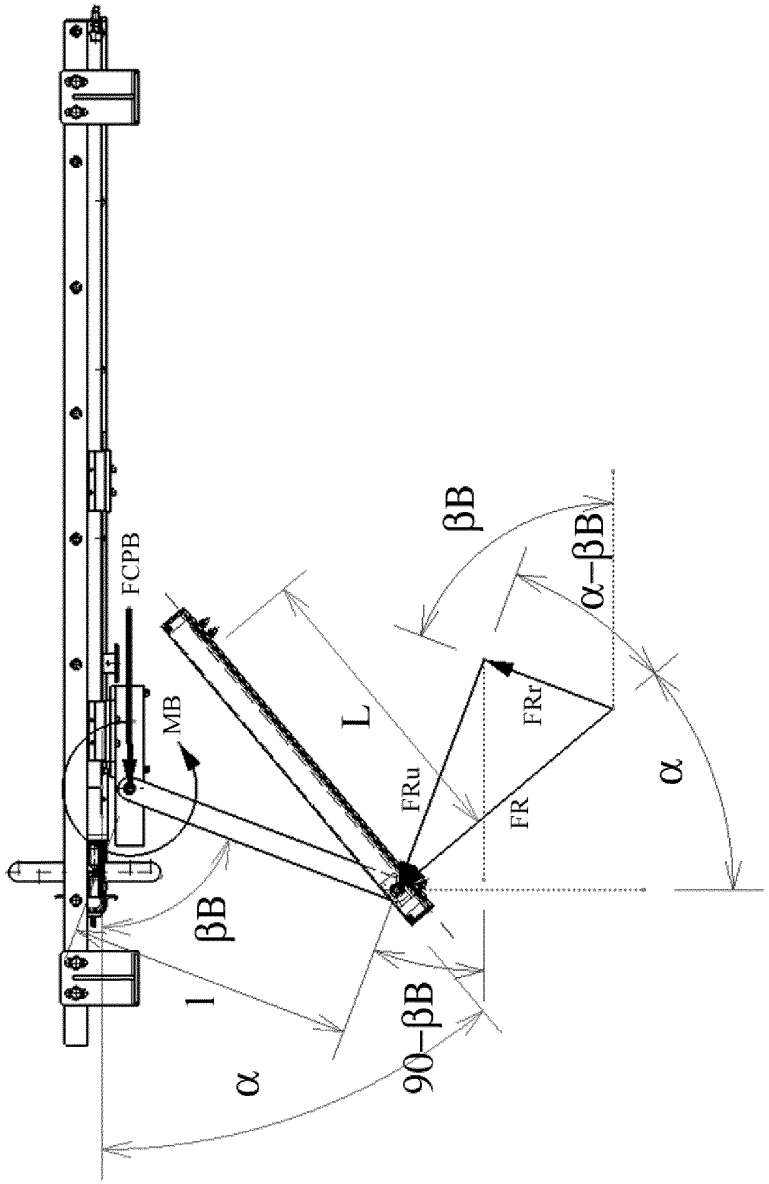


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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ÖNZÁRÓ ESZKÖZ TOLÓAJTÓHOZ

SZABADALMI IGÉNYPONTOK

1. Tolóajtó (2), amely önzáró eszközzel (1) van ellátva, és vasúti kocsi WC fülkéjéhez használható, ahol az eszköz (1) az ajtó (2) záróelemével (8), valamint az ajtó (2) részét képező zárókarral (11) van ellátva, amely a záróeszköz (8) működtető tengelyéhez (9) van csatlakoztatva, és ahol az említett eszköz (1) továbbá ajtó (2) zárását megvezető vezetőelemet (10), és zárókaron (11) elrendezett első csuklós véget (11a) tartalmaz, és ahol a zárókar (11) a vezetőelemmel (10) van összekapcsolva, és az első csuklós vég (11a) a vezetőelem (10) mentén elmozdulhat, miközben zárókar (10) második, átellenes csuklós vége (11b) az ajtó (2) mozgó vezetőelemével (3) együttműködve elmozdul annak érdekében, hogy bezárja az ajtót (2), és ahol az említett záróelem zárótesttel (8) van ellátva, amelynek a működtető tengelyt (9) hajtó rugóeleme van, és a vezetőelem (10) az ajtó vezetőelemével (3) hegyesszöget bezáró (α) irány mentén van elrendezve, valamint a vezetőelem (10) iránya lehetővé teszi a kar (11) mozgását ajtózárási pálya (dAB) mentén, azon a pályán kívül, amelynek mentén a kar (11) elfordul a záróelemben (10), ***azzal jellemezve***, hogy a működtető tengely (9) úgy van elrendezve, hogy lehetővé tegye a kar (11) csuklós elfordulását az ajtó síkjára (2) merőleges sík körül.

2. Az 1. igénypont szerinti eszköz, ***azzal jellemezve***, hogy a zárókar (11) második csuklós vége (11b) csatlakoztatva van a záróeszköz (8) működtető tengelyéhez (9), és a záróeszköz (8) kapcsolatban van az ajtó vezetőelemével (3) úgy, hogy az említett záróeszköz (8) együtt mozog az ajtóval (2).

3. A 2. igénypont szerinti eszköz, ***azzal jellemezve***, hogy a záróeszköz (8) csatlakoztatva van az ajtó (2) szárnyának támaszához (6a), amely az ajtó (2) vezetőelemének csúszkájával (5a) van kapcsolatban.

4. Az 1. igénypont szerinti eszköz, ***azzal jellemezve***, hogy a záró test (8) a működtető tengely (9) forgási sebességének szabályozására szolgáló eszközzel van ellátva.

5. A 4. igénypont szerinti eszköz, ***azzal jellemezve***, hogy az említett szabályozó eszköz hidraulikus eszköz, amely lehetővé teszi az ajtó (9) zárási pályájának egy vagy több hossza menti tengelyének (9) forgási sebesség szabályozását.

6. Az előző igénypontok bármelyike szerinti eszköz, ***azzal jellemezve***, hogy az említett záróirányú vezetőelem (10) egyenes, és az a vonal, amely összeköti az egyenes vezetőelem (10) végpontjait (A, B) hegyesszöget (α) zár be az ajtó (2) vezetőelemével (3).

7. Az előző igénypontok bármelyike szerinti eszköz, ***azzal jellemezve***, hogy az említett hegyesszög kisebb, mint 90°.

8. A 7. igénypont szerinti eszköz, ***azzal jellemezve***, hogy a szög (α) 30° és 50° közé eső hegyesszög.

9. Az előző igénypontok bármelyike szerinti eszköz, ***azzal jellemezve***, hogy az említett záróirányú vezetőelem (10) bizonyos távolságban van elrendezve az ajtó (2) mozgató vezetőelemétől (3) úgy, hogy

- a vezetőelem (10) indulási helyzetében (A) a zárókar (11) olyan irány mentén helyezkedik el, amely az ajtó (2) vezetőelemével 10°-nál nagyobb szöget (βA) zár be, és
- a vezetőelem (10) véghelyzetében az említett zárókar (11) olyan irány mentén helyezkedik el, amely az ajtó (2) vezetőelemével 80°-nál kisebb szöget (βB) zár be.

10. Az előző igénypontok bármelyike szerinti eszköz, ***azzal jellemezve***, hogy a tolóajtó vasúti kocsik WC fülkéjének zárására szolgáló manuális, lineáris tolóajtó (2).

11. Az 1. – 11. igénypontok bármelyike szerinti önzáró eszközzel (1) ellátott tolóajtó (2) felszerelésére szolgáló eljárás, ahol az eljárás során:

a) önzáró eszköz (1) záró testének (8) működtető tengelyét (9) lényegében párhuzamosan rendezzük el az ajtóval (2) úgy, hogy a zárókar (11) csuklósan elfordulhat az ajtó síkjára (2) merőleges sík körül, és

b) elrendezzük az ajtó (2) záróirányú vezetőelemét (10) olyan irány mentén, amely hegyesszöget (α) zár be az ajtó (2) vezetőelemével (3) úgy, hogy az említett vezetőelem (10) lehetővé teszi a zárókar (11) mozgását az ajtó zárási útvonala (dAB) mentén, amely különbözik attól az útvonaltól, amelyet a kar forgása jelöl ki ugyanabban a záróirányú vezetőelemben (10).