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(54) AUTOMATIC SLIDING DOOR POWER DRIVE ASSEMBLY

Antriebssystem für eine automatische Schiebetür

Ensemble d'entraînement motorisé pour une porte coulissante automatique

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Description

[0001] The present invention relates to an automatic sliding door power drive assembly.

[0002] More specifically, the present invention relates to a power drive assembly for supporting and automatically operating sliding doors. Use to which the following description refers purely by way of example without this implying any loss of generality.

[0003] As is known, a sliding door is installed over a through opening in a wall, and substantially comprises one or, more often, two rectangular sliding shutters fixed to/suspended vertically from the wall and movable horizontally, still in the vertical position, to and from a closed position, in which the sliding shutter/s is/are positioned over the opening in the wall, usually with one shutter adjacent to the other, to completely close/obstruct the opening and prevent human and/or other traffic through the opening.

[0004] The automatic sliding door power drive assemblies, on the other hand, are anchored rigidly to the wall, directly above the opening to which the sliding door is fixed, and are designed to directly support the sliding shutter/s and at the same time move it/them horizontally to and from the closed position, while keeping them on their own vertical reference laying plane.

[0005] More specifically, automatic sliding door power drive assemblies normally comprise: a straight load-bearing longitudinal member suited to be fixed horizontally onto the wall, just above the opening to which the sliding door is fixed; a number of shutter-supporting carriages which are fixed to the longitudinal member with the capability of sliding freely along it, parallel to its longitudinal axis, and are each provided with an appendix that cantilevered projects downwards from the longitudinal member and is structured to support the sliding shutter of the door while keeping the same shutter substantially coplanar to the load-bearing longitudinal member; and an electric carriage drive system which is fixed directly to the longitudinal member and is able to drive the shutter-supporting carriages back and forth along the load-bearing longitudinal member, so to move the sliding shutters synchronously in a direction parallel to the longitudinal axis of the longitudinal member.

[0006] More specifically, currently marketed automatic sliding door power drive assemblies have a longitudinal drive belt which is looped and tighten about two substantially coplanar return pulleys fixed in axially rotating manner next to the two axial ends of the longitudinal member; and a slip ring electric motor which is fixed to the longitudinal member, next to one of the two return pulleys, and is connected to the return pulley by a mechanical gear reducer which allows the electric motor to drive into rotation the return pulley.

[0007] The shutter-supporting carriages are fixed to the straight top or bottom portion of the drive belt, so as to move with the belt; and the electric motor is able to drive into rotation the return pulley in both rotation direc-

tions, to move the two straight portions of the drive belt back and forth in opposition to each other, thus moving the shutter-supporting carriages back and forth synchronously along the longitudinal member.

[0008] Unfortunately, because of the weight of some of their component parts, automatic sliding door power drive assemblies of this type need at least two fitters to install, thus increasing installation cost.

[0009] More specifically, wall-mounting the automatic sliding door power drive assembly involves first fitting the carriage drive system to the load-bearing longitudinal member, and then fixing/anchoring the load-bearing longitudinal member perfectly horizontally to the wall using expansion anchoring screws .

[0010] This implies that the fitters have to lift an oblong body, weighting tens of kilograms, up over the top of the sliding door; fix a first end of the longitudinal member roughly to the wall using a first expansion anchoring screw; accurately adjust the angle of the longitudinal member with respect to the vertical, so as to arrange the longitudinal member perfectly horizontal; and, finally, fix the second end of the longitudinal member to the wall using a second expansion anchoring screw, to prevent any further movement of the longitudinal member on the wall.

[0011] EP0953708 discloses a sliding-door power-drive assembly comprising the features of the preamble of claim 1 and wherein the load-bearing longitudinal member comprises a first straight section bar which is structured to be rigidly fixed on the wall in a substantially horizontal position; and a second straight section bar which engages onto said first section bar and is structured to support the shutter-supporting carriages and the carriage drive system.

[0012] It is the aim of the present invention to simplify and speed up assembly of currently marketed automatic sliding door power drive assemblies.

[0013] In compliance to the above aims, according to the present invention, there is provided an automatic sliding door power drive assembly as defined in Claim 1 and preferably, though not necessarily, in any one of the dependent Claims.

[0014] A non-limiting embodiment of the present invention will be described by way of example with reference to the attached drawings, in which :

Figure 1 shows a view in perspective of a sliding door equipped with an automatic sliding door power drive assembly in accordance with the teachings of the present invention;

Figure 2 shows a front view, with parts removed for clarity, of the Figure 1 sliding door;

Figure 3 shows a section along line A-A of the automatic sliding door power drive assembly in Figure 2;

Figure 4 shows a section along line B-B of the automatic sliding door power drive assembly in Figure 2.

[0015] With reference to Figures 1, 2, 3 and 4, number

1 indicates as a whole an automatic sliding door power drive assembly which is designed to support and to move horizontally the shutter/s of a sliding door.

[0016] More specifically, the automatic sliding door power drive assembly 1 is structured to be rigidly fixed to the wall P in which the sliding door 100 is installed, just above the opening of wall P wherein the sliding door 100 to be driven is located, and is able to support the sliding shutter/s 101 of sliding door 100.

[0017] In the example shown, in particular, the sliding door 100 preferably has two substantially rectangular sliding shutters 101 which are fixed to/suspended from the power drive assembly 1 so as to be vertically arranged, locally substantially coplanar and adjacent to each other, with the capability to move in a horizontal direction d still remaining on their own vertical laying plane, so as to shift to and from a closed position (see Figure 2) in which the two sliding shutters 101 are stationary over the opening in wall P, preferably closely shut to one another, to substantially completely close/obstruct the opening and prevent human and/or other traffic through the opening.

[0018] Preferably, though not necessarily, the two sliding shutters 101 of door 100 are also designed so that their straight bottom edges rest in axially sliding manner on a straight horizontal rail (not shown) extending on and along the ground, substantially coplanar to the laying plane of the sliding shutters 101.

[0019] The automatic sliding door power drive assembly 1 is designed to at least partly support the two sliding shutters 101 of sliding door 100 and, at the same time, to move horizontally the two sliding shutters 101 in direction d to and from the closed position, in opposition to each other and while keeping the two sliding shutters 101 on their own laying plane.

[0020] More specifically, as shown in Figures 1, 2, 3 and 4, the automatic sliding door power drive assembly 1 comprises :

- a straight load-bearing longitudinal member 2, which is suited to be anchored/fixed rigidly to wall P in a substantially horizontal position and preferably also substantially locally grazing wall P, above the opening in which sliding door 100 is installed;
- a number of shutter-supporting carriages 3, each of which is mounted in sliding manner on longitudinal member 2 to run freely along longitudinal member 2, parallel to the longitudinal axis L of longitudinal member 2 and preferably along substantially the whole length of longitudinal member 2, and is designed to be rigidly fixed to the body of a respective sliding shutter 101 underneath; and
- a carriage driving device 4 which is rigidly fixed to longitudinal member 2 and is designed to move the various shutter-supporting carriages 3 back and forth along longitudinal member 2.

[0021] More specifically, each shutter-supporting car-

riage 3 preferably comprises a projecting bottom appendix 3a which cantilevered projects downwards from longitudinal member 2 and is designed to be rigidly fixed to the body of the sliding shutter 101 preferably, though not necessarily, by means of anchoring screws.

[0022] Furthermore projecting bottom appendix 3a is preferably also designed to keep the sliding shutter 101 locally substantially coplanar with, or at least substantially parallel to, the longitudinal member 2.

[0023] Carriage driving device 4, on the other hand, is preferably designed so to move the shutter-supporting carriages 2 synchronously back and forth along the longitudinal member 2, thus to move the two sliding shutters 101 parallel to the longitudinal axis L of longitudinal member 2 in opposition to each other.

[0024] With reference to Figures 1, 2, 3 and 4, carriage driving device 4 in turn comprises: two substantially coplanar return pulleys 6 and 7 which are fixed in axially rotatable manner to longitudinal member 2, preferably next to the two axial ends of the longitudinal member 2, with their respective rotation axes R locally substantially perpendicular to the longitudinal axis L of longitudinal member 2; a drive belt 8 which is looped and tightened about pulleys 6 and 7 to form two straight adjacent portions substantially parallel to longitudinal axis L of longitudinal member 2; and an electric motor 9 which is fixed to the longitudinal member 2, next to return pulley 7, and is mechanically connected to pulley 7 so as to be able to drive said pulley into rotation about rotation axis R.

[0025] More specifically, depending on which sliding shutter 101 they support, shutter-supporting carriages 3 are attached to a first or second straight portion of drive belt 8 to follow the movements of the belt 8; and electric motor 9 is able to drive pulley 7 into rotation about rotation axis R in both rotation directions so to move the two straight portions of drive belt 8 back and forth in opposition to each other, thus to move shutter-supporting carriages 3 synchronously back and forth along load-bearing longitudinal member 2.

[0026] With reference to Figures 1, 2 and 3, in the example shown, in particular, electric motor 9 is preferably, though not necessarily, fixed to longitudinal member 2 so that its output shaft 9a is locally substantially coaxial with return pulley 7, and the distal end of output shaft 9a fits directly inside pulley 7 in angularly fixed manner, e. g. by means of a key, so that pulley 7 is supported directly by output shaft 9a of the motor and can be rotated both ways about rotation axis R.

[0027] In addition, in the example shown, electric motor 9 is preferably a brushless electric motor 9, preferably, though not necessarily, of a permanent-magnet or variable-reluctance type.

[0028] With reference to Figures 1, 2, 3 and 4, unlike currently marketed automatic sliding door power drive assemblies, the load-bearing longitudinal member 2 comprises two straight section bars 10 and 11 preferably having substantially the same length and preferably made of metal, which extend parallel to longitudinal axis

L, along substantially the whole length of longitudinal member 2, and are designed to engage to one another and firmly lock one above the other by gravity.

[0029] The first straight section bar 10 is designed to be rigidly fixed/attached directly to wall P, in a substantially horizontal position and locally substantially grazing wall P, above the opening to which sliding door 100 is fixed; whereas the second straight section bar 11 is designed to directly support shutter-supporting carriages 3 and driving device 4, and to engage onto straight section bar 10 and then firmly rest in abutment on straight section bar 10 by force of gravity.

[0030] More specifically, straight section bar 10 is designed to form a shelf 10a for supporting straight section bar 11, and which cantilevered projects from wall P while remaining substantially parallel to the ground, i.e. horizontally, when the straight section bar 10 is fixed horizontally to wall P; and straight section bar 11 is designed so as to rest firmly on shelf 10a of straight section bar 10.

[0031] Return pulleys 6 and 7 are therefore fixed in axially rotatable manner to straight section bar 11, preferably next to the two axial ends of section bar 11, with their respective axes of rotation R locally substantially perpendicular to the longitudinal axis of section bar 11; and electric motor 9 is fixed to straight section bar 11, next to return pulley 7, and is mechanically connected to pulley 7 so as to drive into rotation said pulley about rotation axis R.

[0032] Preferably, though not necessarily, load-bearing longitudinal member 2 moreover has one or more mechanical anchoring members 12 designed to lock the straight section bar 11 stably in abutment on straight section bar 10.

[0033] With reference to Figures 1, 3 and 4, in the example shown, straight section bar 10 preferably has a substantially L-shaped cross section, and is designed to be fixed/attached to wall P in a horizontal position, so that its bottom flat portion 10a cantilevered projects substantially horizontally from wall P to form the supporting shelf for straight section bar 11.

[0034] Straight section bar 11, on the other hand, preferably has a substantially C-shaped cross section, is provided with two reciprocally facing longitudinal flat portions 11a and 11b, and is designed to engage onto and firmly lock gravity on L-section bar 10.

[0035] More specifically, C-section bar 11 is designed to engage its top edge 11c directly onto the top edge 10c of L-section bar 10 and, at the same time, arrange its bottom flat portion 11a firmly in abutment on the bottom flat portion 10a of L-section bar 10, so as to remain locked by gravity in abutment on L-section bar 10.

[0036] The top flat portion 11b of C-section bar 11, on the other hand, is suited to cantilevered project from wall P, over bottom flat portion 11a, while remaining locally parallel to and spaced apart from bottom flat portion 11a, i.e. while remaining substantially horizontal.

[0037] Preferably the top flat portion 11b of C-section bar 11 is also wider than the bottom flat portion 11a of

C-section bar 11, so as to project beyond the edge of bottom flat portion 11a.

[0038] With reference to Figures 3 and 4, in the example shown, in addition, load-bearing longitudinal member 2 preferably also comprises a first longitudinal insert 13 made of elastomeric material and which is interposed between the top edge 10c of L-section bar 10 and the top edge 11c of C-section bar 11; and/or a second longitudinal insert 14 made of elastomeric material and which is interposed between the bottom flat portion 10a of L-section bar 10 and the bottom flat portion 11a of C-section bar 11.

[0039] In other words, longitudinal insert 14 is interposed between the straight section bar 11 and the supporting shelf 10a of straight section bar 10.

[0040] The one or more mechanical anchoring member 12 instead preferably consist of one or more through screws 12 that are arranged substantially perpendicular to the longitudinal axis L of the longitudinal member, so that the threaded stem of each screw fits in pass-through manner a slot in the body of section bar 11 and screws firmly into the body of section bar 10. The head of each through screw 12 rests on the body of section bar 11 with the interposition of an bushing 12a made of elastomeric material or other vibration-damping element.

[0041] With reference to Figures 1, 2, 3 and 4, shutter-supporting carriages 3 are preferably located inside the straight channel of C-section bar 11 with the capability to move parallel to the longitudinal axis of C-section bar 11, i.e. parallel to the longitudinal axis L of the longitudinal member, and preferably along substantially the whole length of C-section bar 11.

[0042] More specifically, shutter-supporting carriages 3 are preferably fitted in axially sliding manner on a straight rail 15 which is located on the upper face of the bottom flat portion 11a of C-section bar 11, and which extends parallel to the longitudinal axis of the C-section bar 11, i.e. parallel to the longitudinal axis L of longitudinal member 2, preferably for substantially the whole length of C-section bar 11.

[0043] In the example shown, in particular, rail 15 is preferably fitted and rigidly locked astride a straight projecting rib 16 which protrudes from the upper face of the bottom flat portion 11a of C-section bar 11, and extends along the same bottom flat portion 11a parallel to the longitudinal axis of C-section bar 11, preferably for substantially the whole length of C-section bar 11. Preferably a longitudinal insert 17 made of elastomeric material and preferably, though not necessarily, with a Q-shaped cross section is furthermore interposed between rail 15 and the straight rib 16 of C-section bar 11.

[0044] Carriage driving device 4 is preferably hanged up beneath the top flat portion 11b of C-section bar 11, so as to substantially face the longitudinal channel of C-section bar 11.

[0045] With reference to Figures 3 and 4, load-bearing longitudinal member 2 preferably also comprises a third straight section bar 18 which has a substantially C-

shaped cross section and is designed to rigidly lock onto and cantilevered project from the longitudinal edge of the top flat portion 11b of section bar 11, with its concavity facing the C-section bar 11, and also in this case preferably with the interposition of a longitudinal insert 19 made of elastomeric material, so as to close the space fronting the channel of section bar 11 along which shutter-supporting carriages 3 run, for covering and protecting the shutter-supporting carriages 3 and the carriage driving device 4.

[0046] In the example shown, in particular, the straight section bar 18 is preferably made of metal, and is substantially the same length as straight section bar 11.

[0047] In other words, as shown in Figures 1, 2 and 3, load-bearing longitudinal member 2 preferably has two flat projecting shelves 2a, 2b of different widths, which are parallel and faced to one another and, when longitudinal member 2 is fixed horizontally to wall P, cantilevered project from wall P one over the other while remaining substantially parallel to the ground, i.e. horizontally; and a front protective casing 2c which is arranged astride the two flat projecting shelves 2a, 2b to close the space in front of flat projecting shelves 2a, 2b.

[0048] The shutter-supporting carriages 3 are placed resting on the bottom flat shelf 2a of longitudinal member 2, inside the straight channel laterally bounded by the flat projecting shelves 2a, 2b of longitudinal member 2, with the capability to move parallel to the longitudinal axis L of the longitudinal member.

[0049] Carriage driving device 4, on the other hand, is hanged up beneath the top flat shelf 2b of longitudinal member 2, so as to locally substantially face the mouth of the channel bounded by the flat projecting shelves 2a, 2b of longitudinal member 2, behind front casing 2c.

[0050] Obviously, the bottom flat portion 10a of section bar 10 and the bottom flat portion 11a of section bar 11 form the bottom flat shelf 2a of longitudinal member 2; and the top flat portion 11b of section bar 11 forms the top flat shelf 2b of longitudinal member 2. C-section bar 18, on the other hand, forms the front casing 2c of longitudinal member 2.

[0051] As regards the carriage driving device 4, with reference to Figures 1, 2, 3 and 4, in the example shown, return pulley 6 is preferably supported in axially rotatable manner by a supporting bracket 20 which projects downwards from the top flat portion 11b of straight section bar 11, and which is preferably, though not necessarily, also fixed to the straight section bar 11, or more specifically to the top flat portion 11b of section bar 11, in a rigid and stable, though easily removable manner.

[0052] Likewise, return pulley 7 is preferably supported in axially rotatable manner by a supporting bracket 21 which cantilevered projects downwards from the top flat portion 11b of straight section bar 11, and which is preferably, though not necessarily, also fixed to the straight section bar 11, or more specifically to the top flat portion 11b of section bar 11, in a rigid and stable, though easily removable manner.

[0053] More specifically, as shown in Figure 3, electric motor 9 is rigidly fixed directly to supporting bracket 21, preferably with the interposition of vibration-damping joints 22; and return pulley 7 is rigidly fitted directly to the distal end of the output shaft 9a of electric motor 9, so that electric motor 9 is able to directly support and at the same time to drive into rotation the pulley 7 about its own rotation axis R in both rotation directions.

[0054] In the example shown, the whole of carriage driving device 4 is therefore preferably suspended in a rigid and stable, though easily removable manner, beneath the top flat portion 11b of the straight section bar 11 of longitudinal member 2.

[0055] With reference to Figures 1, 2, 3 and 4, preferably supporting brackets 20 and 21 are moreover designed to keep the rotation axes R of return pulleys 6 and 7 locally substantially parallel to each other and locally perpendicular to the longitudinal axis of section bar 11, i.e. locally perpendicular to longitudinal axis L of longitudinal member 2, and preferably also substantially horizontal, i.e. perpendicular to the plane of sliding shutters 101.

[0056] Consequently, return pulleys 6, 7 and drive belt 8 preferably lie in a substantially vertical reference plane which is locally substantially parallel to longitudinal axis L of longitudinal member 2; and the two straight portions of drive belt 8 are offset vertically, one over the other.

[0057] More specifically, with reference to Figures 1, 3 and 4, in the example shown, the bottom face of the top flat portion 11b of straight section bar 11 has two projecting longitudinal ribs 23 having a substantially L-shaped cross section, which project from the bottom face of the top flat portion 11b of C-section bar 11, and extend substantially parallel to and facing each other along the same top flat portion 11b, parallel to the longitudinal axis of the C-section bar 11 preferably for substantially the whole length of section bar 11, so as to form a substantially straight longitudinal groove 24 with a substantially T-shaped cross section.

[0058] As regards the supporting brackets 20 and 21, the supporting bracket 20 that supports pulley 6 is preferably provided with a plate-like fastening head 20a which is designed to fit in a rigid and stable, though easily removable manner, inside longitudinal groove 24 of the straight section bar 11; and a supporting appendix 20b which cantilevered extends from plate-like fastening head 20a and is shaped/designed to support the return pulley 6 in axially rotatable manner and, when fastening head 20a is fitted inside longitudinal groove 24, to keep the rotation axis R of return pulley 6 substantially perpendicular to the longitudinal axis of the straight section bar 11, i.e. substantially perpendicular to the longitudinal axis L of longitudinal member 2, and preferably also locally substantially parallel to the top flat portion 11b of section bar 11, i.e. substantially horizontal.

[0059] More specifically, as shown in Figure 4, the width s of the plate-like fastening head 20a is preferably greater than the width w of the mouth of longitudinal

groove 24, and is less than the sum of the width w of the mouth of longitudinal groove 24 and the width k_1 , k_2 of the horizontal bottom portion of either of the L-section projecting longitudinal ribs 23 bounding groove 24.

[0060] In addition, supporting bracket 20 preferably also has a lock screw or pin 25 which screws through plate-like fastening head 20a and has the distal end of the threaded stem/shaft in abutment on the bottom of the longitudinal groove 24 of section bar 11, so as to push and keep plate-like fastening head 20a resting firmly on the bottom horizontal portions of the two projecting longitudinal ribs 23 bounding longitudinal groove 24.

[0061] With reference to Figure 4, supporting appendix 20b of supporting bracket 20 is instead preferably defined by a plate-like fin 20b which cantilevered extend from the plate-like fastening head 20a perpendicularly to the latter, so as to become, when fastening head 20a is fitted inside longitudinal groove 24 of section bar 11, locally substantially parallel to longitudinal axis L of longitudinal member 2 and preferably also locally substantially perpendicular to top flat portion 11b of straight section bar 11, i.e. substantially vertical.

[0062] Return pulley 6 is therefore fixed to the plate-like fin 20b of supporting bracket 20, with its rotation axis R locally substantially perpendicular to the plane of plate-like fin 20b, preferably with the interposition of a tensioning mechanism 26 preferably of a screw-nut screw type, which is integral with plate-like fin 20b and is designed to move the pin 27 that supports pulley 6 on plate-like fin 20b in a direction parallel to longitudinal axis L of longitudinal member 2, so as to adjust the tension of drive belt 8.

[0063] With reference to Figure 3, likewise supporting bracket 20, the supporting bracket 21 that supports pulley 7 is preferably also provided with a plate-like fastening head 21a which is designed to fit in a rigid and stable, though easily removable manner, inside the longitudinal groove 24 of straight section bar 11; and a supporting appendix 21b which cantilevered extends from the plate-like fastening head 21a, and is shaped/ designed to support the return pulley 7 in axially rotatable manner and, when fastening head 21a is fitted inside longitudinal groove 24, to keep the rotation axis R of return pulley 7 substantially perpendicular to the longitudinal axis of straight section bar 11, i.e. substantially perpendicular to the longitudinal axis L of longitudinal member 2, and preferably also locally substantially parallel to the top flat portion 11b of section bar 11, i.e. substantially horizontal.

[0064] More specifically, as shown in Figure 3, the width t of plate-like fastening head 21a is preferably greater than the width w of the mouth of longitudinal groove 24, and is less than the sum of width w of the mouth of longitudinal groove 24 and the width k_1 , k_2 of the horizontal bottom portion of either of the L-section projecting longitudinal ribs 23 bounding groove 24.

[0065] In addition, likewise supporting bracket 20, the supporting bracket 21 preferably also has a lock screw or pin 27 which screws through plate-like fastening head

21a, and has the distal end of the threaded stem/shaft in abutment on the bottom of the longitudinal groove 24 of section bar 11, so as to push and keep the plate-like fastening head 21a resting firmly on the bottom horizontal portions of the two projecting longitudinal ribs 23 bounding longitudinal groove 24.

[0066] Still with reference to Figure 3, supporting appendix 21b of supporting bracket 21 is preferably also defined by a plate-like fin 21b which cantilevered extends from the plate-like fastening head 21a perpendicularly to the latter, so as to become, when fastening head 21a is fitted inside longitudinal groove 24 of section bar 11, locally substantially parallel to the longitudinal axis L of longitudinal member 2, and preferably also locally substantially perpendicular to the top flat portion 11b of straight section bar 11, i.e. substantially vertical.

[0067] Electric motor 9 is preferably cantilevered fixed to the plate-like fin 21b of supporting bracket 21, preferably with the interposition of vibration-damping bushings 22 made of elastomeric material, so that its output shaft 9a is locally substantially perpendicular to the laying plane of plate-like fin 21b; and return pulley 7 is fitted directly to the distal end of the output shaft 9a of the motor.

[0068] More specifically, in the example shown electric motor 9 and return pulley 7 are preferably located on opposite sides of the plate-like fin 21b of supporting bracket 21, coaxial to a reference axis substantially perpendicular to the laying plane of plate-like fin 21b; and electric motor 9 is arranged/oriented so that its output shaft 9a cantilevered extends through the plate-like fin 21b engaging in axially rotatable manner a through hole specifically formed in the plate-like fin 21b up to reach pulley 7.

[0069] Operation of automatic sliding door power drive assembly 1 is clear from the above description, with no further explanation required.

[0070] As regards the wall-mount of automatic sliding door power drive assembly 1, the fitter firstly has to rigidly anchor/fix the section bar 10 to wall P, in a horizontal position above the opening to which sliding door 100 is installed; and then to rest section bar 11, fitted beforehand with carriage driving device 4, directly onto straight section bar 10.

[0071] The design of longitudinal member 2 has major advantages.

[0072] Because of its light weight, straight section bar 10 can be fitted horizontally to the wall quickly and easily by only one fitter.

[0073] Fitting straight section bar 11 to straight section bar 10 is equally quick and easy, by involving no particularly accurate alignment of straight section bar 11 on straight section bar 10, and can therefore also be done by one fitter.

[0074] Moreover, interposition of elastomeric-material inserts 13 and 14 between section bars 10 and 11 provide for significantly damping/attenuating vibration of longitudinal member 2, with all the advantages this affords. In fact, the operating noise level of automatic sliding door

power drive assembly 1 is much lower than that of conventional automatic sliding door power drive assemblies.

[0075] Even interposition of elastomeric-material insert 17 between rail 15 and straight section bar 11 allows to reduce the noise produced by shutter-supporting carriages 3 running along longitudinal member 2.

[0076] Moreover the fitting of return pulley 7 directly to the output shaft 9a of electric motor 9, with the resulting elimination of the mechanical gear reducer, greatly improves the energy efficiency of the carriage driving device 4 and reduces electric power consumption.

[0077] Furthermore, eliminating the mechanical reducer greatly reduces the noise level of automatic sliding door power drive assembly 1, with all the advantages this affords. And using a brushless electric motor 9 with no mechanical gear reducer simplifies routine maintenance and servicing of power drive assembly 1.

[0078] Finally, the system by which supporting brackets 20 and 21 lock inside the longitudinal groove 24 of straight section bar 11 simplifies assembly and/or maintenance of carriage driving device 4, with all the advantages this affords.

[0079] Clearly, changes may be made to automatic sliding door power drive assembly 1 without, however, departing from the scope of the present invention.

[0080] For example, in case of a sliding door with one sliding shutter, automatic sliding door power drive assembly 1 may comprise only one shutter-supporting carriage 3 supporting the sliding shutter.

[0081] In a less sophisticated embodiment, carriage driving device 4 may also comprise a slip ring electric motor.

[0082] Moreover, return pulley 7 may be connected to electric motor 9 by a mechanic gear reducer.

Claims

1. An automatic sliding door power drive assembly (1) comprising : a straight load-bearing longitudinal member (2) which is adapted to be fixed rigidly and in a substantially horizontally position to a generic wall (P), above the sliding door (100); at least one shutter-supporting carriage (3) which is slidingly mounted on the longitudinal member (2) parallel to the longitudinal axis (L) of the longitudinal member, and is structured so as to be rigidly fixed to the body of a corresponding sliding shutter (101) of the sliding door (100); and carriage driving means (4) which are fixed to the longitudinal member (2), and are designed to move said at least one shutter-supporting carriage (3) back and forth along the longitudinal member (2);
the load-bearing longitudinal member (2) comprising a first straight section bar (10) which is structured to be rigidly fixed on said wall (P) in a substantially horizontal position; and a second straight section bar (11) which is structured to support said at least one

shutter-supporting carriage (3) and said carriage driving means (4), and which engages onto said first section bar (10); whereby the said first section bar (10) is structured to form a supporting shelf (10a) that cantilevered projects substantially horizontally from the wall (P); and whereby said second section bar (11) stably rests by gravity in abutment on the shelf (10a) of said first section bar (10); **characterized in that** the load-bearing longitudinal member (2) additionally comprises a first longitudinal elastomeric-material insert (14) interposed between the second section bar (11) and the shelf (10a) of the first section bar (10).

2. Automatic sliding door power drive assembly as claimed in Claim 1, **characterized in that** the first section bar (10) has a substantially L-shaped cross section, and is structured to fix to said wall (P) so that its bottom flat portion (10a) cantilevered projects substantially horizontally from the wall (P); the second section bar (11) being designed to rest on the bottom flat portion (10a) of the first section bar (10).
3. Automatic sliding door power drive assembly as claimed in Claim 2, **characterized in that** the second section bar (11) has a substantially C-shaped cross section, is provided with two reciprocally faced longitudinal flat portions (11a, 11b), and is structured to engage its top edge (11c) onto the top edge (10c) of said first section bar (10) and, at the same time, to rest its bottom flat portion (11a) stably in abutment on the bottom flat portion (10a) of the first section bar (10), so as to remain locked by gravity in abutment on said first section bar (10); the top flat portion (11b) of the second section bar (11) cantilevered projecting from the wall (P), over the bottom flat portion (11a) of the second section bar (11), while remaining locally parallel to and spaced from said bottom flat portion (11a) of the second section bar (11).
4. Automatic sliding door power drive assembly as claimed in Claim 2 or 3, **characterized in that** the first longitudinal elastomeric-material insert (14) is interposed between the bottom flat portion (10a) of the first section bar (10) and the bottom flat portion (11a) of the second section bar (11).
5. Automatic sliding door power drive assembly as claimed in Claim 3 or 4, **characterized in that** the top flat portion (11b) of the second section bar (11) is wider than the bottom flat portion (11a) of the second section bar (11), so as to cantilevered extends beyond the edge of the bottom flat portion (11a) of the second section bar (11).
6. Automatic sliding door power drive assembly as claimed in any one of the preceding claims, **characterized in that** the top edge (11c) of the second sec-

tion bar (11) is structured to engage on the top edge (10c) of the first section bar (10).

7. Automatic sliding door power drive assembly as claimed in Claim 6, **characterized in that** the load-bearing longitudinal member (2) comprises a second longitudinal elastomeric-material insert (13) interposed between the top edge (10c) of the first section bar (10) and the top edge (11c) of the second section bar (11). 5
8. Automatic sliding door power drive assembly as claimed in any one of the preceding claims, **characterized in that** the load-bearing longitudinal member (2) also comprises one or more mechanical anchoring members (12) structured to lock the second straight section bar (11) stably in abutment on the first straight section bar (10). 10
9. Automatic sliding door power drive assembly as claimed in any one of the preceding claims, **characterized in that** said at least one shutter-supporting carriage (3) is fitted in axially sliding manner on a straight rail (15) which in turn is fixed to the second section bar (11) with the interposition of a longitudinal elastomeric-material insert (17). 15
10. Automatic sliding door power drive assembly as claimed in Claim 9, **characterized in that** said straight rail (15) is located on the upper face of the bottom flat portion (11a) of the second section bar (11), and extends parallel to the longitudinal axis of the second section bar (11) substantially for the whole length of the second section bar (11). 20
11. Automatic sliding door power drive assembly as claimed in Claim 10, **characterized in that** said straight rail (15) is fitted and locked rigidly astride a straight projecting rib (16) which protrudes from the upper face of the bottom flat portion (11a) of the second section bar (11); the longitudinal elastomeric-material insert (17) being interposed between said rail (15) and the straight rib (16) of the second section bar (11). 25
12. Automatic sliding door power drive assembly as claimed in any one of the preceding claims, **characterized in that** the carriage driving means (4) comprise : two substantially coplanar return pulleys (6, 7) which are substantially coplanar to one another and are fixed in axially rotatable manner to the second section bar (11) of the longitudinal member (2), next to the two axial ends of the second section bar (11); a drive belt (8) looped about the two return pulleys (6, 7); and an electric motor (9) which is fixed to the second section bar (11) and is mechanically connected to one of the two return pulleys (7) to drive into rotation said return pulley (7) about its rotation 30

axis (R).

13. Automatic sliding door power drive assembly as claimed in Claim 12, **characterized in that** the two return pulleys (6, 7) are supported in axially rotatable manner by respective supporting brackets (20, 21) which cantilevered extend downwards from the top flat portion (11b) of the second section bar (11) and are fixed in a rigid and stable, though easily removable manner, to the top flat portion (11b) of the second section bar (11). 35

Patentansprüche

1. Antriebseinheit zur automatischen Bewegung von Schiebetüren (1) der Art, die Folgendes umfasst: einen geraden Längsträger (2), der starr und in einer im Wesentlichen horizontalen Position auf einer allgemeinen Wand (P) über der Schiebetür (100) befestigt werden kann; mindestens einen Türflügel tragenden Laufwagen (3), der verschiebbar auf dem Längsträger (2) und parallel zur Längsachse des Längsträgers (L) montiert wird und so aufgebaut ist, dass er starr am Körper eines entsprechenden Schiebetürflügels (101) der Schiebetür (100) befestigt wird; und Bewegungsmittel für die Laufwagen (4), die auf dem Längsträger (2) befestigt und so aufgebaut sind, dass sie mindestens einen Türflügel tragenden Laufwagen (3) längs des Längsträgers (2) vor- und zurückschieben können. 40
Der Längsträger (2) umfasst ein erstes gerades Profil (10), das so aufgebaut ist, dass es starr und in einer im Wesentlichen horizontalen Position direkt auf der Wand (P) befestigt werden kann, und ein zweites gerades Profil (11), das so aufgebaut ist, dass es mindestens einen die Türflügel tragenden Laufwagen (3) und die Vorrichtung zur Bewegung der Laufwagen (4) tragen kann und sich am ersten Profil (10) einhängt. 45
Die Antriebseinheit zur automatischen Bewegung von Schiebetüren (1), **dadurch gekennzeichnet, dass** das erste Profil (10) so ausgebildet ist, dass es eine Stützkonsolle (10a) bildet, die auskragend im Wesentlichen horizontal aus der Wand (P) herausragt; dadurch, dass das zweite Profil (11) durch die Schwerkraft fest im Anschlag auf der Konsolle (10a) des ersten Profils (10) aufliegt; und dadurch, dass der Längsträger (2) zusätzlich und die Konsolle (10a) des ersten Profils (10). 50
2. Wobei dass das erste Profil (10) einen im Wesentlichen L-förmigen Querschnitt aufweist und so aufgebaut ist, dass es so an der Wand (P) angebracht werden kann, dass sein unterer flacher Abschnitt (10a) auskragend aus der Wand (P) hervorsteht, wobei er im Wesentlichen horizontal bleibt, und das zweite Profil (11) so aufgebaut ist, dass es auf dem 55

unteren flachen Abschnitt (10a) des ersten Profils (10) aufliegt.

3. Antriebseinheit zur automatischen Bewegung von Schiebetüren gemäß Patentanspruch 4, **dadurch gekennzeichnet, dass** das zweite Profil (11) einen im Wesentlichen C-förmigen Querschnitt aufweist, über zwei sich gegenüberliegende längslaufende flache Abschnitte (11a, 11b) verfügt und so aufgebaut ist, dass es seine obere Kante (11c) auf dem oberen Rand (10c) des ersten Profils (10) einhaken kann und gleichzeitig seinen unteren flachen Abschnitt (11a) fest auf dem unteren flachen Abschnitt (10a) auflegen kann, so dass er durch die Schwerkraft auf dem ersten Profil (10) aufliegend festgeklemmt ist, wobei der obere flache Abschnitt (11b) des zweiten Profils (11) dagegen auskragend über dem unteren flachen Abschnitt (11a) des ersten Profils (11) aus der Wand (P) heraussteht und lokal parallel und mit Abstand von dem unteren flachen Abschnitt (11a) bleibt.
4. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach Patentanspruch 2 oder 3, **dadurch gekennzeichnet, dass** der erste längslaufende Einsatz aus Elastomer-Metall (14) zwischen dem unteren flachen Abschnitt (10a) des ersten Profils (10) und dem unteren flachen Abschnitt (11a) des ersten Profils (10) und dem unteren flachen Abschnitt (11a) des zweiten Profils (11) eingesetzt wird;
5. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach Patentanspruch 3 oder 4, **dadurch gekennzeichnet, dass** der obere flache Abschnitt (11b) des zweiten Profils (11) außerdem breiter ist als der untere flache Abschnitt (11a) desselben Profils (11), so dass er auskragend über den Rand des unteren flachen Abschnitts (11a) reicht.
6. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach jedem der vorhergehenden Patentansprüche, **dadurch gekennzeichnet, dass** die Oberkante (11c) des zweiten Profils (11) so aufgebaut ist, dass sie auf der Oberkante (10c) des ersten Profils (10) einrastet.
7. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach Patentanspruch 6, **dadurch gekennzeichnet, dass** der Längsträger (2) eine erste Längsdichtung aus elastomerem Material (13) umfasst, die zwischen dem oberen Rand (10c) des ersten Profils (10) und der oberen Kante (11c) des zweiten Profils (11) eingesetzt ist.
8. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach einem beliebigen der vorhergehenden Patentansprüche, **dadurch gekennzeichnet, dass** der Längsträger (2) auch ein oder mehrere

mechanische Verankerungsorgane (12) umfasst, die so aufgebaut sind, dass sie das zweite gerade Profil (11) stabil in Auflage auf dem ersten geraden Profil (10) festklemmen.

9. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach einem beliebigen der vorhergehenden Patentansprüche, **dadurch gekennzeichnet, dass** mindestens ein Türflügel tragender Laufwagen (3) axial verschiebbar auf einer geraden Schiene (15) angebracht ist, die ihrerseits auf einem zweiten Profil (11) mit Zwischeneinlage einer Längsdichtung (17) aus elastomerem Material befestigt ist.
10. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach Patentanspruch 9, **dadurch gekennzeichnet, dass** die gerade Schiene (15) über der Oberseite des unteren flachen Abschnitts (11a) des zweiten Profils (11) liegt und sich parallel zur Längsachse des zweiten Profils (11) im Wesentlichen über die gesamte Länge des zweiten Profils (11) erstreckt.
11. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach Patentanspruch 10, **dadurch gekennzeichnet, dass** die gerade Schiene (15) rittlings auf einer hervorstehenden geraden Rippe (16), die aus der Oberseite des unteren flachen Abschnitts (11a) des zweiten Profils (11) herausragt, fest angebracht und fixiert ist, wobei die Längsdichtung (17) aus elastomerem Material zwischen der Schiene (15) und der geraden Rippe (16) des zweiten Profils (11) eingesetzt ist.
12. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach einem beliebigen der vorhergehenden Patentansprüche, **dadurch gekennzeichnet, dass** die Bewegungsmittel der Laufwagen (4) Folgendes umfassen: zwei Umlenkrollen (6, 7), die im Wesentlichen komplanar zueinander liegen und axial drehbar auf dem zweiten Profil (11) des Längsträgers (2) in unmittelbarer Nähe der beiden Achsen des zweiten Profils (11) befestigt sind; einen Mitnehmerriemen (8), der ringförmig um die beiden Umlenkrollen (6, 7) gespannt ist; und einen Elektromotor (9), der auf dem zweiten Profil (11) befestigt und mechanisch so mit der ersten Umlenkrolle (7) verbunden ist, dass er diese erste Umlenkrolle (7) um ihre Drehachse (R) in Drehung versetzen kann.
13. Antriebseinheit zur automatischen Bewegung von Schiebetüren nach Patentanspruch 12, **dadurch gekennzeichnet, dass** die erste (6) und die zweite Umlenkrolle (7) axial drehbar von den entsprechenden Halterungen (20, 21) getragen werden, die sich auskragend aus dem oberen flachen Abschnitt (11b) des zweiten Profils (11) nach unten erstrecken und starr und fest, aber leicht entfernbar, am oberen fla-

chen Abschnitt (11b) des zweiten Profils (11) befestigt sind.

Revendications

1. La motorisation pour l'automatisation de portes à vantaux coulissants (1) du type comprenant: un longeron rectiligne portant(2) en mesure d'être fixé fermement et en position horizontale sur une paroi générique (P), au-dessus de la porte à vantaux coulissants (100); au moins un chariot porte-vantail (3) monté et coulissant sur le longeron (2) parallèlement à l'axe longitudinal du longeron (L), et qui est structuré de manière à être fixé fermement au corps d'un vantail coulissant (101) de la porte à vantaux coulissants (100); et les systèmes de déplacement des chariots (4) qui sont fixés sur le longeron (2), et sont structurés de manière à pouvoir déplacer au moins un chariot porte-vantail (3) en avant et en arrière le long du longeron (2);
Un longeron portant(2) comprend un premier profilé rectiligne (10) qui est structuré de manière à être fixé fermement et en position horizontale directement sur cette paroi (P), et un deuxième profilé rectiligne (11) qui est structuré de manière à supporter au moins un chariot porte-vantail (3) et ce dispositif de déplacement des chariots (4) qui vient s'accrocher sur ce premier profilé (10) ; selon lequel le premier profilé (10) est structuré de manière à former une console de support (10a) qui ressort en porte-à-faux de la paroi (P) tout en restant parallèle au sol ; et selon lequel le deuxième profilé rectiligne (11) est structuré de manière à s'appuyer par gravité de manière stable sur la console (10a) du premier profilé (10) ; **caractérisé par le fait que** le longeron portant (2) qui comprend un supplémentaire premier insert longitudinal en élastomère (14) interposé entre le deuxième profilé rectiligne (11) et la console (10a) sur le premier longeron (10) .
2. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication, **caractérisée par le fait que** le premier profilé (10) possède une section transversale en forme de L, et est structurée pour être fixée fermement sur la paroi (P) de manière à ce que sa portion plane inférieure (10a) ressorte en porte-à-faux de la paroi (P) tout en restant horizontale; le deuxième profilé (11), est structuré pour être en appui sur la portion plane inférieure (10a) du premier profilé 10.
3. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication 4, **caractérisée par le fait que** le deuxième profilé (11) possède une section transversale en forme de C, est munie de deux portions planes longitudinales (11a, 11b) l'une en face l'autre, et est structurée de ma-

nière à pouvoir accrocher son coin supérieur (11c) sur le bord supérieur (10c) de ce premier profilé (10), tout en pouvant placer sa portion plane inférieure (11a) de manière stable en appui sur la portion plane inférieure (10a) du premier profilé (10) ; la portion plane supérieure (11b) du deuxième profilé (11) ressort en porte-à-faux de la paroi (P) au-dessus de la portion plane inférieure (11a) du même premier profilé (11), en restant localement parallèle et éloignée de cette portion plane inférieure (11a) .

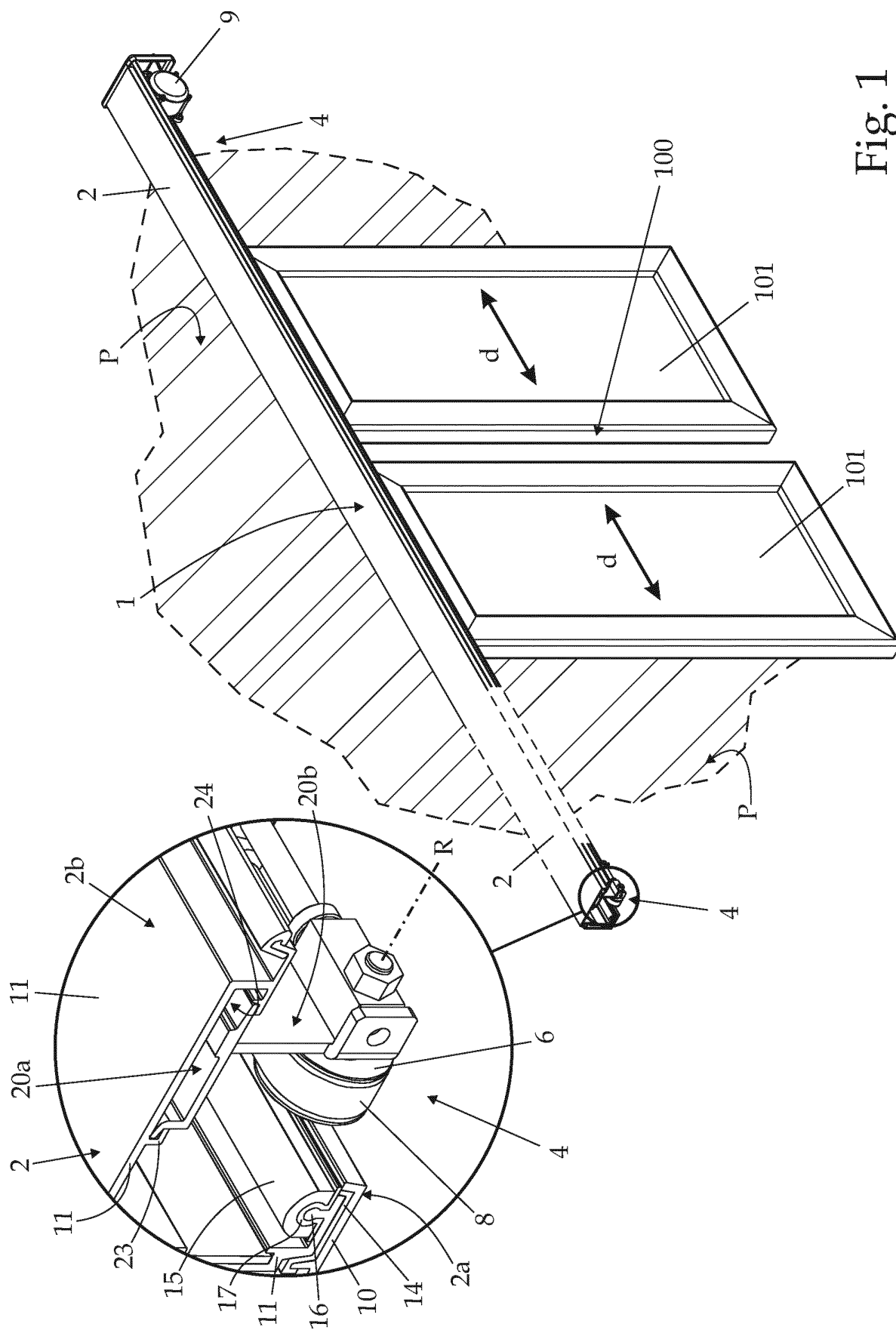
4. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication 2 ou 3, **est caractérisée par le fait que** le premier joint (14) longitudinal en élastomère est placé entre la portion plane inférieure (10a) du premier profilé (10) et la portion plane inférieure (11a) du premier profilé (10) et la portion plane inférieure (11a) du deuxième profilé (11) ;
5. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication 3 ou 4, **caractérisée par le fait que** la portion plane supérieure (11b) du deuxième profilé (11) possède aussi une largeur supérieure à la portion plane inférieure (11a) de ce même profilé (11), de manière à s'étendre en porte-à-faux au-delà du bord de cette même portion plane inférieure (11a).
6. La motorisation pour l'automatisation de portes à vantaux coulissants comme revendiqué dans les revendications précédentes, **caractérisé par le fait que** le coin supérieur (11c) du deuxième profilé rectiligne (11) est structuré pour que s'engage sur le bord supérieur (10c) du premier profilé rectiligne (10).
7. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication 6, **caractérisée par le fait que** le longeron portant (2) comprend un premier joint longitudinal en élastomère (13) qui, interposé entre le bord supérieur (10c) du premier profilé (10) et le coin supérieur (11c) du deuxième profilé (11).
8. La motorisation pour l'automatisation de portes à vantaux coulissants selon n'importe quelle des revendications précédentes, **caractérisée par le fait que** le longeron portant (2) comprend aussi un ou plusieurs organes mécaniques d'ancrage (12) structurés de manière à pouvoir bloquer le deuxième profilé rectiligne (11) de manière stable en appui sur le premier profilé rectiligne (10).
9. La motorisation pour l'automatisation de portes à vantaux coulissants selon n'importe quelle des revendications précédentes, **caractérisée par le fait qu'au moins un** chariot porte-vantail (3) est inséré

de manière axiale et coulissante sur un rail rectiligne (15) qui, à son tour, est fixé sur le deuxième profilé 11 au moyen de l'interposition d'un joint longitudinal (17) en élastomère.

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10. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication 9, **caractérisée par le fait que** ce rail rectiligne (15) est positionné sur la face supérieure de la portion plane inférieure (11a) du deuxième profilé (11) et s'étend parallèlement à l'axe longitudinal du deuxième profilé (11) essentiellement sur l'entièreté de la longueur du deuxième profilé (11). 10
11. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication 10, **caractérisée par le fait que** ce rail rectiligne (15) est inséré et bloqué fermement à cheval sur une nervure rectiligne saillante (16) qui ressort de la face supérieure de la portion plane inférieure (11a) du deuxième profilé 11 ; le joint longitudinal (17) en élastomère est interposé entre ce rail (15) et la nervure rectiligne (16) du deuxième profilé (11). 15
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12. La motorisation pour l'automatisation de portes à vantaux coulissants selon n'importe quelle des revendications précédentes, **caractérisée par le fait que** les systèmes de déplacement des chariots (4) comprennent : deux poulies de renvoi (6, 7) qui sont coplanaires entre elles et sont fixées de manière axiale et pivotante sur le deuxième profilé (11) du longeron (2), derrière les deux extrémités axiales du deuxième profilé (11); une courroie d'entraînement (8) enroulée à anneau autour des deux poulies de renvoi (6, 7); et un moteur électrique (9) qui est fixé sur le deuxième profilé (11) et est raccordé mécaniquement à une première poulie de renvoi (7) afin de pouvoir entraîner en rotation cette première poulie (7) autour de son axe de rotation (R) . 25
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13. La motorisation pour l'automatisation de portes à vantaux coulissants selon la revendication 12, **caractérisée par le fait que** la première (6) et la deuxième poulie de renvoi (7) sont supportées de manière axiale et pivotante par des étriers de support (20,21), en se prolongeant en porte-à-faux vers le bas de la portion plane supérieure (11b) du deuxième profilé (11), et sont fixées à la portion plane supérieure (11b) du deuxième profilé (11) fermement et de manière stable, mais facilement amovible. 45
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Fi. 1

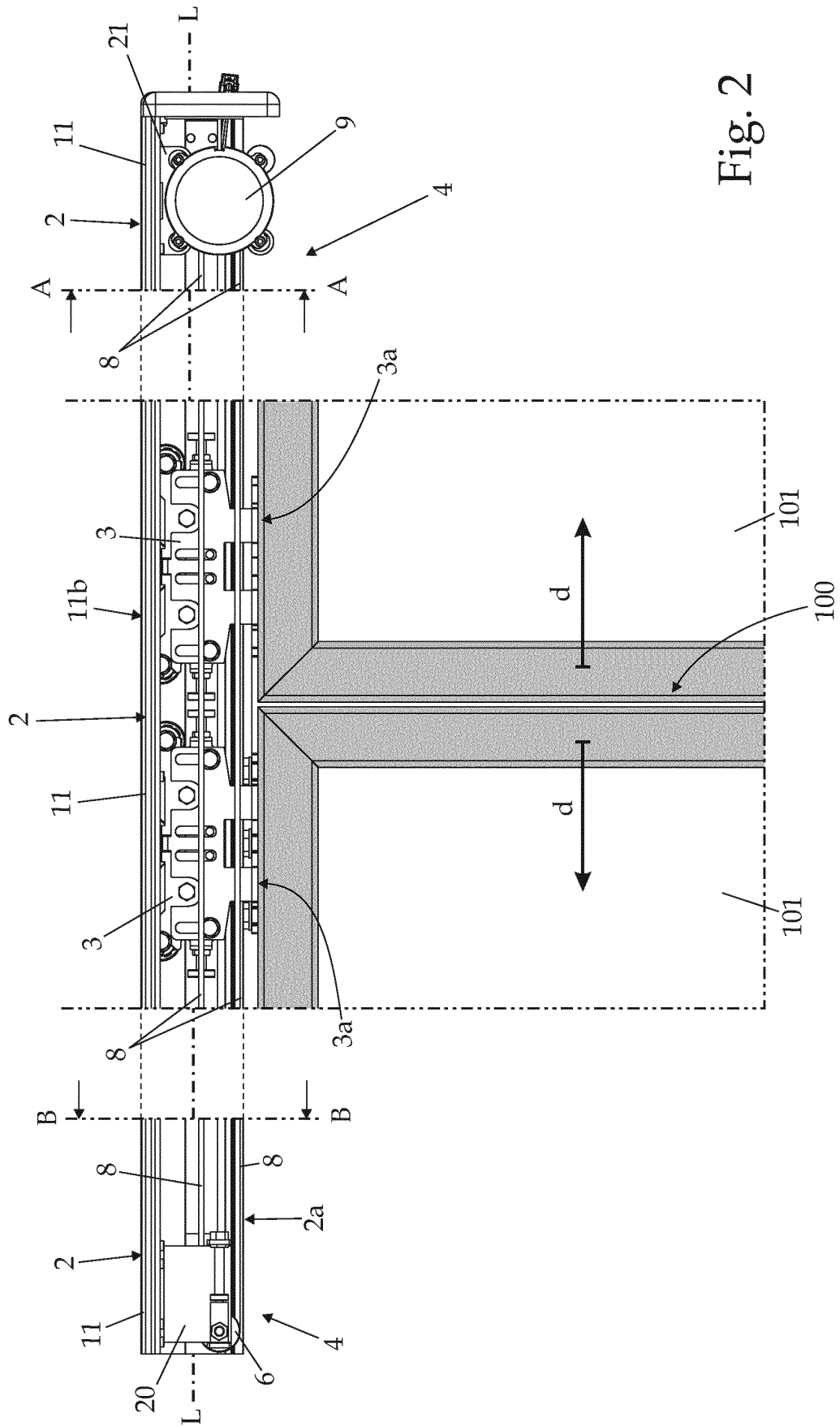


Fig. 2

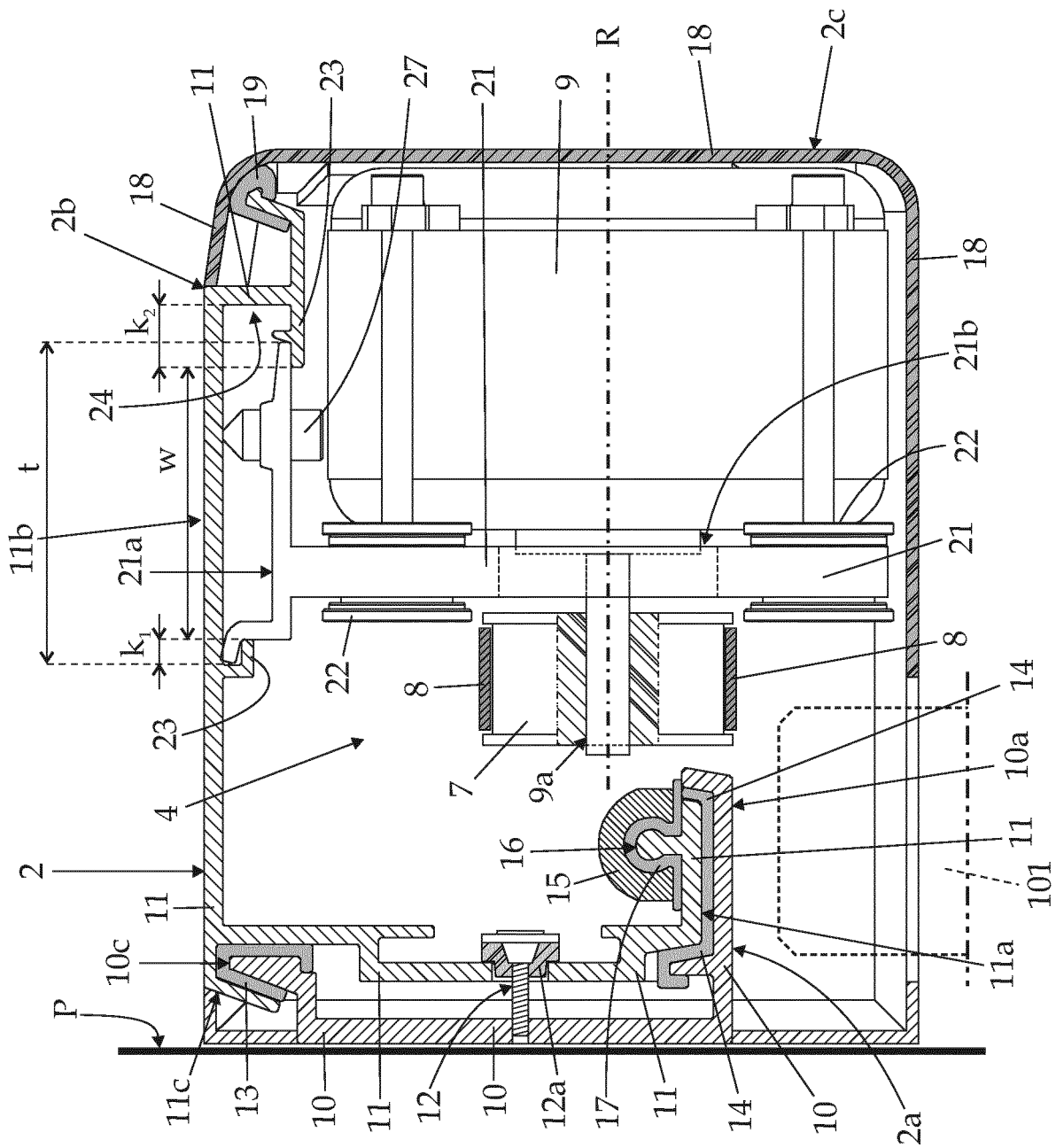


Fig. 3

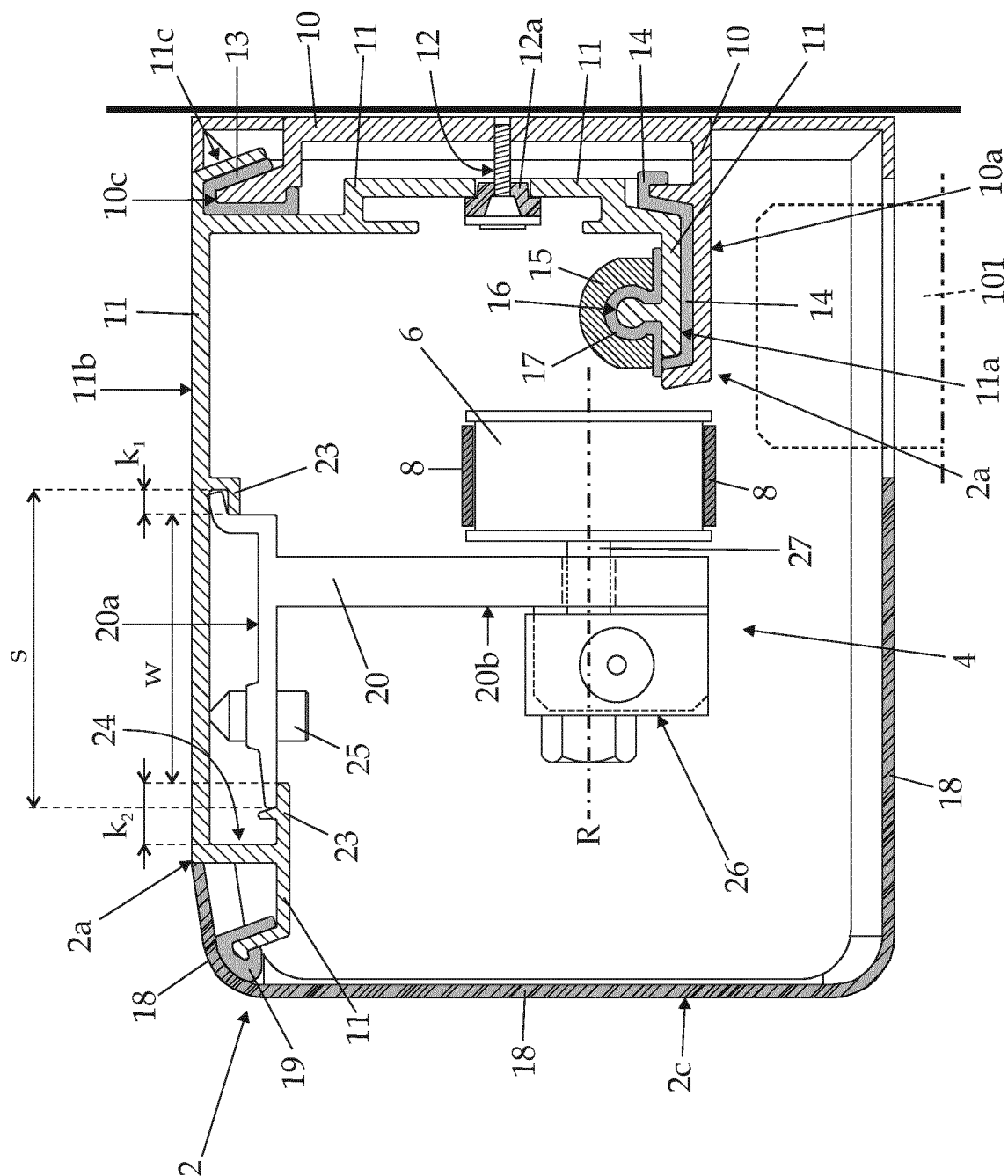


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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