(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 905 933 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.04.2008 Bulletin 2008/14

(51) Int Cl.:
E06B 3/44 *(2006.01)*

(21) Application number: **07116534.4**

(22) Date of filing: **17.09.2007**

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

(30) Priority: **22.09.2006 IT VI20060282**

(71) Applicant: **Besenzoni S.p.A.**
24067 Sarnico (Bergamo) (IT)

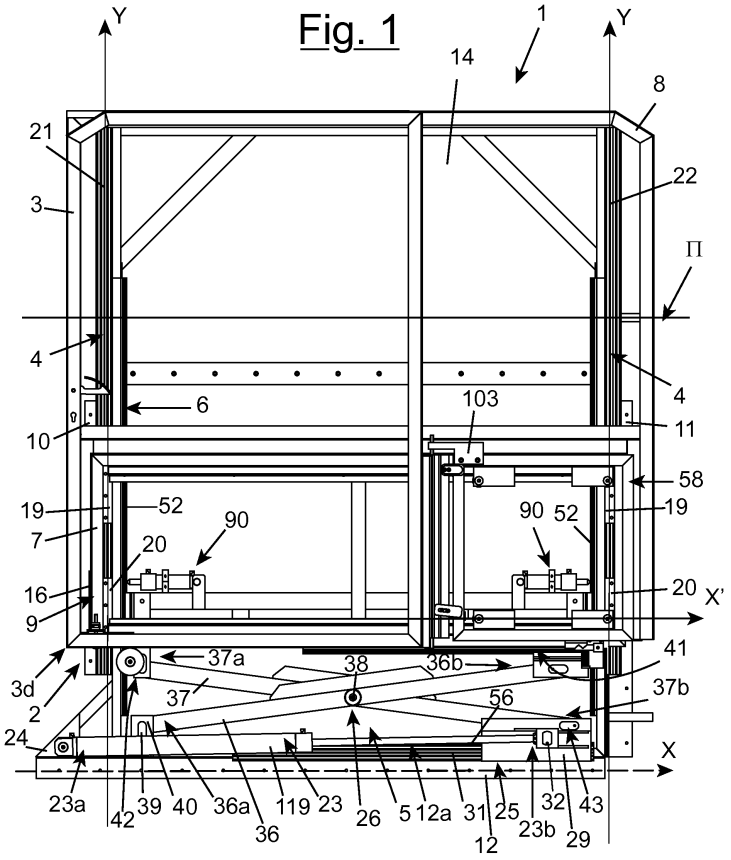
(72) Inventor: **Besenzoni, Giovanni**
24067 Sarnico (Bergamo) (IT)

(74) Representative: **Iannone, Carlo Luigi et al**
Barzanò & Zanardo Roma S.p.A.
Via Piemonte 26
00187 Roma (IT)

(54) Sliding door for opening/closing admissions and method for moving such a door

(57) A sliding door (1) for opening/closing admissions comprising a support frame (2), which is associated with a support structure close to the admission, and a shutter (3) coupled with the support frame (2) to open/close the admission and provided with a top surface (3a) and with a bottom surface (3b) spaced apart according to a first direction (Y). The sliding door comprises translation means (4), associated with the support frame (2), which make the shutter (3) able to slide along the aforementioned first direction (Y).

Fig. 1



EP 1 905 933 A2

Description

[0001] The present invention concerns a sliding door for opening and closing admissions, suitable above all for being installed in boats such as powerboats, yachts, cruisers, liners and so on.

[0002] The invention also concerns the method for moving the same sliding door.

[0003] It is known that the rooms of a support structure, be it a building like a dwelling, a factory, a shopping centre or an office block, be it a boat, a truck equipped with a caravan or something else, communicate with each other or with the outside by means of admissions.

[0004] At such admissions, formed at the dividing or perimetric walls, a door is installed to open and close them.

[0005] On the market there are various types of doors suitable for numerous applications and that range, for example, from conventional doors, connected through hinges to the jamb defining the admission, to sliding doors and to folding doors.

[0006] Within the category of sliding doors there are doors that, supported by a frame installed outside of the wall, slide flush with the wall itself, thus always remaining in view.

[0007] Other sliding doors, on the other hand, are connected to a formwork, also known as counterframe, contained in a slit, formed in the thickness of the wall beside the admission to be served, capable of completely receiving the door leaf or shutter.

[0008] When one wishes to leave the admission free, these doors are made to slide and inserted in the formwork for a certain length or up to the point at which they totally reenter inside of it (hence the name foldaway doors) opening the admission.

[0009] Sliding doors, in particular foldaway ones, are all the more valued when one wishes to limit bulk, especially when open, an increasingly important requirement in modern building constructions; moreover, they have a rather pleasant appearance.

[0010] The movement of the sliding door in any case takes place along a substantially horizontal direction parallel to a wall orthogonal to the walking area defined by the support structure.

[0011] In applications in which the walls do not allow the installation of a foldaway sliding door as it is impossible to make the slit in which to build the formwork, like for example and in particular on boats, it is foreseen to have conventional doors or, more advantageously, sliding doors flush with the wall, outside of it.

[0012] Therefore, the objective of limiting the bulk as much as possible becomes difficult to achieve precisely where it is actually especially needed and crucial, and should be extreme.

[0013] Moreover, the appearance of the room in which a door that slides outside of the wall is arranged, as much as the recent solutions are advanced from this point of view, is to some extent spoilt by the view of the frame that supports the shutter.

[0014] Another drawback, as a direct consequence of the above, is due to the fact that often, in the aforementioned forms of application, with the admission completely open there is not an adequate or at least sufficient aeration capacity of the rooms inside the support structure, disregarding the addition of windows, hatches, portholes and similar.

[0015] Indeed, the size of the admission are somewhat small and linked to the fact that the door, with the admission open, is necessarily beside a supporting wall adjacent to it.

[0016] This is particularly disadvantageous in hot or in any case sunny weather since it makes it less comfortable for people to stay in the rooms.

[0017] The last but not least drawback consists of the fact that, despite the opening of the admission being completely open and even if they are made from glass or crystal, the sliding doors flush with the wall make it harder to see the view or what happens outside for people in the inner rooms.

[0018] The present invention proposes to overcome the drawbacks of the prior art quoted above.

[0019] In particular, the primary purpose of the invention is to provide a sliding door for opening/closing admissions that has a smaller bulk than equivalent known doors, above all when the admission is open.

[0020] A second purpose of the present invention is to make a sliding door capable of giving the room in which it is installed, especially when open, a better appearance than that offered by doors of the prior art.

[0021] A further purpose of the invention is to define a sliding door that in some support structures, for example boats, by opening the admission increases the degree of aeration of the inner rooms compared to the prior art.

[0022] Another purpose of the invention is to devise a sliding door that, by opening the relative admission, allows the field of vision available to people present inside the inner rooms to be increased compared to known sliding doors.

[0023] The last but not least purpose of the invention it to provide a method for moving a sliding door that is practical and simple to carry out.

[0024] Said purposes are accomplished through a sliding door for opening/closing admissions according to the attached claim 1, to which we refer for the sake of brevity.

[0025] Other detailed characteristics of the sliding door according to the invention are shown in the corresponding dependent claims.

[0026] The indicated purposes are also achieved thanks to a method for moving a sliding door according to the attached claim 40, to which we again refer for the sake of ease of explanation.

[0027] Advantageously, the invention makes a system for making a system for moving a sliding door that is

extremely practical and easy to obtain.

[0028] Again advantageously, the sliding door, when the admission is open, almost totally disappears in a space or gap formed in a room of the support structure different to the rooms used for people's normal needs.

[0029] The impact of the door of the invention on the appearance of such rooms is, therefore, zero or negligible.

[0030] In this way, therefore, the invention improves the appearance of the room in which the sliding door opens and closes the admission, said appearance in any case being pleasant even in conditions where the admission is closed.

[0031] Equally advantageously, the sliding door of the invention, especially in the quoted open conditions, has a limited bulk compared to equivalent doors of the

prior art.

[0032] Advantageously, moreover, with the sliding door according to the invention open it is able to ensure better circulation of air in the inner rooms of the support structure than the prior art.

[0033] In addition to this, in such conditions the people present in the rooms are provided with a wider point of observation of the view outside, from a comfortable position, compared to what is offered by similar known doors.

[0034] This aspect is important and distinctive in support structures like boats, especially considering situations out at sea.

[0035] Said purposes and advantages shall become clearer from the description of a preferred embodiment of the invention, given as a non-limiting example with reference to the attached tables of drawings, where:

- figure 1 is the front view of the door of the invention in a first operative condition;
- figure 2 is the door of figure 1 in a second operative condition;
- figure 3 is the rear view of figure 2;
- figure 4 is a first detail of figure 1;
- figure 5 is a second detail of figure 1;
- figure 6 is a third detail of figure 1;
- figure 6a is a side view of figure 6;
- figure 6b is the rear view of figure 6;
- figure 7 is a fourth detail of figure 1;
- figure 8 is a fifth detail of figure 1;
- figure 8a is the plan view of figure 8;
- figure 8b is the view of figure 8a according to the section plane A-A;
- figure 9 is a sixth detail of figure 1;
- figure 9a is the side view of figure 9;
- figure 10 is a seventh detail of figure 1;
- figure 10a is the side view of figure 10;
- figure 11 is an eighth detail of figure 1;
- figure 11a is the side view of figure 11;
- figure 12 is a tenth detail of figure 1;
- figure 12a is the side view of figure 12;
- figure 13 is an enlargement of a first detail of figure 2;
- figure 14 is the side view of an enlarged detail of figure 13;
- figure 15 is an enlargement of a second detail of figure 2;
- figure 16 is an eleventh detail of figure 1;
- figure 17 is a twelfth detail of figure 1;
- figure 17a is the side view of figure 17;
- figure 18 is a thirteenth detail of figure 1;
- figure 18a is the side view of figure 18;
- figure 18b is the view of figure 18 according to the section plane B-B.

[0036] The sliding door of the invention, used to open and close admissions especially in boats such as yachts, cruise ships, powerboats and similar, is illustrated in conditions out of use in figure 1, where it is globally indicated with 1.

[0037] As can be seen, the sliding door 1 comprises a support frame, wholly numbered with 2, which is associated with a support structure, not shown, close to the admission, and a shutter 3, for example of the type made from glass, coupled with the support frame 2 to open and close the admission and provided with a top surface 3a and a bottom surface 3b spaced apart according to a first direction Y.

[0038] According to the invention, the door 1 comprises translation means, generically indicated with 4, associated with the support frame 2, which make the shutter 3 able to slide along the first direction Y.

[0039] Preferably, but not limitingly, the aforementioned first direction Y is substantially vertical and generally crosses a horizontal plane II defined by the support structure.

[0040] Preferably but not necessarily, moreover, the sliding door 1 includes moving means, wholly indicated with 5, applied to the support frame 2, operatively connected to the shutter 3 in the manner described hereafter and actuated by command means, not depicted in the following drawings.

[0041] The command means include a processing and control logic unit, electrically connected to the moving means 5 that drives following a signal transmitted by the user through buttons arranged at the admission.

[0042] Figure 1 shows that the support frame 2 comprises a base frame 6, fixed to the support structure, suitable for being in part contained in a space of the support structure itself.

[0043] For example, the space of the support structure can consist of a gap formed in a boat between the room where the motors are positioned and the rooms surrounding it and below the horizontal plane II belonging to the room where people normally move and spend their time.

[0044] The support frame 2 also includes an intermediate frame 7, operatively connected to the shutter 3, coupled with the base frame 6 through the translation means 4 that allow it to slide along the first direction Y to

define an active position, shown in figures 2 and 3, in which the intermediate frame 7 projects from the plane II of the support structure, and a passive position, able to be seen in figure 1, in which it reenters into the space.

[0045] Finally, the support frame 2 comprises a shaped frame 8, coupled on the outside through joining means, wholly indicated with 9 and able to be seen more clearly in figure 13, with the intermediate frame 7 with respect to which it is arranged on the same vertical plane.

[0046] The base frame 6, the intermediate frame 7 and the shutter 3 lie on three vertical planes that are distinct and parallel to one another.

[0047] Figures 4 and 5 also highlight that the base frame 6 is formed from two main rods 10, 11 spaced apart and defining the first direction Y, connected at the bottom by a cross-member 12, which defines a longitudinal axis X orthogonal to the first direction Y and which supports the moving means 5.

[0048] On top, the main rods 10, 11 are connected by a U-shaped reinforcing framework 13 provided with arms 13a, 13b fixed to the main rods 10, 11 respectively.

[0049] In the passive condition of the intermediate frame 7, coinciding with the maximum opening of the admission, the sliding door 1 remains visible on the outside, projecting from the plane Π, for just the reinforcing framework 13 of the base frame 6, which can be advantageously hidden by a furnishing component such as a sofa, a storage wall or similar.

[0050] Figures 6 and 6b illustrate that the intermediate frame 7 is in the case under examination formed from two horizontal elements 71, 73 that are the same as one another and two vertical elements 72, 74 that are the same as one another that define a rectangular profile for the intermediate frame 7.

[0051] The shaped frame 8, the shape of which is shown in figure 7, is advantageously equipped with a sheet of vitreous material 14, for example crystal, built into a perimetric recess 15 formed on the inner wall 8b of the top part 81b of the shaped frame 8.

[0052] From figures 1, 2 and 3 it can be seen that the top part 81b of the shaped frame 8 projects from the intermediate frame 7 according to the first direction Y.

[0053] In relation to the joining means 9, they include a shaped profile 16, stably connected both to the intermediate frame 7 and to the shaped frame 8.

[0054] The shaped profile 16 is arranged between the outer wall 7a of the intermediate frame 7 and the inner wall 8a of the bottom part 81a of the shaped frame 8.

[0055] In greater detail, the shaped profile 16 is arranged at the ends 72a, 74a of the vertical elements 72, 74 of the intermediate frame 7, as well as at two rectilinear wings 17, 18 present in the bottom part 81a of the shaped frame 8.

[0056] As regards the translation means 4, they preferably comprise two pairs of first sliding blocks 19, 20, each fixed to one of the vertical elements 72, 74 of the intermediate frame 7, as shown in figures 6, 6a and 6b, and two first rails 21, 22, able to be seen more clearly in figure 4, each of which matches with a pair of first sliding blocks 19, 20.

[0057] The first rails 21, 22 are coupled with the respective front wall 10a, 11a of the corresponding main rods 10, 11, engaging its entire length.

[0058] In other embodiments of the invention, not shown, the number of sliding blocks and of rails per main rod can be different, just as they can be associated with just one of the rods.

[0059] Figures 1, 2 and 3 show that preferably the moving means 5 first introduced include:

- a linear actuator 23, for example of the hydraulic type, having a first end 23a fixedly connected to a joining bracket 24 that makes the main rod 10 and the cross-member 12 integral with each other, and a second end 23b connected through first guide means, wholly numbered with 25, to the cross-member 12;
- a transmission linkage, wholly indicated with 26 and slidably coupled with the base frame 6 and with the intermediate frame 7.

[0060] The first guide means 25 comprise a second sliding block 27, clearly visible in figure 8b, integral with a bent plate 28, shaped like an L and near to a shaped support 29, also shown in figures 8 and 8a, joined through fixed connection means, wholly indicated with 30, to the second end 23b of the linear actuator 23.

[0061] The first guide means 25 also comprise a second rail 31, matching with the second sliding block 27, coupled with the front surface 12a of the cross-member 12 and engaging it for more than half of its length.

[0062] In this specific case, the fixed connection means 30 include a first pin 32 inserted in through holes arranged coaxially, formed in the shaped support 29, in the second end of the linear actuator 23 and in a bushing 35, arranged between the second end 23b of the linear actuator 23 and the bent plate 27.

[0063] For the sake of ease of explanation, the through holes can only be seen for the shaped support 29 and the bushing 35, for which they are respectively indicated with reference numerals 33, 34.

[0064] According to the preferred embodiment of the invention described here, the transmission linkage 26 comprises two longitudinal arms 36, 37, connected together close to the intermediate area through an articulation pin 38 to form the device known in the field of mechanical construction as articulated quadrilateral.

[0065] In figures 1, 2, 3 and 4 it can also be seen that the first longitudinal arm 36 has an end 36a pivoted through a second pin 39 to a pair of small plates 40 opposite to each other, fixed to the extremity 12b of the cross-member from which they project, and the opposite end 36b coupled with the intermediate frame 7 through second guide means, wholly indicated with 41.

[0066] The second longitudinal arm 37 has an extremity 37a connected to the main rod 10 through third guide

means, wholly indicated with 42, and the opposite extremity 37b connected to the cross-member 12 through fourth guide means, wholly indicated with 43.

[0067] In the described example the second guide means 41 include a third sliding block 44, integral outside with the base 45a of a first plate 45, according to what has been shown in figures 9 and 9a.

[0068] The end 36b of the first arm 36 is connected to the first plate 45 by means of a third pin 46, inserted in coaxial through holes 47, made in the first plate 45, and in a through hole, not visible, formed at the end 36b itself.

[0069] The second guide means 41 also comprise a third rail 48, matching with the third sliding block 44, coupled with the side surface 71a of the horizontal element 71 of the intermediate frame 7.

[0070] The third rail 48 engages the horizontal element 71 for more than half of its length.

[0071] Similarly, the third guide means 42 comprise a fourth sliding block 49, as highlighted in figures 10 and 10a, integral outside with the base 50a of a second plate 50 to which the extremity 37a of the second arm 37 is connected through a fourth pin 51.

[0072] The pin 50 is inserted in a pair of coaxial through holes 51, formed in the second plate 50, as well as in a through hole, not represented, present at the extremity 37a of the second arm 37.

[0073] The third guide means 42 also comprise a fourth rail 52, matching with the fourth sliding block 49, coupled with the inner wall 10b, 11b of both of the main rods 10, 11 of the base frame 6.

[0074] The fourth guide means 43 comprise a fifth sliding block 53, integral outside with the base 54a of a third plate 54, as illustrated by figure 8b, to which the extremity 37b of the second arm 37 is connected through a fifth pin 55.

[0075] Moreover, the fourth guide means 43 comprise a fifth rail 56, matching with the fifth sliding block 53, coupled with the inner surface 12c of the cross-member 12 of the base frame 6.

[0076] In practice, the first guide means 25 and the fourth guide means 43 are constructively integral with each other and with the cross-member 12 and, since the first guide means 25 are connected to the moving means 5, are, therefore, also connected from an operative point of view, as shall be made clearer later on.

[0077] Figures 8b, 9a and 10a show that, preferably but not necessarily, each of the plates 54, 45 and 50 has a substantially U-shaped profile in cross section.

[0078] Preferably, the sliding door 1 comprises sliding means, wholly indicated with 57, associated with the intermediate frame 7, which allow the translation of the shutter 3 along a second direction X' orthogonal to the first direction Y.

[0079] The shutter 3 thus defines a first operative position, not able to be seen in the drawings, in which it is arranged projecting from the base frame 6 opening the admission, and a second operative position, according to figures 2 and 3, in which it projects at the side from the intermediate frame 7 closing the admission.

[0080] In particular, the sliding means 57 comprise a connection frame 58, shown in figures 11 and 11a, provided on the side wall 58a with a series of projecting pulleys 59, and a pair of laminar profiles 60, 61 on each of which the pulleys 59 are arranged so that they can slide.

[0081] Each of the laminar profiles 60, 61, for example made from aluminium, is coupled with one of the horizontal elements 71, 73 of the intermediate frame 7, as shown in figures 6, 6a and 6b.

[0082] The connection frame 58 is made up of four tubular bodies 62a, 62b two by two counterposed and interconnected one to the other to form a square profile.

[0083] In detail, in figures 11 and 11a it is shown that, in the embodiment described, the two tubular bodies 62a are provided with a pair of projecting pulleys 59.

[0084] The connection frame 58 is connected to the shutter 3 through fastening means, wholly numbered with 63, which foresee:

- two first plaques 64, shown in figure 11a, each having a first end fixed to the bottom part 621b of the tubular body 62b of the connection frame 58;
- a linear profile 65, visible in figure 12, coupled on one side with a bottom portion of the side edge 3c of the shutter 3 through joining means, wholly numbered with 66, and on the other side with the connection frame 58 through a pin 67 inserted in a slot 68, formed at the second end of each of the first plaques 64, and in a through hole 69 made at the base 65a of the linear profile 65;
- two second plaques 70, each having a first extremity fixed to the top 65b of the linear profile 65 and a second extremity connected to the connection frame 58 through a pin 75 inserted in coaxial through openings 76, 77, formed respectively at the second extremity of each of the second plaques 70 and at the top part 622b of the tubular body 62b of the connection frame 58.

[0085] Figure 12a shows that the joining means 66 include, as a non-exclusive example, a hollow body 78 made from polymeric material and having the same profile in cross section as the sliding blocks 19, 20, 27, 44, 49 and 53 mentioned earlier.

[0086] The linear profile 65 in a side view has a substantially U-shaped profile, the same as that of the sliding blocks 45, 50 and 54.

[0087] Advantageously, the sliding door 1 comprises safety means, clearly visible in figure 13 where they are wholly indicated with 79, associated with the intermediate frame 7, intended to counteract the accidental movement of the shutter 3 along a generic horizontal direction, especially during the translation along the first direction Y.

[0088] Preferably, the safety means 79 comprise a support plate 80, projecting from the side surface 71a of the horizontal element 71 of the intermediate frame 7 and

fixed to it close to one of the vertices of its rectangular profile.

[0089] The safety means 79 therefore comprise a shaped block 82, coupled cantilevered with the support plate 80 through attachment means, globally indicated with 83, and having a transversal notch 84 close to the free end 82a.

[0090] Finally, the safety means 79 include a counter-shaped insert 85, projecting from the outer wall 621a of the tubular body 62a of the connection frame 58, as illustrated in figure 11.

[0091] The counter-shaped insert 85 is provided with a tooth 86 that, in the first operative position of the shutter 3, engages in the transversal notch 84, whereas in the second operative position of the shutter 3 it disengages from it.

[0092] In this specific case, moreover, the safety means 79 comprise elastic means, wholly numbered with 87 and consisting for example of a spring, associated on the outside with a pin 88 that, as shown in figure 14, is supported by a laminar body 89 projecting orthogonally from the outer surface 80a of the support plate 80.

[0093] The elastic means 87 are arranged below the free end 82a of the shaped block 82 with which they cooperate to absorb the strain transmitted to it by the counter-shaped insert 85 during the opening and closing of the admission.

[0094] The usefulness of the safety means 79 is therefore clear since they keep the shutter 3 stable in the position for coupling with the intermediate frame 7 during the movement along the first direction Y, during the course of which unadvised and accidental movements orthogonal to this direction must be prevented or limited as much as possible.

[0095] Moreover, when the admission is open, the safety means 79 keep the shutter 3 in a stable position without bringing it back totally inside the space of the support structure.

[0096] In these conditions, the safety means 79 are able to greatly limit accidental and uncontrolled sliding along the second direction X', and the consequent closing of the admission, due to strains like, for example, the rocking undergone by a boat in the port or at sea.

[0097] A further guarantee against translation along the first direction Y of the intermediate frame 7 and, consequently, of the shutter 3, especially after the intermediate frame 7 has reached the active position, derives from the fact that the sliding door 1 comprises, generally but not necessarily, locking means, wholly indicated with 90 and visible as well as in figures 1, 2 and 3 also in the enlargements of figures 13 and 15.

[0098] The locking means 90 are supported by a composite structure 91 integral with the intermediate frame 7 and coupled through linear sliding guides, wholly indicated with 92, with both of the main rods 10, 11 of the base frame 6.

[0099] The linear guides 92 also in this case comprise a sixth sliding block 93, fixed to each of the side edges of the composite structure 91, and the fourth rail 52, matching, as well as with the fourth sliding block 49, also with the sixth sliding block 93.

[0100] Preferably, the locking means 90 include a pair of linear cylinders 94, electrically connected to the logic unit and connected through fitting brackets 95 to the composite structure 91.

[0101] Each of the linear cylinders 94 is provided with a stem 96 that defines a work position in which, after the intermediate frame 7 has reached the active position, it is inserted in a side hole, not highlighted, formed on the corresponding inner wall 10b, 11b of the respective main rods 10, 11 on top of the fourth rail 52.

[0102] The stem 96 also defines a rest position in which it is removed from the side hole to enable the sliding along the first direction Y of the intermediate frame 7 from the active position, for example when the sliding door 1 is arranged practically totally in the space of the support structure.

[0103] In the example shown, the sliding door 1 comprises detection means, not represented and of the *per sé* known type, for example contact sensors, electrically connected to the logic unit and arranged on the base frame 6, which indicate when the shutter 3 is in the first operative position and the stem 96 of the linear cylinders 94 is in the work position.

[0104] In figure 15 it is shown that the sliding door 1 advantageously comprises a support wheel 97, made from polyamide and height-adjustable, fixed to a ring 98 projecting from the side surface 71a of the horizontal element 71 of the intermediate frame 7.

[0105] In the second operative position and when the intermediate frame 7 slides along the first direction Y, the support wheel 97 supports the free end 3d of the shutter 3 that would otherwise tend to bend dangerously downwards.

[0106] Such a constructive provision during the movement of the shutter 3 helps to determine conditions of extreme safety and of excellent stability that, considering the combined vertical and horizontal translation movement that it can make, are essential for avoiding even irreparable damage of the sliding door 1.

[0107] The sliding door 1 also comprises first means for adjusting the position of the shutter 3 with respect to the horizontal plane Π of the support structure, arranged at the side edge 3c of the shutter 3.

[0108] The first adjustment means, indicated in figure 2 with overall number 99, consist of a threaded rod 100, shown in figure 16, arranged parallel to the linear profile 65, on one side provided with a connection plate 101, fixed to the bottom surface 3b of the shutter 3, and on the opposite side inserted in a through hole 102 made in a shaped connection 103 fixed to the tubular body 62a of the connection frame 58.

[0109] Figures 17, 17a illustrate that the shaped connection 103 has a profile respectively shaped like a P in front view and like a U in side view.

[0110] The sliding door 1 also includes second adjust-

ment means, wholly numbered with 104, applied to the base profile 105 of the shutter 3, suitable for arranging it parallel to the horizontal plane II of the support structure.

[0111] Figures 18, 18a and 18b show that, in a preferred but not limiting manner, the second adjustment means 104 include a threaded rod 106 and a bushing 107 coupled on the outside with such a rod 106.

[0112] The bushing 104 has a series of radial holes 108 suitable for receiving a tool, for example a key or any sort of nib, for rotation about the axis Y'.

[0113] The second adjustment means 104 also comprise a contact pulley 109 associated with the bottom part 106a of the threaded rod 106 and projecting by a variable amount from the bottom surface 3b of the shutter 3 to be arranged near to the plane II of the support structure.

[0114] The threaded rod 106 is arranged passing through a shaped bracket 110 fixed to the top edge 105a of the base profile 105 of the shutter 3 and in which a recess 111 is defined that receives a plate 112, U-shaped in cross section and supported by the threaded rod 106.

[0115] The contact pulley 109 is made integral with the plate 112 through connection means, wholly indicated with 113, which specifically include a pin 114 inserted through the interposition of a bearing 115 in an axial through hole, not visible, formed in the contact pulley 109, and in a slotted through hole 116 made in a support shoulder 117 connected to the shaped bracket 110.

[0116] The object of the present invention is also the method for moving the sliding door 1 for opening/closing admissions described here.

[0117] In accordance with the invention, the sliding of the shutter 3 takes place along the first direction Y according to which the distance between the top surface 3a and the bottom surface 3b of the shutter 3 can be calculated.

[0118] Usually but not necessarily, the first direction Y is vertical and incident a horizontal plane II defined by the support structure.

[0119] The sliding of the shutter 3 takes place through a translation along the first direction Y of the mobile intermediate frame 7 that belongs to the support frame 2 and supports the shutter 3.

[0120] According to the preferred form of application of the invention described here, the translation of the intermediate frame 7 is automatic, thanks to the actuation of the moving means 4 by the command means.

[0121] The translation of the intermediate frame 7 takes place according to opposite directions that arrange it alternately in an active position and in a passive position.

[0122] In the active position, the intermediate frame 7 projects from the plane II of the support structure and arranges the shutter 3 in a first operative condition, beside the admission.

[0123] In the passive position, the intermediate frame 7 reenters in a space of the support structure arranged below the horizontal plane II of it and adjacent to the admission.

[0124] In particular, the translation along the first direction Y consists of an initial raising and a subsequent lowering of the intermediate frame 7 respectively from the passive position towards the active position and viceversa.

[0125] During the raising, the stem 118 of the linear actuator 23 reenters into the chamber 119 making the second sliding block 27 and the fifth sliding block 53 slide, respectively, along the second rail 31 and along the fifth rail 56 of the cross-member 12, the third sliding block 44 along the third rail 48, as well as the sliding blocks 49 and 93 along the fourth rail 52.

[0126] Consequently, the articulated quadrilateral passes from the configuration of figure 1 to the configuration of figure 2.

[0127] During the lowering, the stem 118 of the linear actuator 23 sticks out from the chamber 119 making the sliding blocks 27, 44, 49, 53 and 93 slide in the opposite direction and taking the articulated quadrilateral back into the configuration of figure 1.

[0128] The raising and lowering cycles of the intermediate frame 7 are repeated many times, according to the requirements of use of the sliding door 1.

[0129] Preferably, the method of the invention also includes a moving operation of the shutter 3 along a second direction X' substantially orthogonal to the first direction Y, carried out after the translation of the intermediate frame 7 according to a first direction along the first direction Y.

[0130] The moving operation of the shutter 3 in this case takes place manually, thanks to the intervention of the operator, but it is clear that it is possible to foresee other variant applications in which such an operation is carried out automatically.

[0131] The moving operation of the shutter 3 along the second direction X' takes place according to opposite directions to arrange it alternately between the first operative condition, in which it keeps the admission open, and the second operative condition in which it closes the admission itself.

[0132] Preferably but not exclusively, the method according to the invention comprises a locking operation of the intermediate frame 7 in the active position, carried out after the translation according to the first direction along the first direction Y.

[0133] The locking operation is carried out before arranging the shutter 3 in the second operative condition.

[0134] The locking operation is piloted by the logic unit and consists of arranging the stem 96 of the linear cylinders 94 inside the side holes of the main rods 10, 11.

[0135] This prevents mechanical failures of the moving means 5, accidental knocks or rocking undergone by the support structure, for example the boat, from causing an unforeseen movement, in general lowering, of the sliding door 1 along the first direction Y that takes the intermediate frame 7 back into the passive position.

[0136] The locking of the intermediate frame 7 also

takes place keeping the counter-shaped insert 85 matching with the shaped block 82 thanks to the coupling of the tooth 86 in the transversal notch 84.

[0137] To close the admission, the operator pulls the shutter 3, freeing the tooth 86 from the transversal notch 84, and makes it slide along the second direction X' in one direction.

[0138] To open the admission, on the other hand, the operator pushes the shutter 3 in the opposite direction along the horizontal direction X', preferably but not exclusively until the tooth 86 is coupled again in the transversal notch 84 to avoid sudden and accidental movements of the shutter 3 along the second direction X', due for example to stresses, rocking or something else of the support structure.

[0139] The method of the invention therefore comprises an unlocking operation of the intermediate frame 7 from the active position, carried out before the translation of the intermediate frame 7 in a second direction along the first direction Y, in order to allow it to be arranged in the passive position.

[0140] Such an operation, again piloted by the logic unit, takes place by removing the stem 96 from the side holes of the respective main rods 10, 11.

[0141] In the case described, the method comprises an operation to detect the position of the shutter 3 and to lock the intermediate frame 7, carried out before the unlocking operation of the intermediate frame.

[0142] In practice, the detection operation takes place when the shutter 3 is in the first operative condition and indicates to the logic unit the possibility or not of moving the intermediate frame 7 along the first direction Y, in particular of lowering it to put it back in the space of the support structure below the plane II.

[0143] Before the unlocking operation, it is suitable for the shaped block 82 and the counter-shaped insert 85 to again be matched to obtain greater guarantees against uncontrolled and unforeseen horizontal movements during the lowering of the intermediate frame 7 along the first direction Y.

[0144] Advantageously, the locking, detection and unlocking operations take place automatically.

[0145] The sliding door of the invention thus has a smaller bulk than equivalent known doors, especially when it leaves the admission open and reenters in the space made in the support structure.

[0146] In such a condition of use, the sliding door allows aeration of the top room compared to the prior art, at the same time ensuring a wider view of the outside.

[0147] Moreover, the door of the invention can be moved extremely practically and easily.

[0148] Based upon what has been outlined above, it can therefore be understood how the sliding door of the invention and the method for moving such a door achieve the purposes and obtain the advantages mentioned previously.

[0149] In the embodiment step, modifications can be made to the sliding door according to the invention consisting, for example, of translation means different to those quoted during the course of the text.

[0150] It should also be specified that, as a purely indicative preferred example, the sliding blocks 19, 20, 27, 44, 49, 53 and 93 introduced during the course of the description are made from polymeric material.

[0151] The sliding door of the invention can be installed in any support structure where a space or gap is foreseen or can in any case been formed in an area above or below the room that the door itself must serve.

[0152] Regarding this, therefore, the sliding door of the invention lends itself to installation in boats, for example in the aft area.

[0153] The description carried out must not be interpreted literally as a limitation of the scope of protection of the invention that must rather be built based upon the concept and the scope of protection of the attached claims.

[0154] Finally, it is clear that numerous other variants can be brought to the sliding door in question, without for this reason departing from the novelty principles inherent to the inventive idea, just as it is clear that, in the practical embodiment of the invention, the materials, the shapes and the sizes of the illustrated details can be whatever, according to requirements, and they can be replaced with others that are technically equivalent.

Claims

1. Sliding door (1) for opening/closing admissions comprising a support frame (2), suitable for being associated with a support structure close to said admission, and a shutter (3), coupled with said support frame (2) to open/close said admission and provided with a top surface (3a) and with a bottom surface (3b) spaced apart according to a first direction (Y) **characterised in that** it comprises translation means (4), associated with said support frame (2), suitable for making said shutter (3) able to slide along said first direction (Y).

2. Door (1) according to claim 1) **characterised in that** said first direction (Y) is substantially vertical.

3. Door (1) according to any one of the previous claims **characterised in that** it includes moving means (5), applied to said support frame (2), operatively connected to said shutter (3) and actuated by command means.

4. Door (1) according to claim 3) **characterised in that** said command means include a processing and control logic unit, electrically connected to said moving means (5) that moves following a signal transmitted by the user through at least one button arranged at said admission.

5. Door (1) according to any one of the previous claims **characterised in that** said support frame (2) comprises:

- a base frame (6), fixed to said support structure, suitable for being at least partially contained in a space of said support structure;
- an intermediate frame (7), operatively connected to said shutter (3), coupled with said base frame (6) through said translation means (4) that allow it to slide along said first direction (Y) to define an active position, in which said intermediate frame (7) remains projecting from said support structure, and a passive position, in which it reenters in said space;
- a shaped frame (8), coupled on the outside through joining means (9) with said intermediate frame (7) with respect to which it is arranged on the same vertical plane.

6. Door (1) according to claim 5) **characterised in that** said shutter (3), said base frame (6) and intermediate frame (7) lie on three vertical planes that are distinct from one another and parallel.

7. Door (1) according to claim 5) **characterised in that** said base frame (6) is formed from two main rods (10, 11) spaced apart and defining said first direction (Y), connected at the bottom by a cross-member (12), which defines a longitudinal axis (X) orthogonal to said first direction (Y) and which supports said moving means (5), and at the top by a reinforcing framework (13), fixed to said main rods (10, 11).

8. Door (1) according to claim 7) **characterised in that** said intermediate frame (7) is formed from two horizontal elements (71, 73) that are the same as one another and from two vertical elements (72, 74) that are the same as one another that define a rectangular profile for said intermediate frame (7).

9. Door (1) according to claim 5) **characterised in that** said shaped frame (8) is equipped with a sheet of vitreous material (14), inserted in a perimetric recess (15) formed on the inner wall (8b) of the top part (81b) of said shaped frame (8) projecting from said intermediate frame (7) according to said first direction (Y).

10. Door (1) according to claim 5) **characterised in that** said joining means (9) include at least one shaped profile (16) arranged between the outer wall (7a) of said intermediate frame (7) and the inner wall (8a) of said shaped frame (8) and stably connected to them.

11. Door (1) according to claim 8) **characterised in that** said translation means (4) comprise:

- at least one first sliding block (19, 20), fixed to at least one of said vertical elements (72, 74) of said intermediate frame (7);
- at least one first rail (21, 22), matching with said first sliding block (19, 20), coupled with the front wall (10a, 11a) of at least one of said main rods (10, 11).

12. Door (1) according to claim 11) **characterised in that** said moving means (5) include:

- a linear actuator (23) having a first end (23a) fixedly connected to a joining bracket (24) that makes one of said main rods (10, 11) integral with said cross-member (12), and a second end (23b) connected through first guide means (25) to said cross-member (12);
- a transmission linkage (26) slidably coupled with said base frame (6) and with said intermediate frame (7).

13. Door (1) according to claim 12) **characterised in that** said first guide means (25) comprise a second sliding block (27), integral with a bent plate (28) next to a shaped support (29) joined through fixed connection means (30) to said second end (23b) of said linear actuator (23), and a second rail (31), matching with said second sliding block (27), coupled with the front surface (12a) of said cross-member (12).

14. Door (1) according to claim 12) **characterised in that** said fixed connection means (30) include a first pin (32) inserted in through holes (33, 34) that are arranged coaxial to each other formed in said shaped support (29), in said second end (23b) of said linear actuator (23) and in a bushing (35) arranged between said second end (23b) of said linear actuator (23) and said bent plate (27).

15. Door (1) according to claim 12) **characterised in that** said transmission linkage (26) comprises two longitudinal arms (36, 37), connected together close to the intermediate area through an articulation pin (38).

16. Door (1) according to claim 15) **characterised in that** an end (36a) of the first longitudinal arm (36) is pivoted through a second pin (39) to a pair of small plates (40) opposite to each other, fixed to an extremity (12b) of said cross-member (12) from which they project, and the opposite end (36b) is coupled through second guide means (41) to said intermediate frame (7).

17. Door (1) according to claim 15) **characterised in that** an extremity (37a) of the second longitudinal arm (37) is connected through third guide means (43) to one of said main rods (10, 11) and the opposite

extremity connected to said cross-member through fourth guide means.

18. Door (1) according to claim 16) **characterised in that** said second guide means (41) comprise:

- a third sliding block (44), integral outside of the base of a first plate (45) to which said end (36b) of said first arm (36) is connected through a third pin (46);
- a third rail (48), which matches with said third sliding block (44), coupled with the side surface (71a) of one of said horizontal elements (71, 73) of said intermediate frame (7).

19. Door (1) according to claim 17) **characterised in that** said third guide means (42) comprise:

- a fourth sliding block (49), integral outside with the base (50a) of a second plate (50) to which said extremity (37a) of said second arm (37) is connected through a fourth pin (51);
- a fourth rail, which matches with said fourth sliding block, coupled with the inner wall (10b, 11b) of said main rods (10, 11) of said base frame (6).

20. Door (1) according to claim 17) **characterised in that** said fourth guide means (43) comprise:

- a fifth sliding block (53), integral outside with the base (54a) of a third plate (54) to which said extremity (37b) of said second arm (37) is connected through a fifth pin (55);
- a fifth rail (56), matching with said fifth sliding block (53), coupled with the inner surface (12a) of said cross-member (12) of said base frame (6).

21. Door (1) according to any one of claims 18), 19) and 20) **characterised in that** said plate (45, 50, 54) has a substantially U-shaped profile in cross section.

22. Door (1) according to claim 8) **characterised in that** it comprises sliding means (57), associated with said intermediate frame (7), suitable for allowing the translation of said shutter (3) along a second direction (X') orthogonal to said first direction (Y) to define a first operative position, in which said shutter (3) is arranged projecting from said base frame (6) opening said admission, and a second operative position, in which said shutter (3) projects at the side from said intermediate frame (7) closing said admission.

23. Door (1) according to claim 22) **characterised in that** said sliding means (57) comprise a connection frame (58) provided on the side wall (58a) of a plurality of projecting pulleys (59), and a pair of laminar profiles (60, 61), on each of which at least one of said pulleys (59) is slidably arranged, each coupled with one of said horizontal elements (71, 73) of said intermediate frame (7).

24. Door (1) according to claim 23) **characterised in that** said connection frame (58) is made up of four tubular bodies (62a, 62b) that form a square profile and is connected to said shutter (3) through fastening means (62).

25. Door (1) according to claim 24) **characterised in that** said fastening means (63) foresee:

- at least one first plaque (64) that has a first end fixed to the bottom part (621b) of one of said tubular bodies (62b) of said connection frame (58);
- a linear profile (65), coupled on one side with a bottom portion of the side edge (3c) of said shutter (3) through joining means (66) and on the other side with said connection frame (58) through a pin (67) inserted in a slot (68), formed at the second end of said first plaque (64), and in a through hole (69) made at the base (65a) of said linear profile (65);
- at least one second plaque (70), having a first extremity fixed to the top (65b) of said linear profile (65) and a second extremity connected to said connection frame (58) by means of a pin (75) inserted in through openings (76, 77) that are coaxial to one another formed at the second extremity of said second plaque (70) and at the top part (622b) of one of said tubular bodies (62b) of said connection frame (58).

26. Door (1) according to claim 23) **characterised in that** it comprises safety means (79), associated with said intermediate frame (7), suitable for counteracting the accidental movement of said shutter (3) along a horizontal direction.

27. Door (1) according to claim 26) **characterised in that** said safety means (79) comprise:

- a support plate (80), projecting from the side surface (71a) of one of said horizontal elements (71) to which it is fixed close to one of the vertices of said rectangular profile of said intermediate frame (7);
- a shaped block (82), coupled cantilevered with said support plate (80) through attachment means (83) and having at least one transversal notch (84) near to the free end (82a);
- a counter-shaped insert (85), projecting from the outer wall of said connection frame (58), provided with at least one tooth (86) that in said first operative position of said shutter (3) engages in

said transversal notch (84) and in said second operative position of said shutter (3) is free from said transversal notch (84).

28. Door (1) according to claim 27) **characterised in that** said safety means (79) comprise elastic means (87), associated on the outside with a pin (88) supported by a laminar body (89) projecting from the outer surface (80a) of said support plate (80), and arranged below said free end (82a) of said shaped block (82) with which they cooperate to absorb the strain transmitted from said counter-shaped insert (85) to said shaped block (82).

29. Door (1) according to claim 13) **characterised in that** it comprises locking means (90), supported by a composite structure (91) integral with said intermediate frame (7) and coupled through linear sliding guides (92) with said main rods (10, 11) of said base frame (6), suitable for preventing the accidental movement of said shutter (3) along said first direction (Y) when said intermediate frame (7) is in said active position.

30. Door (1) according to claim 29) **characterised in that** said linear guides (92) comprise:

- a sixth sliding block (93), fixed to each of the side edges of said composite structure (91);
- said fourth rail (52), which matches with said sixth sliding block (93), coupled with said inner wall (10b, 11b) of said main rods (10, 11).

31. Door (1) according to claim 29) **characterised in that** said locking means (90) include a pair of linear cylinders (94), electrically connected to said logic unit and connected through fitting brackets (95) to said composite structure (91), each of which is provided with a stem (96) suitable for defining:

- a work position in which it is inserted in a side hole, formed on said inner wall (10b, 11b) of said main rods (10, 11) above said fourth rail (52), after said intermediate frame (7) has reached said active position;
- a rest position in which it is removed from said side hole to enable to sliding along said first direction (Y) of said intermediate frame (7) going from said active position.

32. Door (1) according to claim 31) **characterised in that** it comprises detection means, electrically connected to said logic unit and arranged on said base frame (6), suitable for indicating when said shutter (3) is in said first operative position and said stem (96) of said linear cylinders (94) is in said work position.

33. Door (1) according to claim 23) **characterised in that** it comprises first means (99) for adjusting the position of said shutter (3) with respect to a plane (II) of said support structure, arranged at said side edge (3c) of said shutter (3).

34. Door (1) according to claim 33) **characterised in that** said first adjustment means (99) include a threaded rod (100), arranged parallel to said linear profile (65), on one side equipped with a connection plate (101), fixed to said bottom surface (3b) of said shutter (3), and on the opposite side inserted in a through hole (102) made in a shaped connection (103) fixed to one of said tubular bodies (62a) of said connection frame (58).

35. Door (1) according to claim 1) **characterised in that** it includes second adjustment means (104), applied to the base profile (105) of said shutter (3), suitable for arranging it parallel to said plane (II) of said support structure.

36. Door (1) according to claim 35) **characterised in that** said second adjustment means (104) include a threaded rod (106), a bushing (107) coupled on the outside with said threaded rod (106) and that has a series of radial holes (108) suitable for receiving a rotation tool, and a contact pulley (109) associated with the bottom part (106a) of said threaded rod (106), suitable for projecting to a variable degree from said bottom surface (3b) of said shutter (3) being arranged closed to said plane (II) of said support structure.

37. Door (1) according to claim 36) **characterised in that** said threaded rod (106) is arranged passing through a shaped bracket (110) fixed to the top edge (105a) of said base profile (105) of said shutter (3) and in which a recess (111) is defined suitable for receiving a plate (112), supported by said threaded rod (106) and with which said contact pulley (109) is made integral through connection means (113).

38. Door (1) according to claim 37) **characterised in that** said connection means (113) comprise a pin (114) inserted through interposition of a bearing (115) in an axial through hole, formed in said contact pulley (109), and in a slotted through hole (116) made in a support shoulder (117) connected to said shaped bracket (110).

39. Door (1) according to claim 8) **characterised in that** it comprises a support wheel (97), fixed to a projecting ring (98) from said side surface (71a) of one of said horizontal elements (71, 73) of said intermediate frame (7), suitable for supporting the free end (3d) of said shutter (3) in said second operative position and when said intermediate frame (7) slides along

said first direction (Y).

40. Method for moving a sliding door (1) for opening/closing admissions comprising a support frame (2), suitable for being associated with a support structure close to said admission, and a shutter (3) coupled with said support frame (2) and provided with a top surface (3a) and with a bottom surface (3b) spaced apart according to a first direction (Y) **characterised in that** the sliding of said shutter (3) takes place along said first direction (Y).

41. Method according to claim 40) **characterised in that** said sliding of said shutter (3) takes place through a translation along said first direction (Y) of an intermediate frame mobile (7) that belongs to said support frame (2) and supports said shutter (3).

42. Method according to claim 41) **characterised in that** said translation of said intermediate frame (7) takes place according to opposite directions that arrange it alternately in an active position, in which said intermediate frame (7) remains projecting from said support structure and arranges said shutter (3) in a first operative condition next to said admission, and a passive position, in which said intermediate frame (7) reenters into a space of said support structure, said space being below said horizontal plane (II) of said support structure and adjacent to said admission.

43. Method according to claim 41) **characterised in that** said translation of said intermediate frame (7) takes place automatically.

44. Method according to claim 41) **characterised in that** said translation along said first direction (Y) consists of a raising/lowering of said intermediate frame (7) from/towards said passive position towards/from said active position.

45. Method according to claim 42) **characterised in that** it comprises a moving operation of said shutter (3) along a second direction (X') substantially orthogonal to said first direction (Y), carried out after said translation of said intermediate frame (7) in a first of said directions along said first direction (Y).

46. Method according to claim 45) **characterised in that** said moving operation of said shutter (3) takes place manually.

47. Method according to claim 45) **characterised in that** said moving operation of said shutter takes place automatically.

48. Method according to claim 45) **characterised in that** said moving operation of said shutter (3) along said second direction (X') takes place according to opposite directions to arrange it alternately between said first operative condition, in which it keeps said admission open, and a second operative condition in which it closes said admission.

49. Method according to claim 48) **characterised in that** it comprises a locking operation of said intermediate frame (7) in said active position, carried out after said translation in said first direction along said first direction (Y).

50. Method according to claim 49) **characterised in that** said locking operation is carried out before arranging said shutter (3) in said second operative condition.

51. Method according to claim 50) **characterised in that** it comprises an unlocking operation of said intermediate frame (7) from said active position, carried out after said locking operation and before said translation of said intermediate frame (7) in the second of said directions along said first direction (Y).

52. Method according to claim 51) **characterised in that** it comprises an operation of detecting the position of said shutter (3) and the locking of said intermediate frame (7), carried out before said unlocking operation of said intermediate frame (7).

53. Method according to claim 52) **characterised in that** said detection operation takes place when said shutter (3) is in said first operative condition.

54. Method according to claim 52) **characterised in that** said locking, detection and unlocking operations take place automatically.

Fig. 1

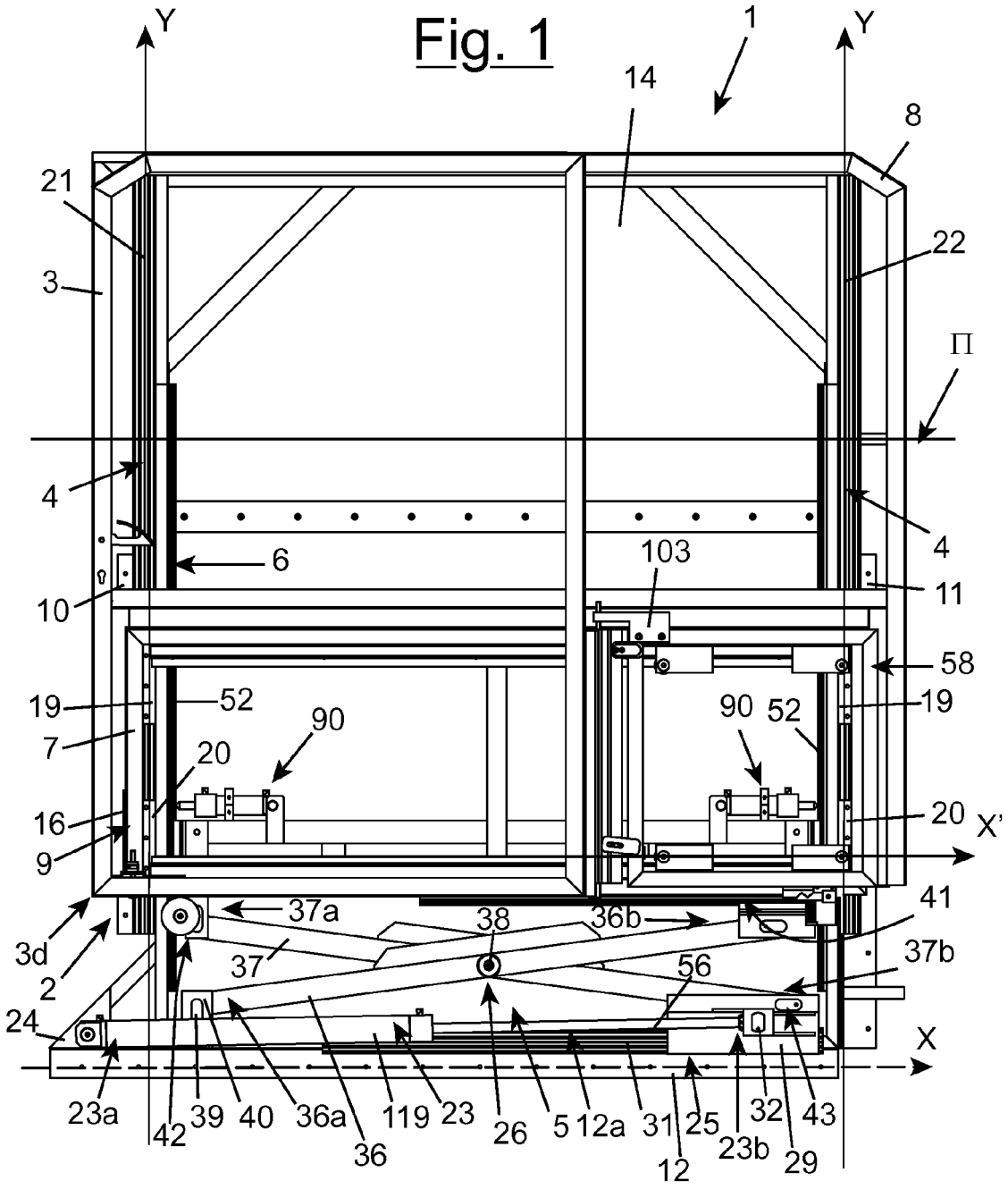

Y
1
Y
14
8
21
22
3
Π
4
4
6
103
11
10
58
19
52
90
90
52
19
7
20
16
20
X'
9
37a
38
36b
41
3d
37
37b
2
56
24
X
23a
42
39
40
36a
119
23
26
5
12a
31
25
32
43
36
12
23b
29

Fig. 2

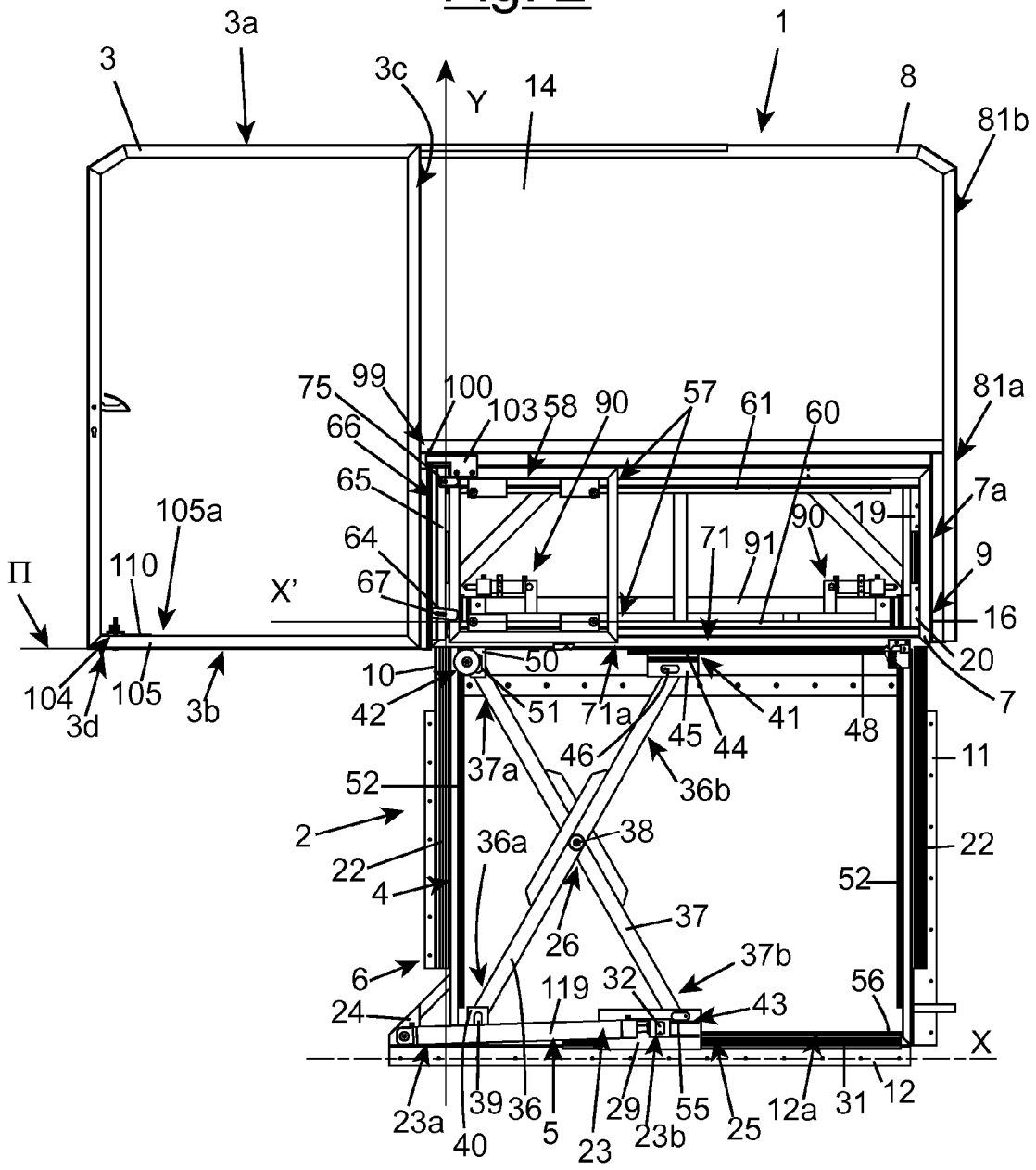

3
3a
3c
Y
14
1
8
81b
81a
7a
9
16
20
7
75
99
100
103
58
90
57
61
60
66
65
64
67
105a
110
Π
X'
104
3d
105
3b
10
42
50
51
71a
45
44
41
48
11
46
37a
36b
52
2
22
4
36a
38
22
52
37
26
6
24
37b
119
32
43
56
X
23a
39
40
36
5
23
29
23b
55
25
12a
31
12
19
90
71
91

Fig. 3

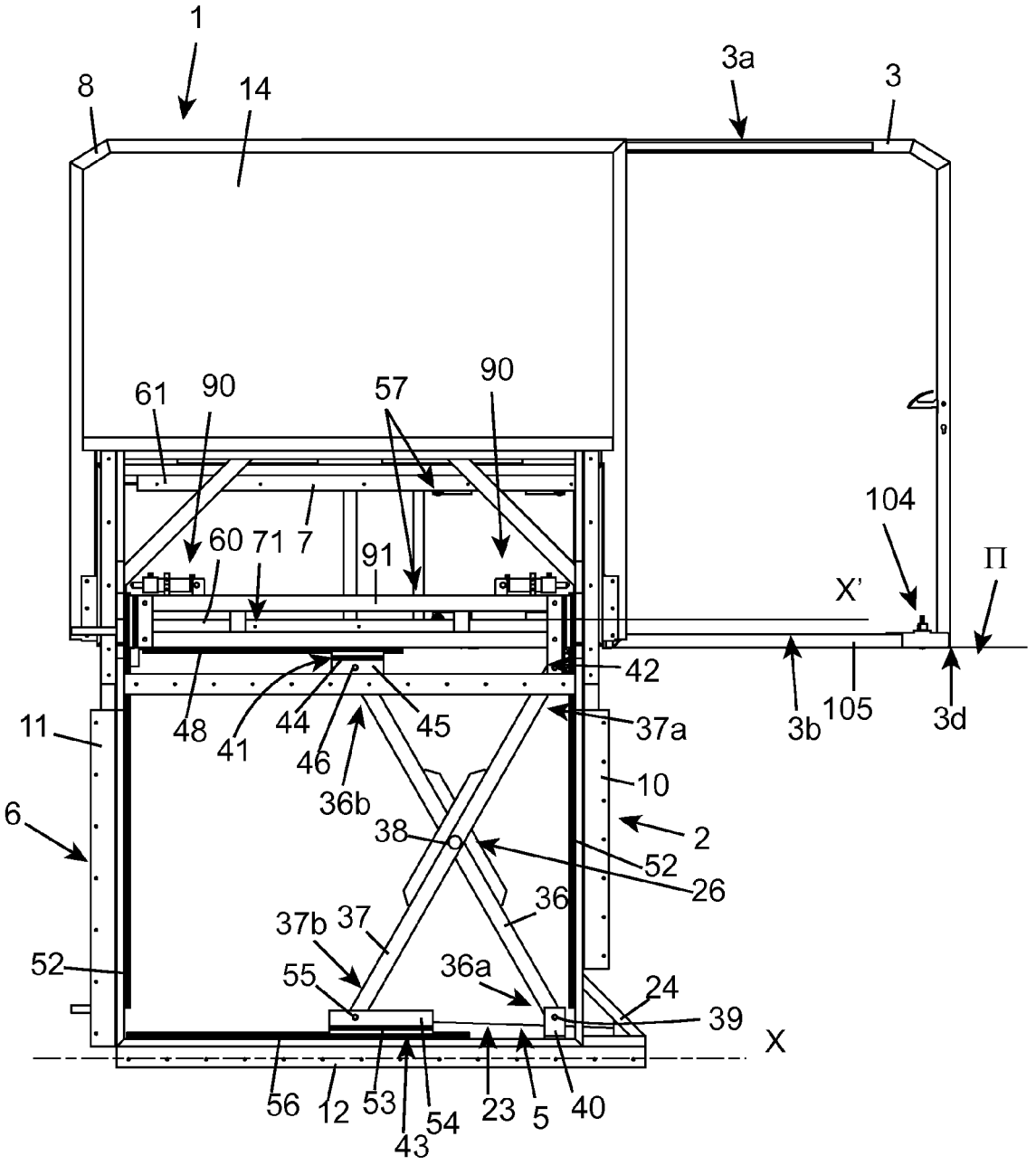

1
8
14
3a
3
61
90
57
90
104
60
71
7
91
X'
Π
42
48
41
44
46
45
37a
3b
105
3d
11
10
6
36b
38
2
52
26
36
37b
37
52
55
36a
24
39
X
56
12
53
54
43
23
5
40

Fig. 5

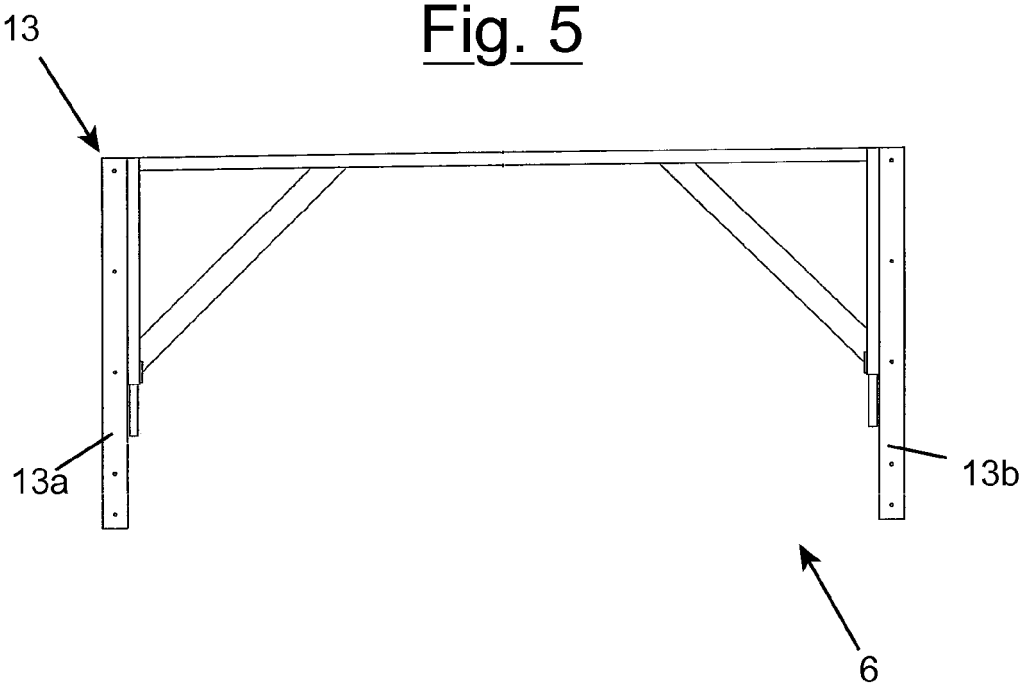
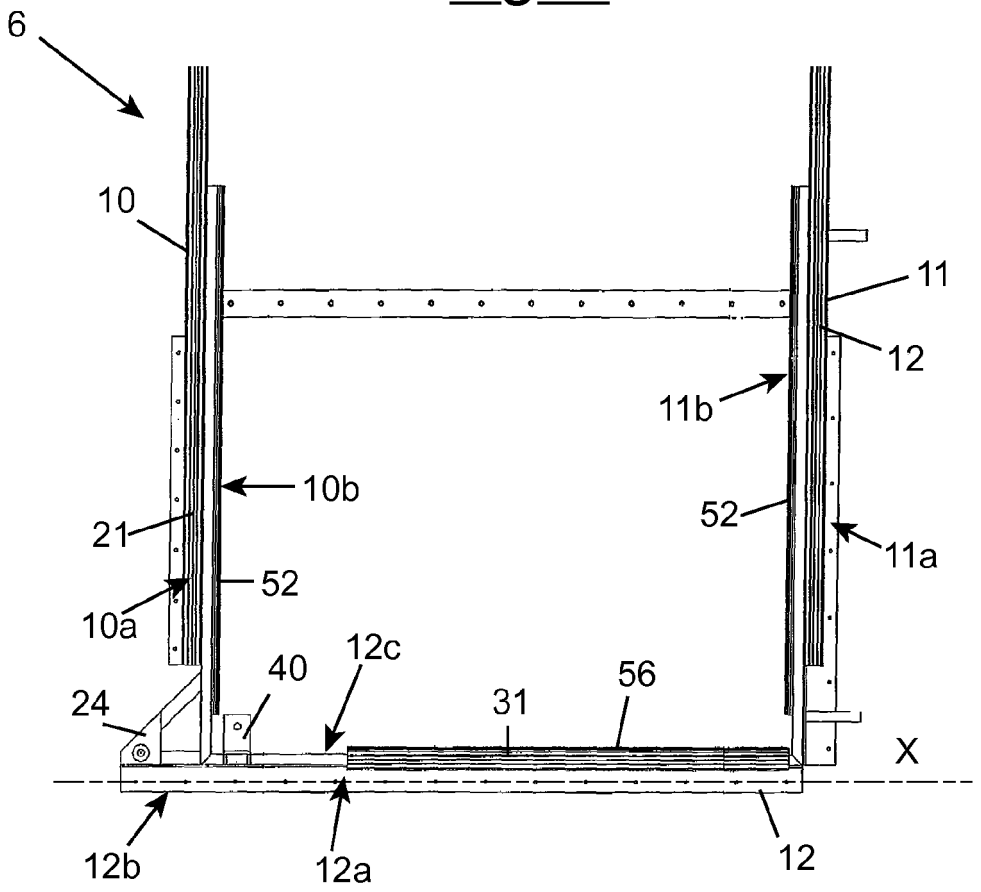

13
13a
13b
6

Fig. 4


6
10
11
12
11b
10b
52
21
11a
52
10a
12c
40
56
24
31
X
12b
12a
12

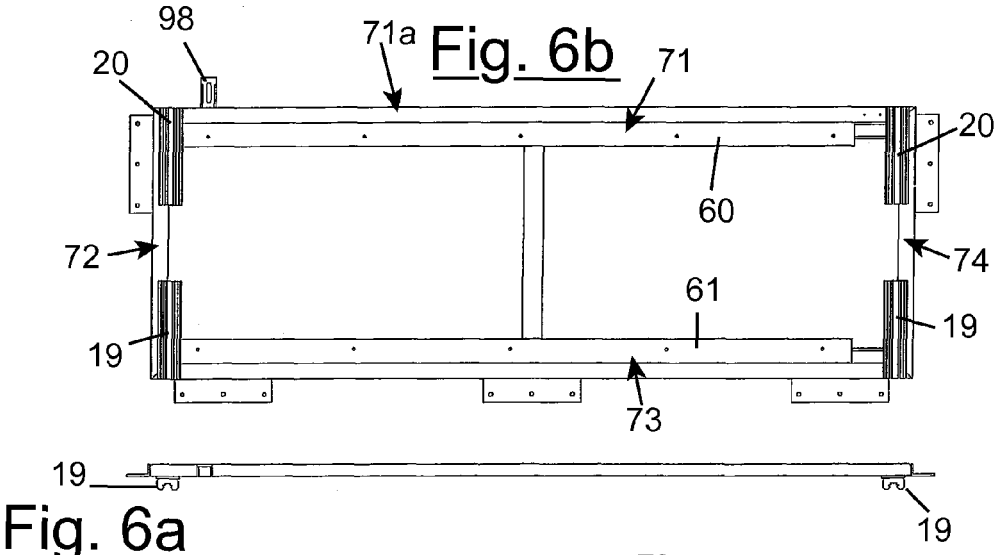


Fig. 6b

Fig. 6a

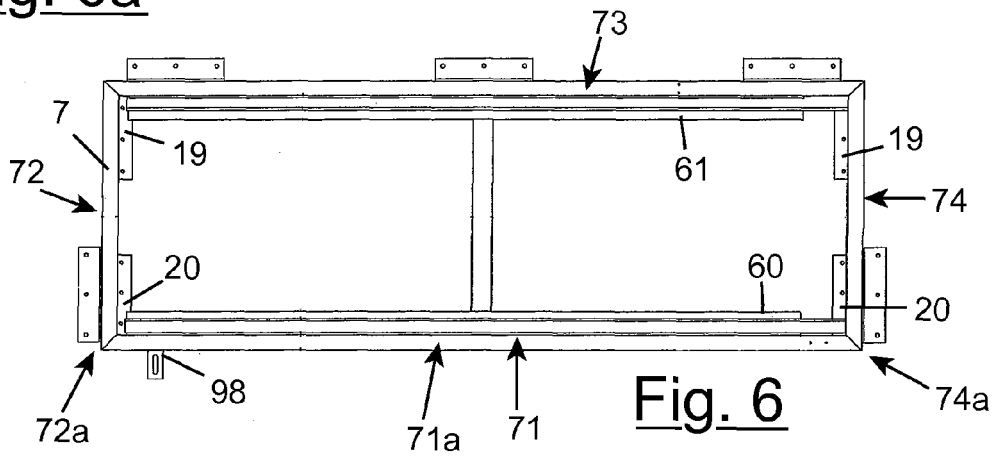


Fig. 6

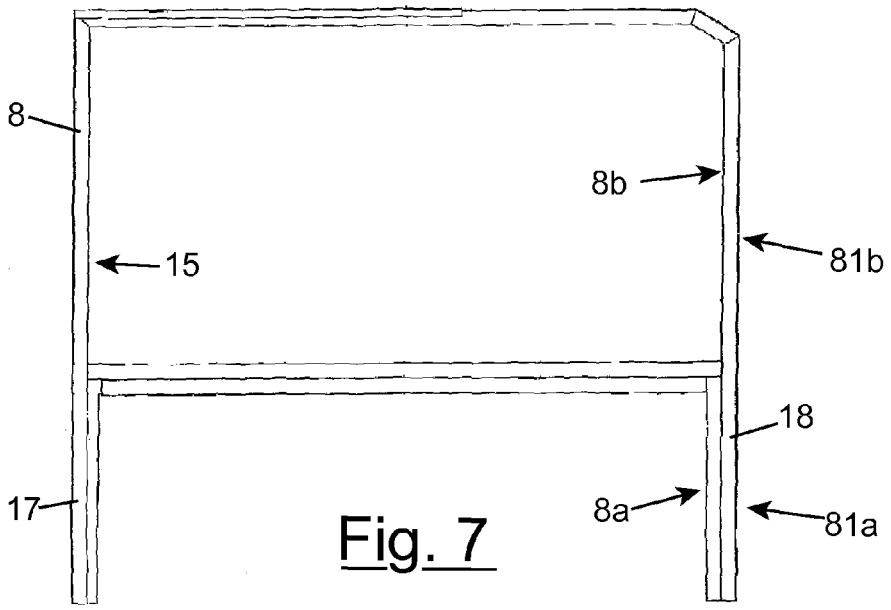


Fig. 7

Fig. 8a

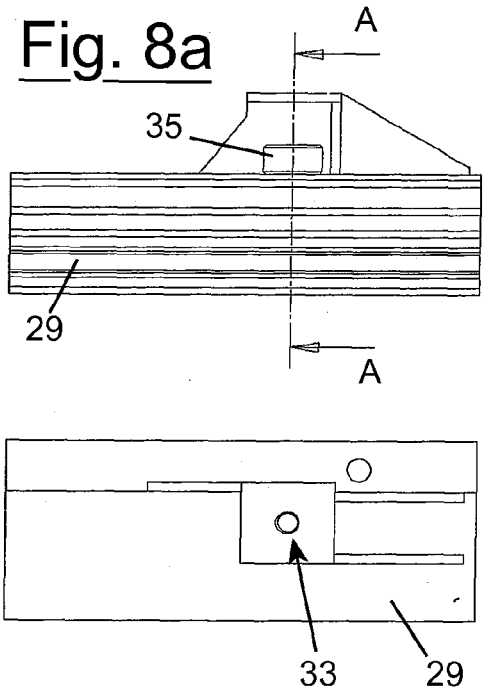


Fig. 8b

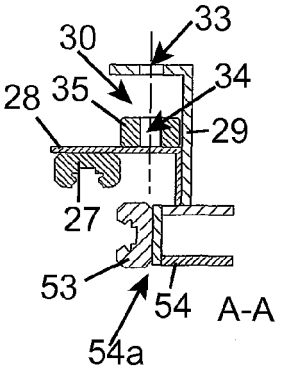


Fig. 8

Fig. 9

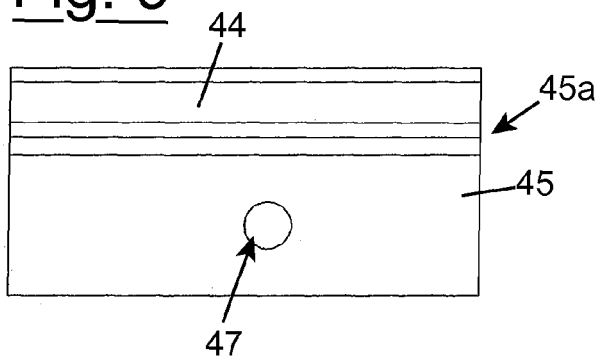
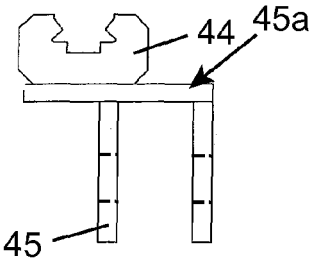


Fig. 9a



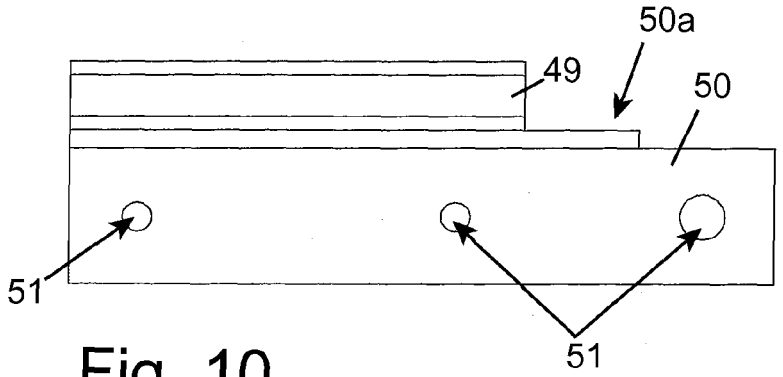


Fig. 10

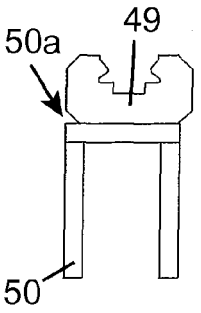


Fig. 10a

Fig. 11a

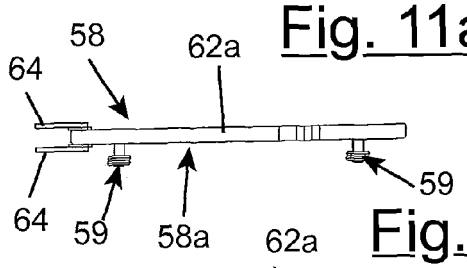


Fig. 11

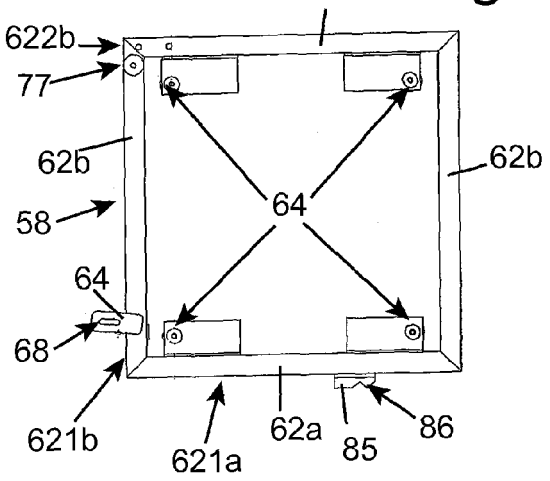
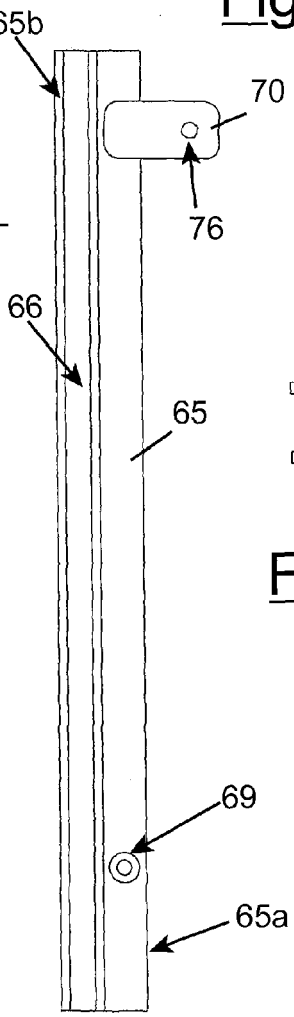


Fig. 12



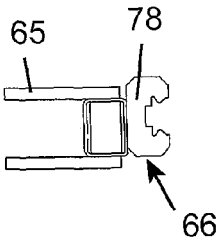


Fig. 12a

Fig. 13

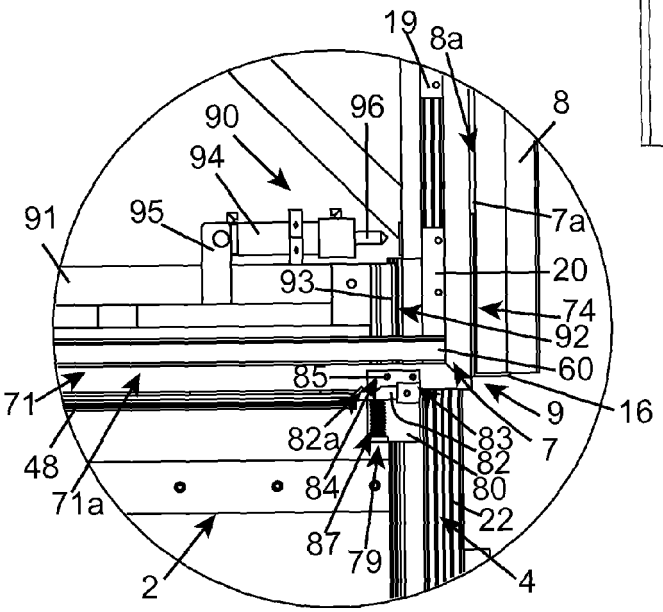
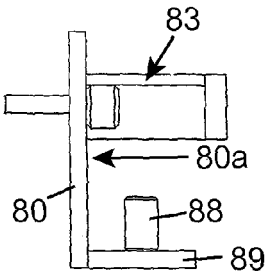


Fig. 14



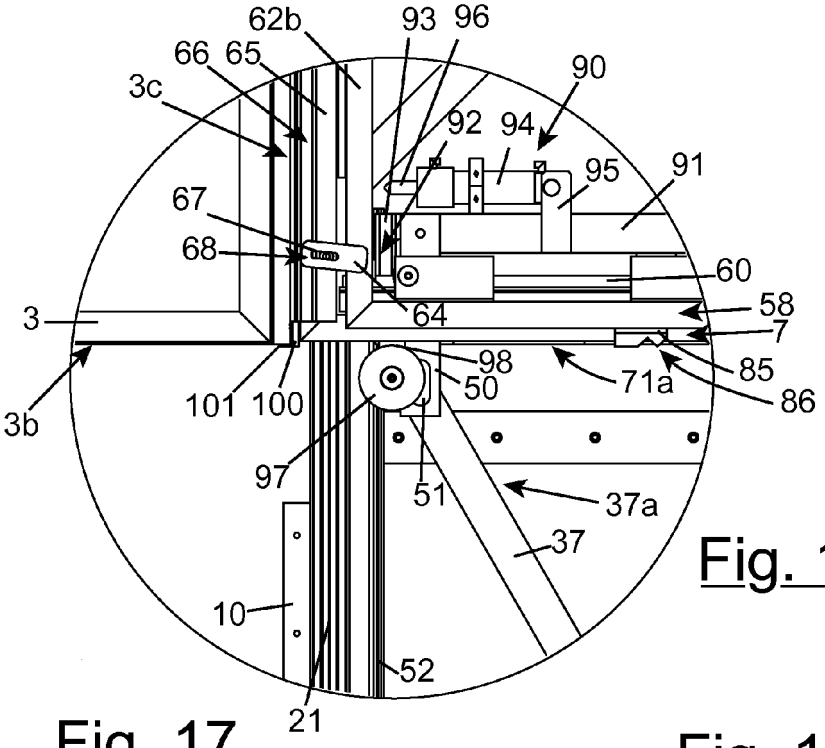


Fig. 15

Fig. 17

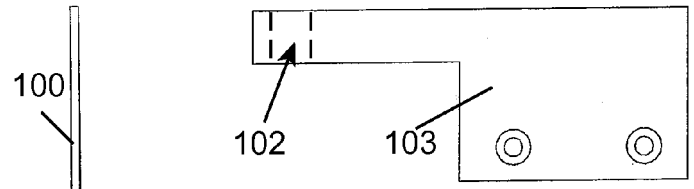
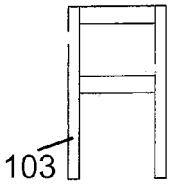


Fig. 17a



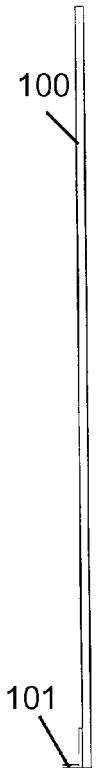


Fig. 16

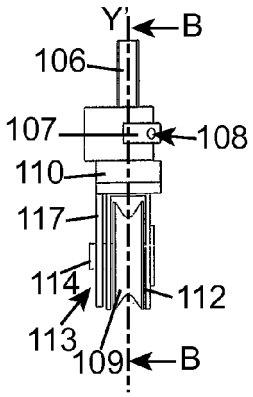
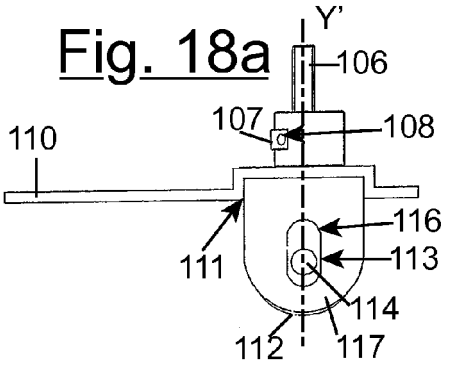


Fig. 18

Fig. 18a



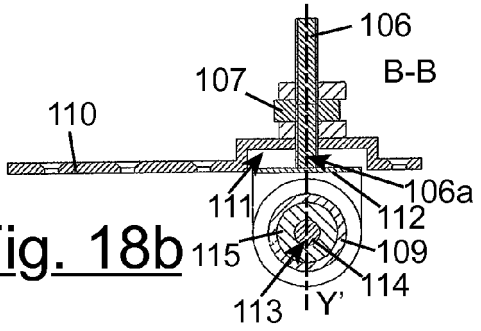


Fig. 18b