



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.04.2013 Bulletin 2013/17

(51) Int Cl.:
E05D 15/10 (2006.01)

(21) Application number: **12007151.9**

(22) Date of filing: **16.10.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **18.10.2011 IT CO20110048**

(54) **Sliding system of a furniture door**

(57) The present invention relates to a sliding system of a door (100) of a piece of furniture (300) comprising: a carriage (1) provided with wheels (2) adapted to slide along a track (9) according to a first direction (D1), a support (3) constrained to said carriage (1) and adapted to support said door (100), and means (6) adapted to allow guided translation of said support (3) with respect to said carriage (1) in a second direction (D2) perpendicular to said first direction (D1); said support (3) comprises

moreover a first and a second rack (4) parallel to said second direction (D2), and said carriage (1) comprises moreover a first and a second rotating sprocket (51, 52) which are connected by means of a bar (50) parallel to said first direction (D1) and which mesh respectively on said first and second racks (4); in this way, a perfect parallelism is maintained between said carriage said carriage (1) and said support (3), regardless of the mutual position. This system is used in furniture above all for doors of small dimensions.

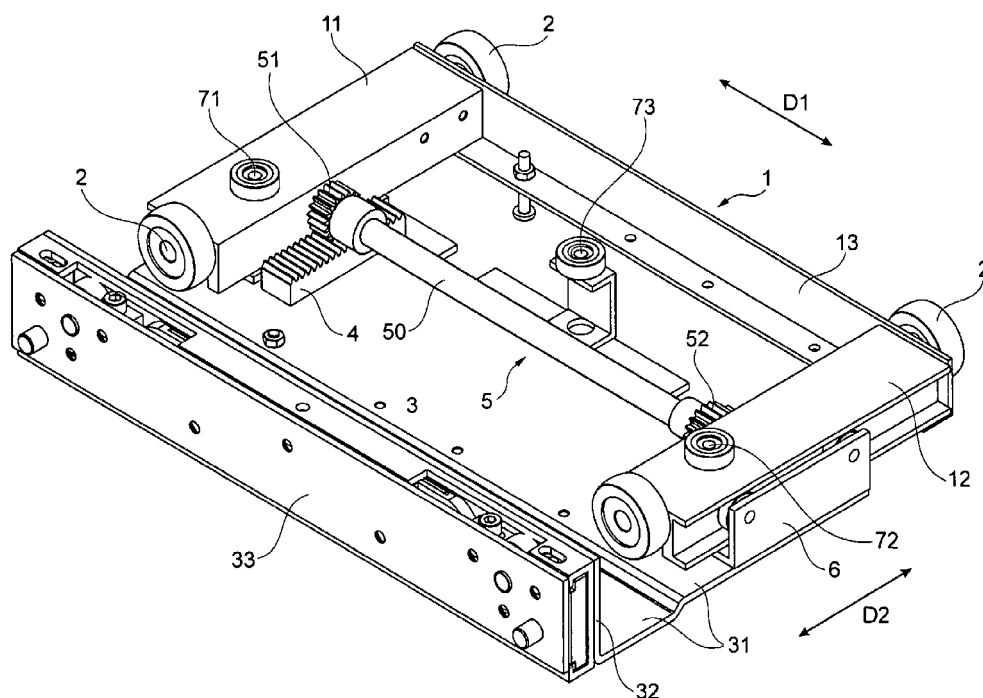


Fig. 1

Description

[0001] The present invention relates to a sliding system of a door of a piece of furniture and to a piece of furniture using this system.

[0002] Many pieces of furniture made of wood and of metal are provided with doors that can move; in general, the movement of the doors has the purpose of first allowing access to an inner compartment of the piece of furniture (doors open) and then closing of the same compartment (doors closed).

[0003] Fundamentally, the movement of the doors with respect to the structure of the piece of furniture is rotational or translational. The present invention is applicable to furniture with doors that translate, i.e. slide.

[0004] The main object of the present invention is to provide a solution for the sliding of furniture doors according to which the doors are perfectly aligned when closed.

[0005] This object is achieved by means of the sliding system having the technical characteristics set forth in the appended claims, which form an integral part of the present description.

[0006] At the basis of the present invention there is a mechanism that allows the door to advance in the direction of the user (i.e. the direction perpendicular to the front surface of the piece of furniture which typically corresponds to a horizontal direction when the piece of furniture is installed), maintaining it perfectly parallel at all times with respect to the position thereof in closed condition and then to slide the door in transverse direction to the same door; the degree of forward movement is small (typically from 1 to 4 cm), in particular sufficient to exceed (for example by 0.5 to 1.5 cm) the depth of the same door, which corresponds to the depth of the doors located at the side of the same door.

[0007] In fact, there are solutions that produce a "parallel displacement", but not a "parallel translation". As is known, the term "displacement" refers to the difference between the initial position and final position of an object, while the term translation refers to the movement of the object; therefore, a "parallel displacement" i.e. a displacement according to which the initial position and the final position are mutually parallel, can be obtained, for example, by means of two rotations (or more complex movements), rather than by means of a simple translation.

[0008] Typically and advantageously, in a piece of furniture, there is used a single system according to the present invention for each door and this system is located at the upper or lower side of the door.

[0009] Typically and advantageously, in a piece of furniture provided with several doors, there is used a single track for all the adjacent doors; the sliding system of each of these doors slides along this single track; in this case, to obtain extensive opening of the doors it is necessary to appropriately select the area in which to fasten the system according to the present invention to the respec-

tive door.

[0010] Very advantageously, the system according to the present invention also comprises a guide device adapted to guide the door when it slides and to prevent the door from moving back in the direction of the body of the piece of furniture when the door is not located at the compartment of the piece of furniture.

[0011] The solution according to the present invention is relatively simple, but very effective. The present invention is particularly suitable to be used with rectangular or square doors of small dimensions (for example having a height of 40-60 cm and a width of 40-60 cm).

[0012] According to a further aspect, the present invention also relates to a piece of furniture with doors wherein at least one of the doors is fastened to such a sliding system. The technical characteristics and the advantages of the present invention will be more apparent from the description hereinafter which should be regarded together with the accompanying drawings wherein:

Fig.1 shows, according to a perspective view, a sliding system according to the present invention in partly closed condition (i.e. with the support partly moved towards the carriage);

Fig.2 shows, according to a perspective view, the sliding system of Fig.1 in completely open condition (i.e. with the support moved completely away from the carriage);

Fig.3 shows three orthogonal projections of the assembly of two sliding systems of

Fig.1 and of a track common to both the systems;

Fig.4A shows the cross sectional view of the sliding system of Fig.1 in completely open condition (i.e. with the support moved completely away from the carriage) - it is also possible to see the double C-shaped track into which the carriage of the system is completely inserted;

Fig.4B shows the cross sectional view of the sliding system of Fig.1 in completely open condition (i.e. with the carriage moved completely towards the support) - it is also possible also to see the double C-shaped track into which the carriage of the system is completely inserted;

Fig.5 shows the perspective view of a guide device which is advantageously used in combination with the device of Fig.1;

Fig.6A shows a cross sectional view of the device of Fig.5 when the support of the system is moved completely away from the carriage of the system (i.e. when the door of the piece of furniture is moved away from body of the piece of furniture);

Fig.6B shows a cross sectional view of the device of Fig.5 when the support of the system is partly moved away from (and also partly moved towards) the carriage of the system;

Fig.6C shows a cross sectional view of the device of Fig.5 when the support of the system is moved completely towards the carriage of the system (i.e.

when the door of the piece of furniture is moved towards the body of the piece of furniture and therefore completely closes a compartment of the piece of furniture);

Fig.7A shows a door of a piece of furniture adapted to cooperate with the device of Fig.5;

Fig.7B shows a detail of the door of Fig.7A, in particular the cross section of the section bar fastened on the door and also a part (i.e. two wheels and part of an arm) of the device of Fig.5 adapted to cooperate with the section bar;

Fig.8 shows a perspective view of a piece of furniture with two compartments on which there is mounted (on the central vertical support element) a device such as that of Fig.5 and (at the bottom) a device such as that of Fig.1; it must be noted that in this figure there are also shown the two section bars to be fastened to the door, but not the door; fastening of the device of Fig.5 to the central vertical support element is shown in detail on the right;

[0013] Both the description hereinafter and the accompanying drawings are to be regarded only for illustrative and therefore non-limiting purposes; consequently, the present invention can be implemented according to other and different embodiments.

[0014] In general and with reference to the example of embodiment of the figure, the sliding system of a door 100 of a piece of furniture 300 comprises:

- a carriage 1 provided with wheels 2 adapted to slide along a track 9 according to a first direction D1,
- a support 3 constrained to said carriage 1 and adapted to support said door 100, and
- means 6 adapted to allow guided translation of said support 3 with respect to said carriage 1 in a second direction D2 perpendicular to said first direction D1; moreover, said support 3 comprises a first and a second rack 4 parallel to said second direction D2, and said carriage 1 comprises a first and a second rotating sprocket 51 and 52, which are connected by means of a rotating bar 50 (which acts as shaft) parallel to said first direction D1 and which engage respectively on said first and second racks 4.

[0015] Consequently, a (perfect) parallelism is maintained between said carriage 1 and said support 3 regardless of the mutual position.

[0016] The displacement is of limited extent, in particular from a minimum of 1 cm to a maximum of 4 cm, and is advantageously with adjustable travel (start and end) in such a manner as to be able to be fastened and adapted to any specific piece of furniture.

[0017] The support 3 is a section bar with substantially L-shaped profile; the support comprises a first substantially flat plate 31 adapted to remain in horizontal position when the system is mounted on a piece of furniture 300 and a second substantially flat plate 32 (smaller than the

first) adapted to remain in vertical position when the system is mounted on a piece of furniture 300; there is fastened to the second plate a device 33 for mounting and adjusting the door 100 of the piece of furniture 300.

[0018] The sliding system comprises two guide-slider pairs 6 fastened to the carriage 1 and to the support 3 to guide the translation of the support with respect to the carriage.

[0019] In particular, the two guide-slider pairs 6 are respectively placed at two end areas of the carriage 1 and of the support 3.

[0020] In a simplified embodiment, the support comprises a single rack, the carriage comprises a single sprocket which meshes on the rack, and this rack-sprocket pair is adapted to maintain a (good parallelism) between the carriage and the support, regardless of their mutual position.

[0021] In the best embodiment, said first sprocket 51 and said second sprocket 52 are respectively located at the ends of said bar 50.

[0022] According to the example of embodiment of the figures, said carriage 1 is provided with a first pair of wheels 2 associated with a first axle 11 (the outer box thereof can be seen in the figures) parallel to said second direction D2 and with a second pair of wheels 2 associated with a second axle 12 (the outer box thereof can be seen in the figures) parallel to said second direction D2; said first axle 11 and said second axle 12 are fastened to two cross members in such a manner as to maintain them spaced apart: a first fixed cross member 13 parallel to said first direction D1 and a second rotating cross member 5 (constituted in particular by the assembly of the bar 50 and of the sprockets 51 and 52) parallel to said first direction D1.

[0023] The fixed cross member 13 is located at the ends of the axles 11 and 12, i.e. at two of the wheels 2, those adapted to be located farthest from the door 100; the rotating cross member 5 is located in an intermediate area of the axles 11 and 12 to allow travel of the support 3.

[0024] According to the example of embodiment of the figures, said first sprocket 51 is adjacent to said first axle 11 and said second sprocket 52 is adjacent to said second axle 12 and are located on respective inner and facing sides of the axles. Moreover, the system comprises a first and a second guide-slider pair 6; said first guide-slider pair 6 is adjacent to said first axle 11 on the outer side thereof and said second guide-slider pair 6 is adjacent to said second axle 12 on the outer side thereof; therefore, the first plate 31 of the support 3 preferably has a width slightly greater than the distance between centres of the carriage 1.

[0025] According to the example of embodiment of the figures, the system also comprises three wheels 71, 72 and 73 whose axes of rotation (all parallel with one another) are perpendicular both to said first direction D1 and to said second direction D2 and vertical when the system is mounted. The first wheel 71 is mounted in a rotating manner on the box of the first axle 11 of the car-

riage 1; the second wheel 72 is mounted in a rotating manner on the box of the second axle 12 of the carriage 1; the third wheel 73 is mounted in a rotating manner on the support 3, in particular on the first plate 31 by means of a small bracket. The wheels 71 and 62 are adapted to slide in a rectilinear guide 91 of the track 9. The wheel 73 is adapted to slide in a shaped guide 92 of the track 9; as a result of the shape of the guide, the wheel 73 causes translation of the support 3 with respect to the carriage 1; there can be provided a spring to facilitate perfect movement of the support 3, in particular of the second plate 32, towards the carriage 1.

[0026] The sliding system also and advantageously comprises a device 8 adapted to guide the door 100 when the carriage 1 slides and to prevent guided displacement of the support 3 when the device 8 is in one or more operating conditions (this takes place with reference to the figures when the door 100 is not located at the compartment of the piece of furniture 300).

[0027] The device 8 typically comprises:

- at least one section bar 81 fastened to the door 100,
- at least one pair of wheels 82 and 83 mounted on an mobile arm 84 adapted to roll along the section bar 81 on opposite sides of the section bar;

the mobile arm 84 is adapted to be mounted in a rotating manner on a vertical support element 200 of the piece of furniture 300, typically at an end thereof, or in equivalent position.

[0028] At least one of the two wheels could be replaced, in a substantially equivalent manner, with a slider.

[0029] In particular, the device 8 has a first and a second stable operating condition; in the first stable operating condition (Fig.6C) one of the wheels of the pair (i.e. the wheel 82) is confined in the section bar 81 and the other of the wheels of the pair (i.e. the wheel 83) is released from the section bar 81 and the arm 84 can rotate with respect to the section bar 81; in the second stable operating condition (Fig.6A) one of the wheels of the pair (i.e. the wheel 82) is confined in the section bar 81 and the other of the wheels of the pair (i.e. the wheel 83) is constrained to the section bar 81 and the arm 84 cannot rotate with respect to the section bar 81.

[0030] In particular, the device 8 comprises two section bars and two pairs of wheels (see Fig.7A and Fig.7B); the two rotating arms 84 of the two pairs of wheels are mounted rigidly at the ends of a same shaft 80 (see Fig.5).

[0031] Typically, the two section bars are respectively placed at two end areas of the door 100 (see Fig.7A).

Claims

1. Sliding system of a door (100) of a piece of furniture (300) comprising:

- a carriage (1) provided with wheels (2) adapted

to slide along a track (9) according to a first direction (D1),

- a support (3) constrained to said carriage (1) and adapted to support said door (100), and
- means (6) adapted to allow guided translation of said support (3) with respect to said carriage (1) in a second direction (D2) perpendicular to said first direction (D1); **characterized in that** said support (3) comprises a first and a second rack (4) parallel to said second direction (D2), and **in that** said carriage (1) comprises a first and a second rotating sprocket (51, 52) which are connected by means of a rotating bar (50) parallel to said first direction (D1) and which mesh respectively on said first and second racks (4), so that there is maintained a parallelism between said carriage (1) and said support (3) regardless of the mutual position.

2. Sliding system according to claim 1, wherein said displacement is of limited extent, in particular from a minimum of 1 cm to a maximum of 4 cm, and is advantageously with adjustable travel.

3. Sliding system according to claim 1 or 2, wherein said support (3) is a section bar with substantially L-shaped profile.

4. Sliding system according to any one of the preceding claims, comprising two guide-slider pairs (6) fastened to said carriage (1) and to said support (3) to guide said translation.

5. Sliding system according to any one of the preceding claims, wherein said first and second sprockets (51, 52) are respectively located at the ends of said bar (50).

6. Sliding system according to any one of the preceding claims, wherein said carriage (1) is provided with a first pair of wheels (2) associated with a first axle (11) parallel to said second direction (D2) and with a second pair of wheels (2) associated with a second axle (12) parallel to said second direction (D2), and wherein said first sprocket (51) is adjacent to said first axle (11) and said second sprocket (52) is adjacent to said second axle (12).

7. Sliding system according to claim 6, wherein said carriage (1) comprises a fixed cross member (13) parallel to said first direction (D1) and fastened to said first and second axles (11, 12) in such a manner as to maintain them spaced apart.

8. Sliding system according to claim 6 or 7, comprising a first and a second guide-slider pairs (6), wherein said first guide-slider pair (6) is adjacent to said first axle (11) and said second guide-slider pair (6) is ad-

jacent to said second axle (12).

9. Sliding system according to any one of the preceding claims, wherein said support (3) comprises a wheel (73) adapted to slide in a shaped guide (92) of said track (9) and to cause translation of said support (3) with respect to said carriage (1). 5

10. Sliding system according to any one of the preceding claims, also comprising a device (8) adapted to guide said door (100) when said carriage (1) slides and to prevent said guided displacement of said support (3) when said device (8) is in one or more operating conditions. 10
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11. Sliding system according to claim 10, wherein said device (8) comprises:
 - at least one section bar (81) fastened to said door (100), 20
 - at least one pair of wheels (82, 83) mounted on a mobile arm (84) and adapted to roll along said section bar (81) on opposite sides of said section bar (81);
 - wherein said mobile arm (84) is adapted to be mounted in a rotating manner on a vertical support element (200) of said piece of furniture (300). 25

12. Sliding system according to claim 11, wherein said device (8) has a first and a second stable operating condition, wherein in said first stable operating condition (Fig.6C) one (82) of the wheels of said pair is confined in said section bar (81) and the other (83) of the wheels of said pair is released from said section bar (81) and said arm (84) can rotate with respect to said section bar (81), wherein in said second stable operating condition (Fig.6A) one (82) of the wheels of said pair is confined in said section bar (81) and the other (83) of the wheels of said pair is constrained to said section bar (81) and said arm (84) cannot rotate with respect to said section bar (81). 30
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13. Sliding system according to claim 11 or 12, wherein said device (8) comprises two section bars and two pairs of wheels, and wherein the two rotating arms (84) of said two pairs of wheels are mounted rigidly at the ends of a same shaft (80). 45
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14. Piece of furniture (300) comprising at least one door sliding system according to any one of the preceding claims. 55

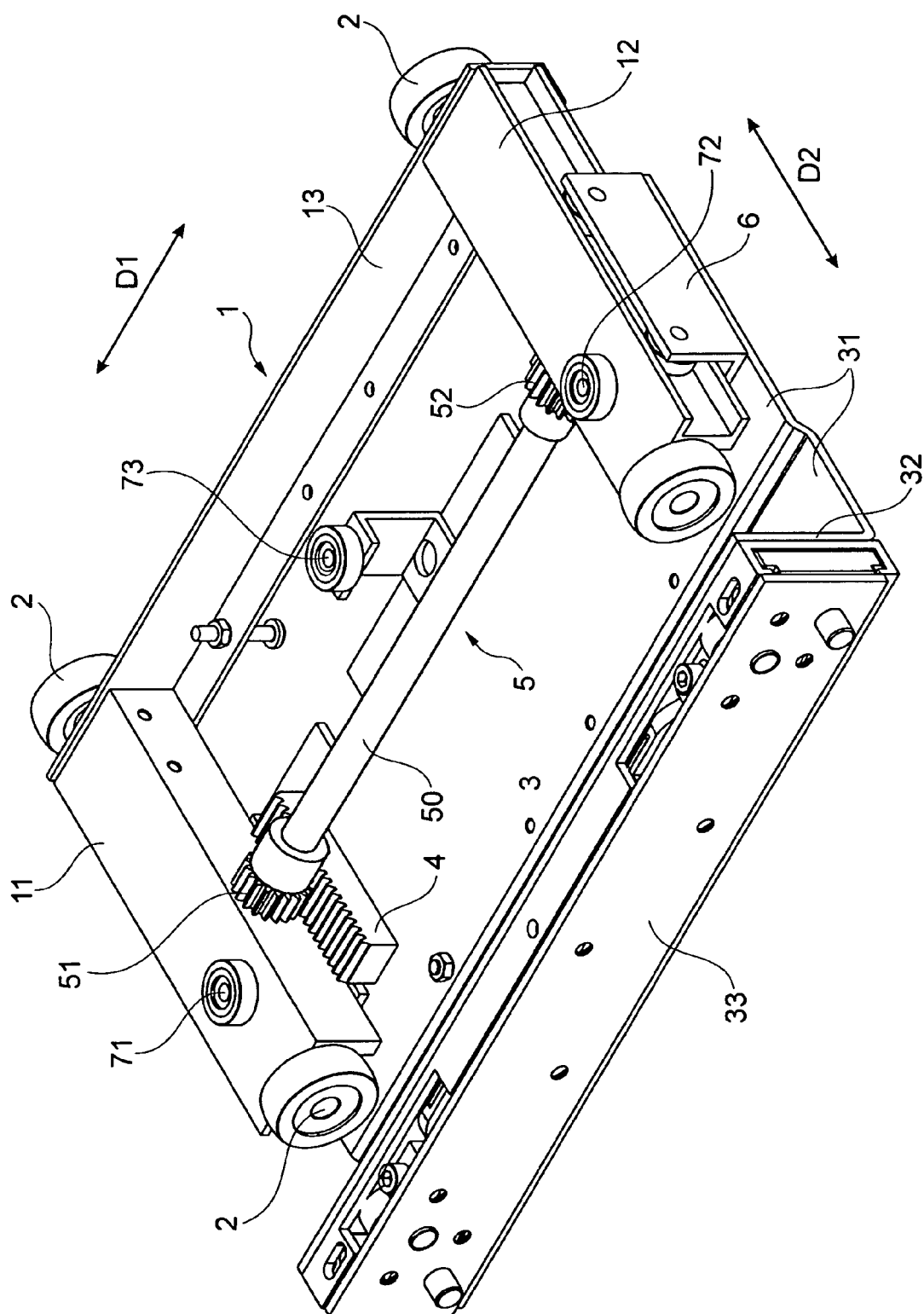


Fig. 1

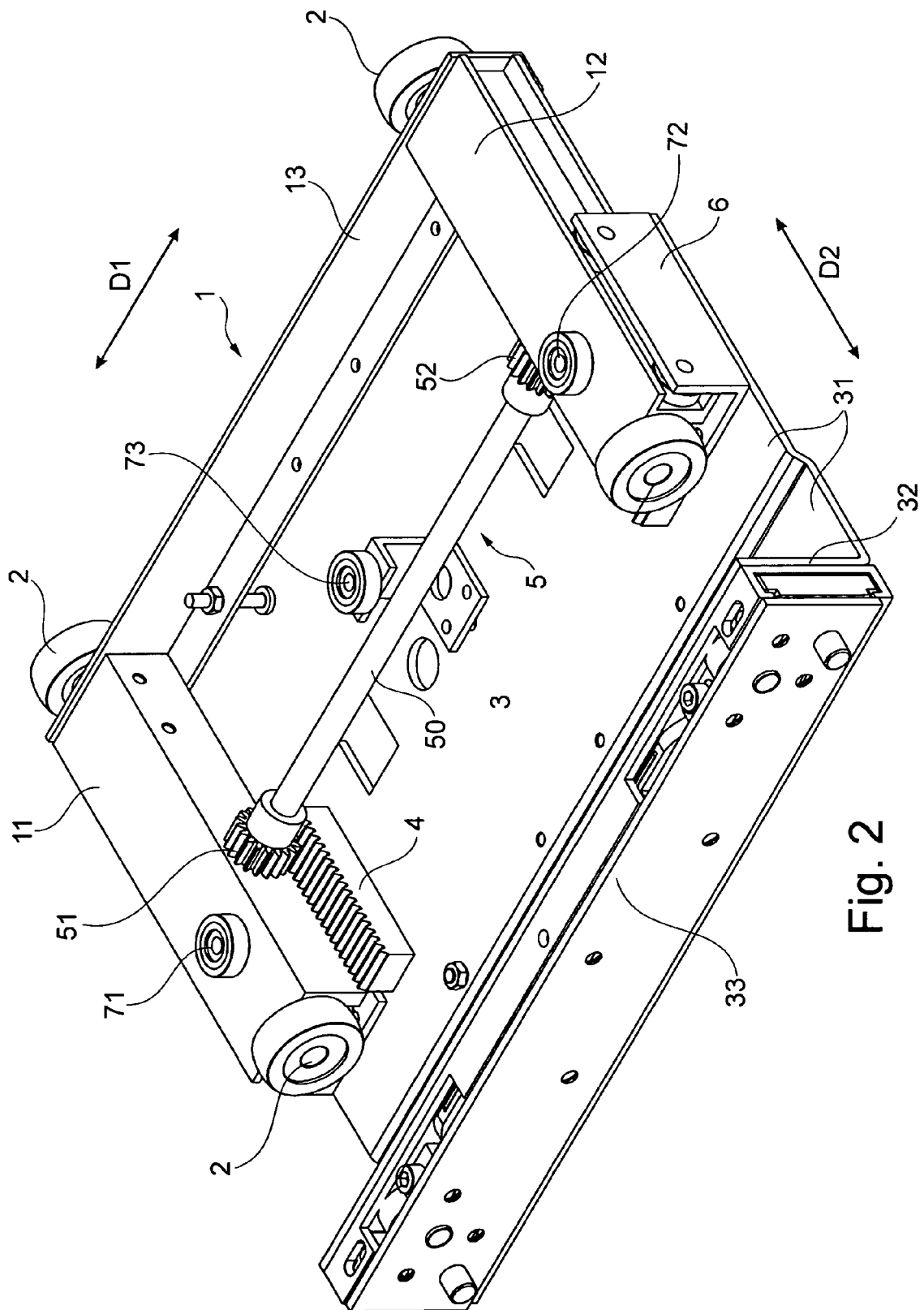


Fig. 2

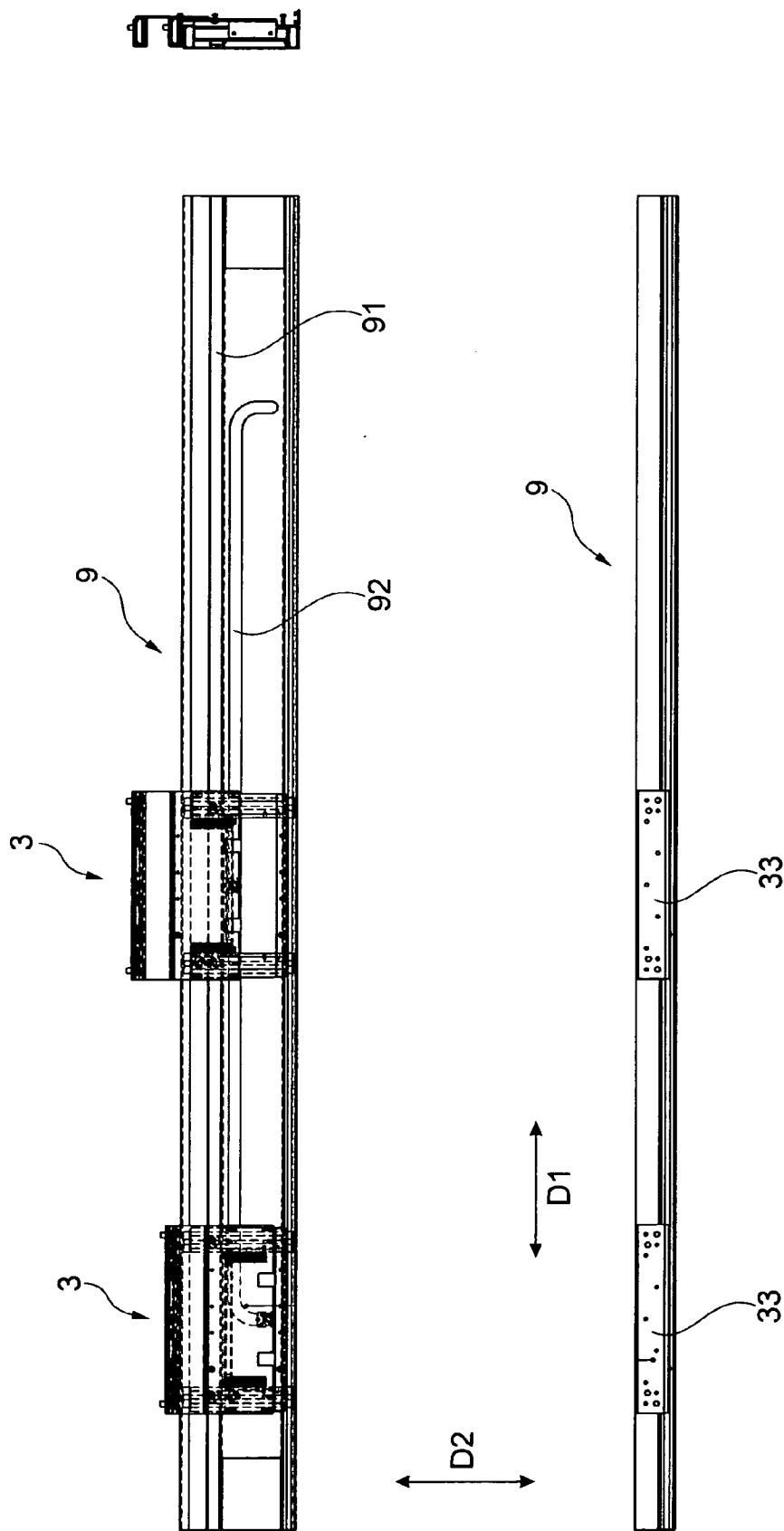


Fig. 3

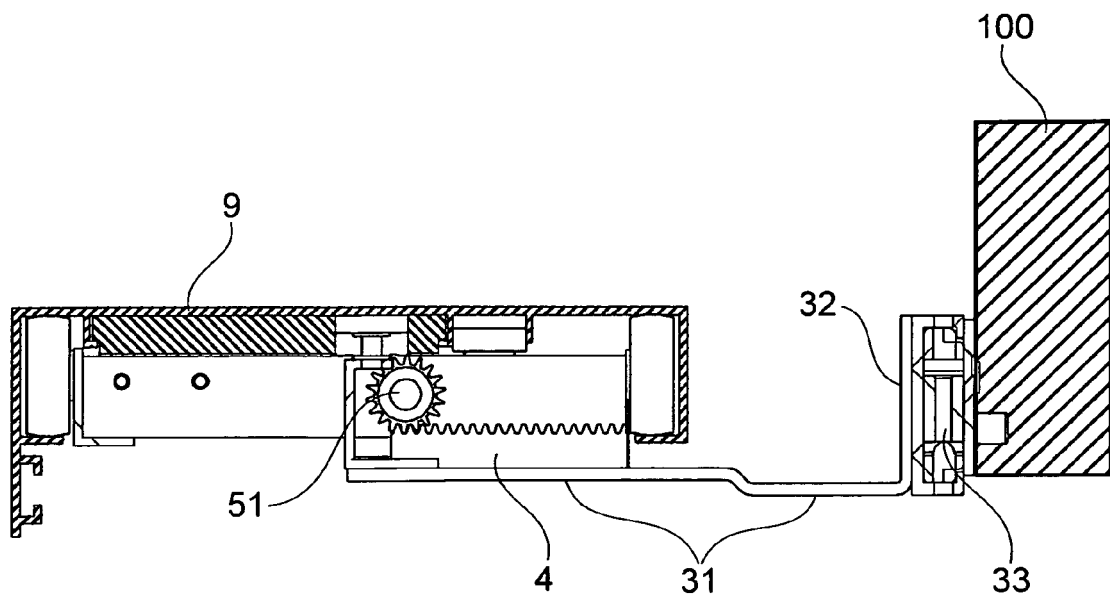


Fig. 4A

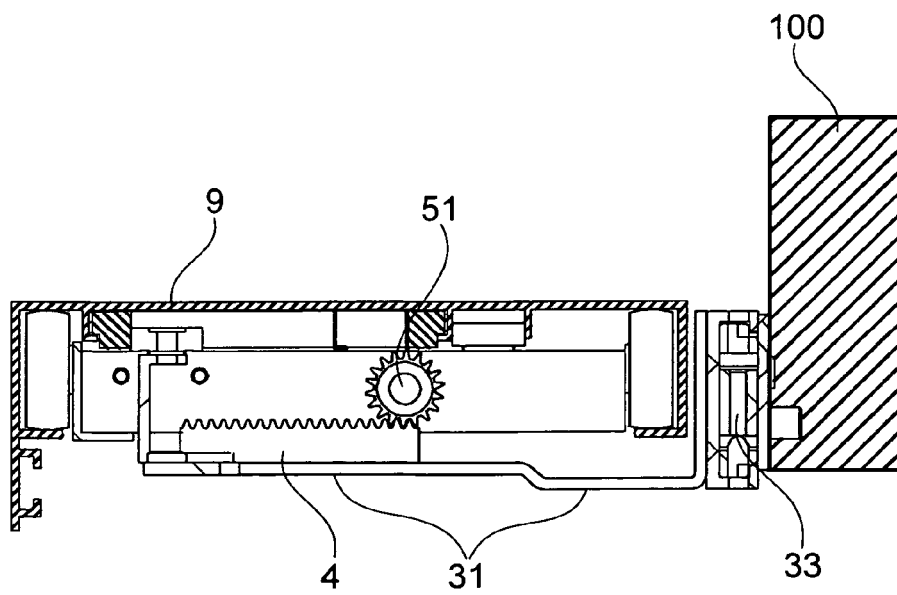
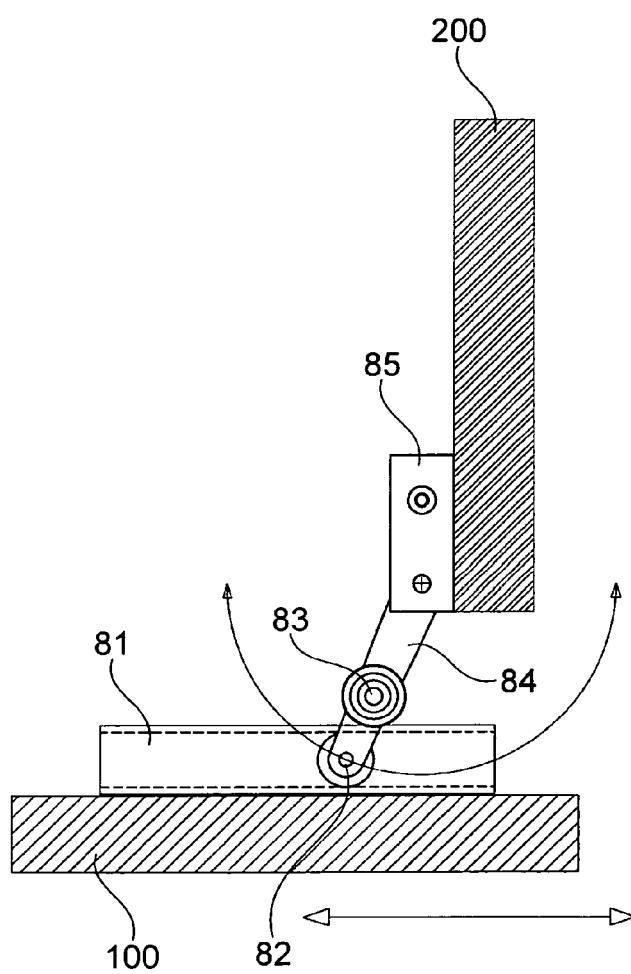
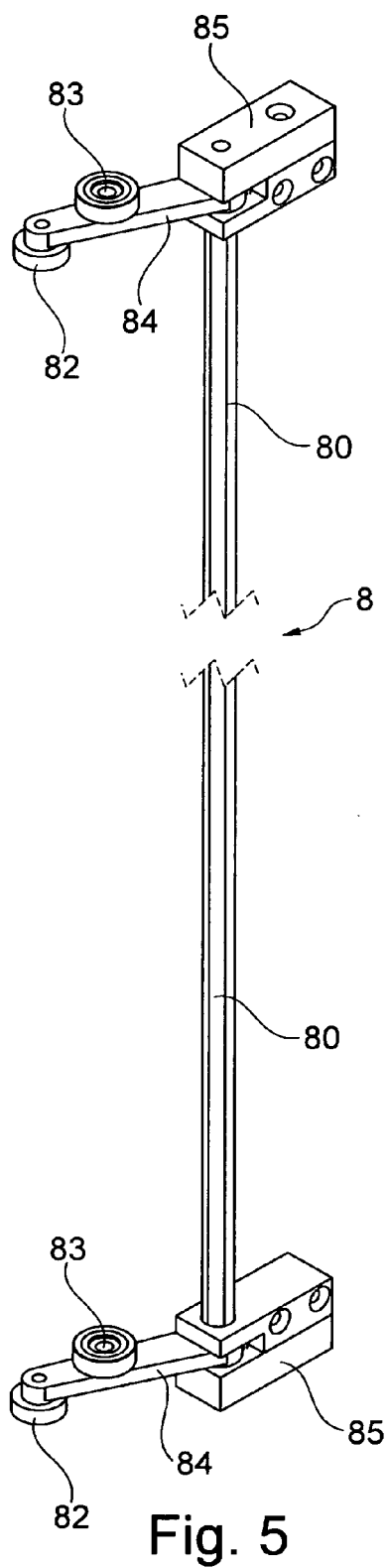


Fig. 4B



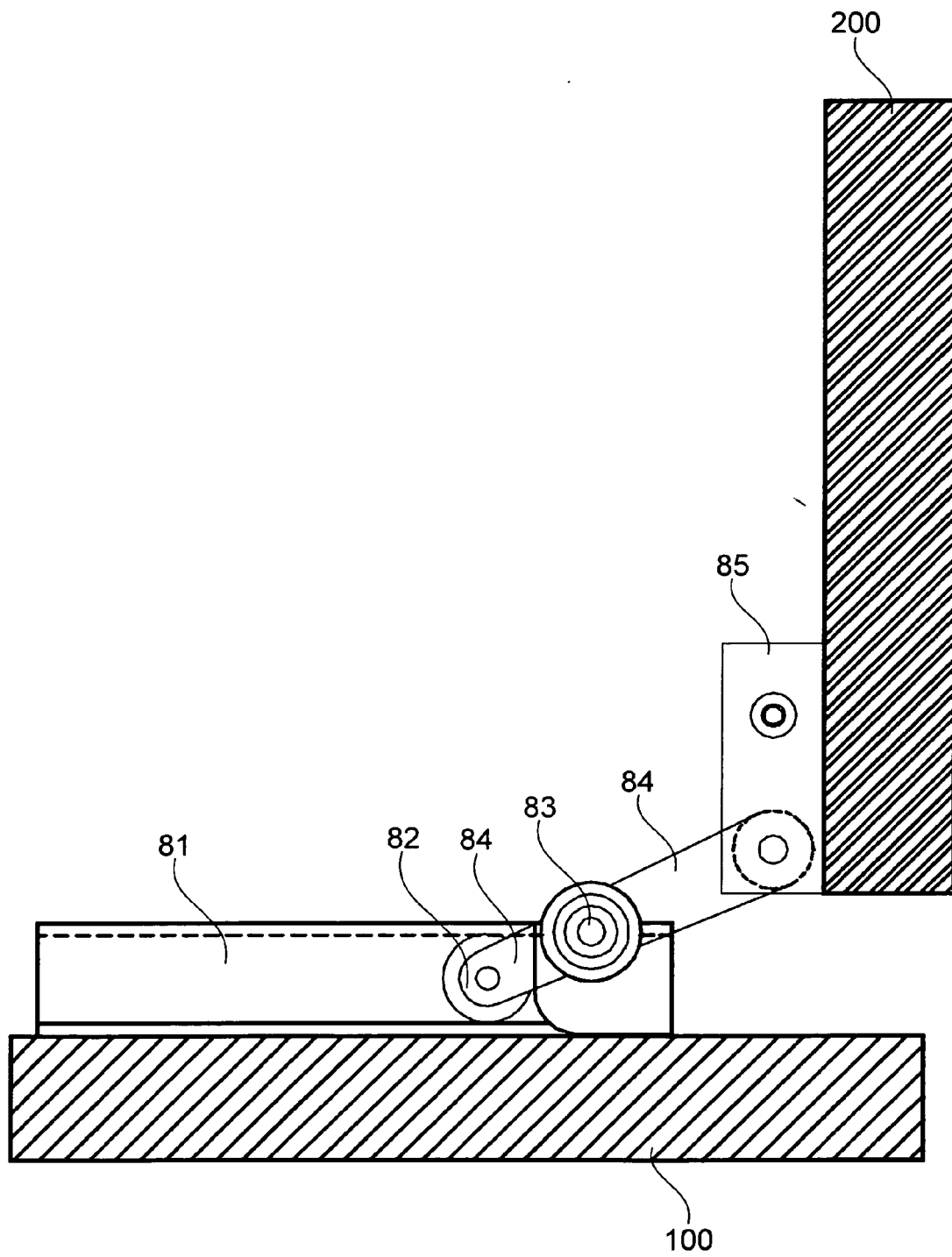


Fig. 6B

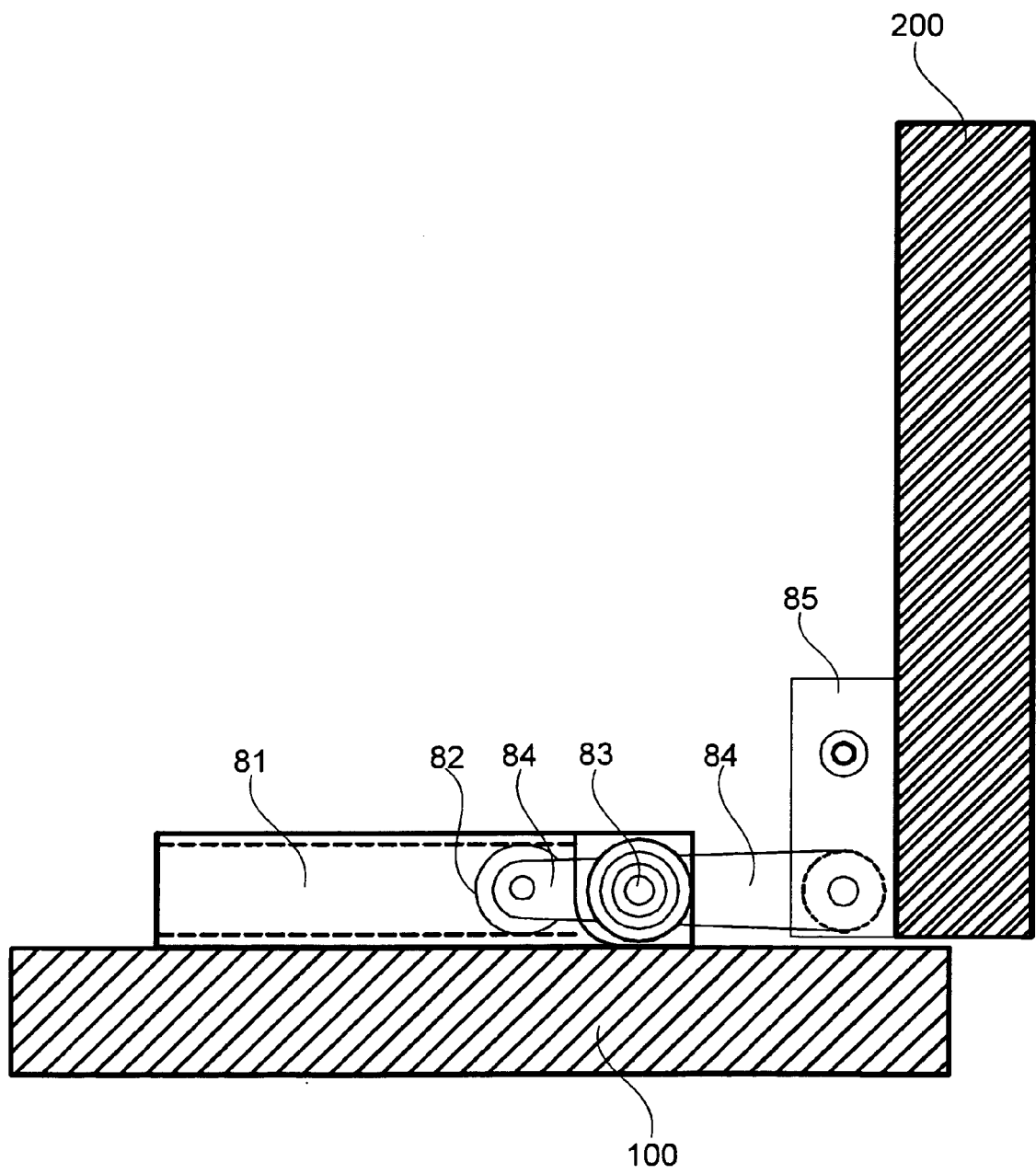
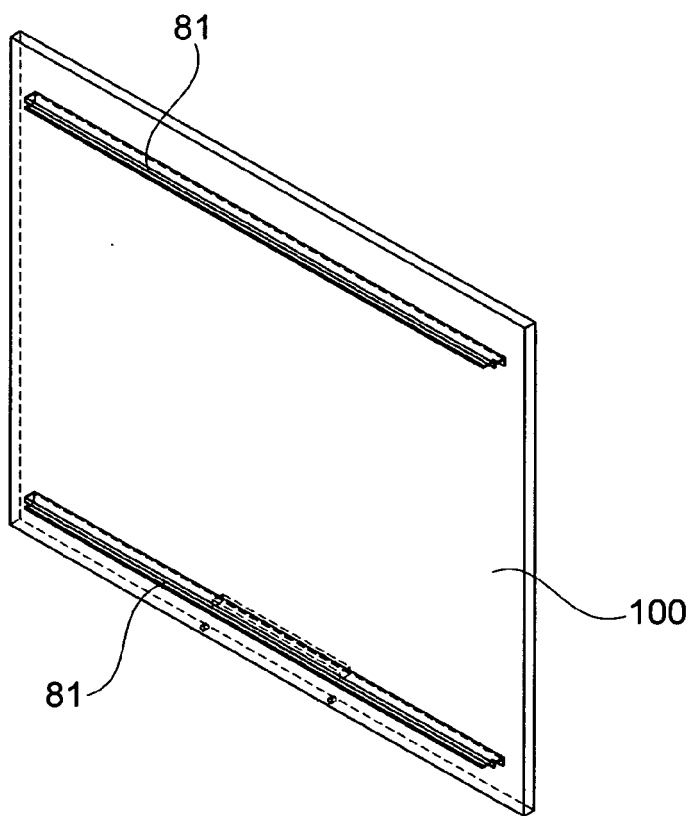
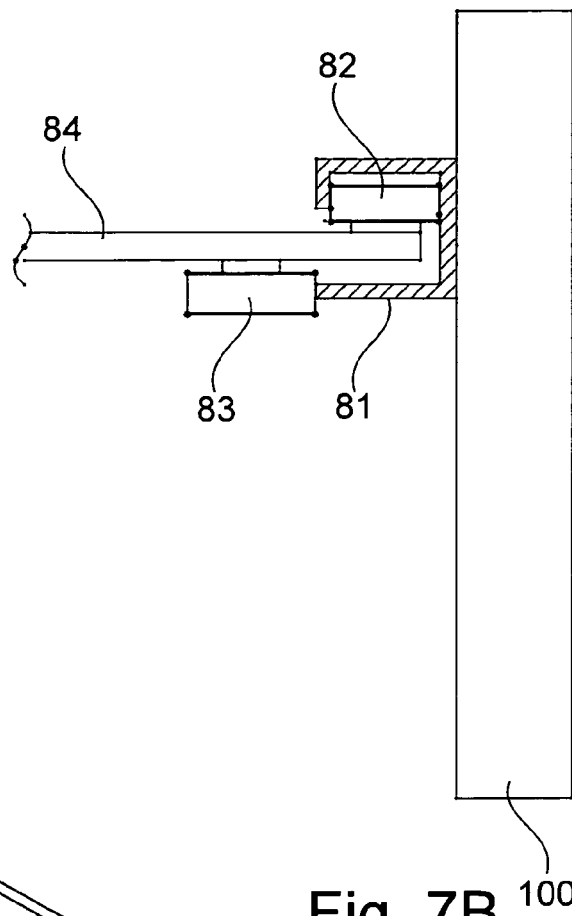


Fig. 6C



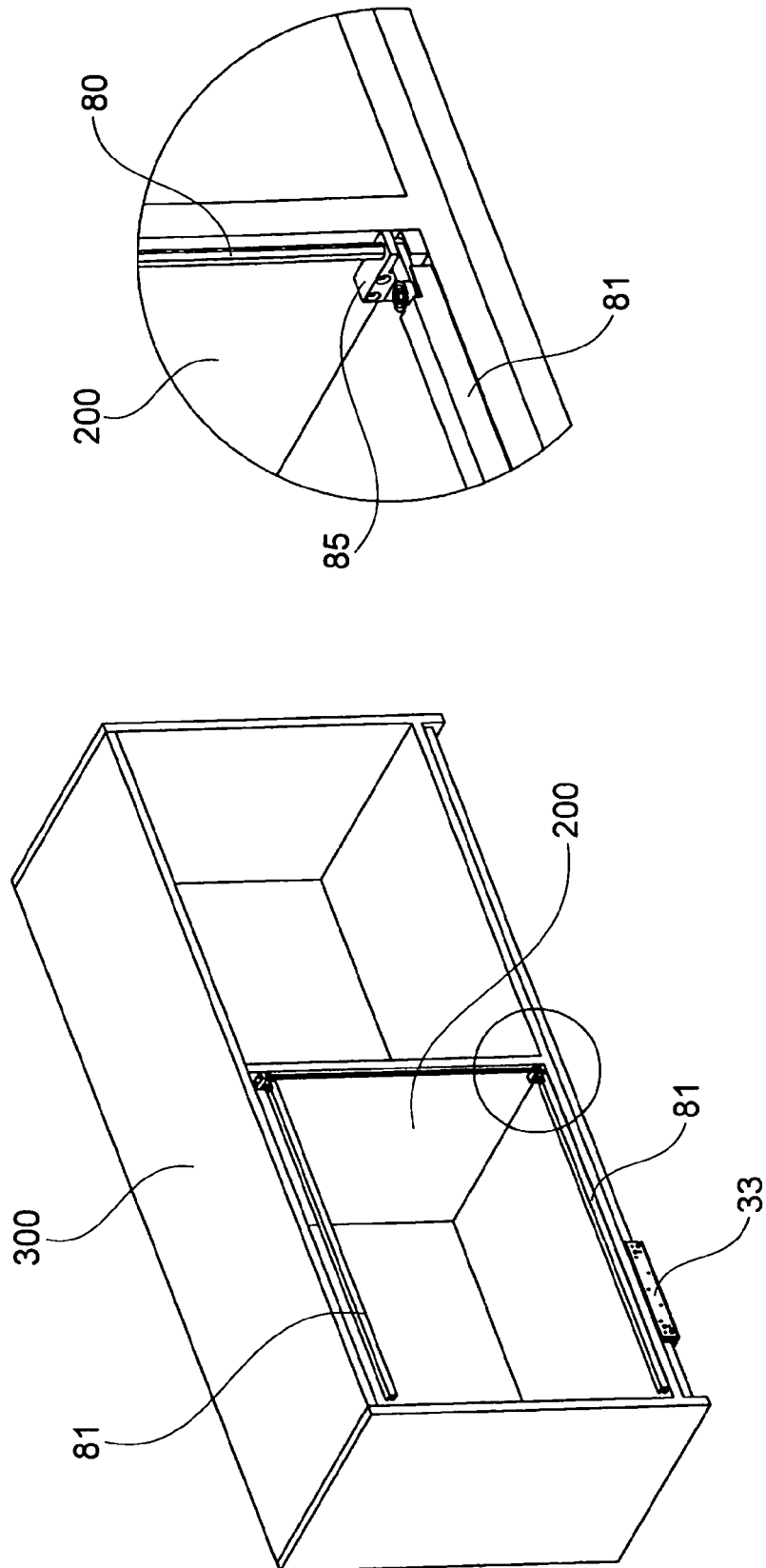


Fig. 8



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Application Number
EP 12 00 7151

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2004/090274 A1 (BORTOLUZZI MOBILI SPA [IT]; BORTOLUZZI GUIDO [IT]) 21 October 2004 (2004-10-21) * page 8, line 19 - page 14, line 5 * * figures 9-14 * -----	1-14	INV. E05D15/10
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 January 2013	Examiner Klemke, Beate
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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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