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(54) **CONVERTIBLE FURNITURE SYSTEM FOR CONVERTING A SOFA INTO A BED AND VICE VERSA**

(57) The invention relates to a convertible system that occupies a reduced space and the installation thereof is located in side areas of a piece of furniture, which enables internal spaces of the unit of furniture to be used to store objects. It comprises a pair of lower guides (2) and a pair of upper guides (3) located above the lower

guides (2); wherein the lower guides (2) and the upper guides (3) are located in side areas of the piece of furniture (1). It further comprises two articulated structures (5) that connect a first seat frame (6) and a second back-rest frame (7); wherein the articulated structures (5) are coupled to the lower guides (2) and the upper guides (3).

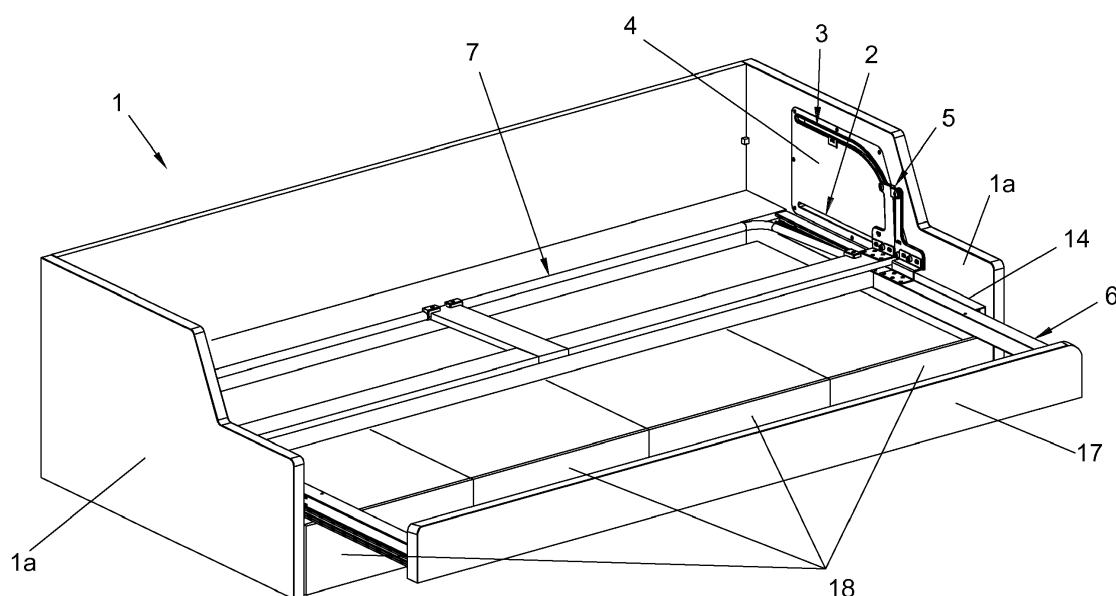


FIG. 2

Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a convertible furniture system for converting a sofa into a bed and vice versa that is intended to facilitate the operations for converting a sofa into a bed and vice versa. The convertible system occupies a reduced space, it also being notable that the installation thereof is located in side areas of the piece of furniture, which enables internal spaces of the unit of furniture to be used to store objects, and even drawers can be assembled in said internal spaces.

TECHNICAL PROBLEM TO BE SOLVED AND BACKGROUND OF THE INVENTION

[0002] At present two types of convertible furniture systems for converting a sofa into a bed and vice versa are mainly known; one wherein the pieces of furniture include a bed frame structure that can be folded and can adopt a first unfolded position to convert the piece of furniture into a bed; and a second folded position to convert the piece of furniture into a sofa, wherein the bed frame structure is taken in and hidden inside an inner space of the piece of furniture in this second position.

[0003] To convert the sofa furniture into a bed, the bed frame structure is taken out by either pulling a lower part of the sofa or by pulling said lower part of the sofa upwards.

[0004] The problem of this convertible system lies in the fact that, on one hand, the bottom part of the piece of furniture is completely disabled, in other words, it cannot be used as a storage area, since said bottom part is needed to house part of the bed frame structure and/or be able to carry out the folding and unfolding of said bed frame structure.

[0005] On the other hand, these convertible systems require considerable physical effort to take out and once again store the bed frame structure.

[0006] Lastly, it is worth noting that in the case of the convertible system in which the bed frame structure is taken out by means of pulling (for example by using wheels), said convertible system has the added drawback that the contact of the wheels with the floor may scratch the surface of said floor.

[0007] Another known type of convertible system for converting sofa furniture into a bed is that in which the backrest of the piece of furniture in sofa mode is folded backwards, thereby converting the sofa into a bed.

[0008] The problem with this convertible system described in the previous paragraph lies in the fact that the sofa must be separated a certain distance from a wall so that the backrest can be folded and can convert the sofa into a bed. In these pieces of furniture with a foldable backrest, a limitation with regard to the length of said backrest and therefore, of the bed, must also be added.

[0009] Likewise, with regard to the previous para-

graph, to convert the bed mode into sofa mode once again, it is necessary to lift the backrest from behind with the considerable physical effort that it entails.

DESCRIPTION OF THE INVENTION

[0010] With the aim of reaching the objectives and preventing the drawbacks mentioned in the previous sections, the invention proposes a convertible furniture system for converting a sofa into a bed and vice versa which comprises a pair of lower guides and a pair of upper guides that are located in opposite side areas of the piece of furniture; wherein the upper guides are located above the lower guides.

[0011] The convertible system further comprises two articulated structures that connect a first seat frame and a second backrest frame; wherein the articulated structures are coupled to the lower guides and the upper guides.

[0012] Each articulated structure comprises a first arm connected to the first frame and a second arm connected to the second frame.

[0013] The first arm and the second arm are coupled to each another by means of a common joint; wherein the first arm is coupled to the lower guide by means of a first connecting element, and the second arm is coupled to the upper guide by means of a second articulated connecting element.

[0014] The two articulated structures can move along the lower guides and the upper guides; wherein the convertible system is configured so that when the two articulated structures move, the second arms pivot in an angular space with respect to the first arms around the common joints.

[0015] The lower guides comprise straight paths, while the upper guides comprise initial straight sections and final arched sections that are a continuation of the initial straight sections; wherein the convertible system is configured so that during the path of the second articulated connecting elements of the second arms along the arched sections of the upper guides, the second arms pivot with respect to the first arms, varying the angular space existing between said arms.

[0016] The arched sections of the upper guides are curved in a convergent way towards the lower guides.

[0017] The convertible system comprises parallel side guides located under the lower guides; wherein the first seat frame is coupled in said side guides; and wherein the side guides are configured to guide and support the first seat frame.

[0018] The first seat frame is joined to the first arms by means of first parts and the second backrest frame is joined to the second arms by means of second parts.

[0019] Each first connecting element of the first arm and each second articulated connecting element of the second arm are linked by means of an actuator that is coupled to said connecting elements, respectively, by means of a lower joint and by means of an upper joint.

[0020] The lower guides and the upper guides are located on two plates fixed to sides of a frame of the piece of furniture; wherein the lower guides and the upper guides comprise through slots that pass through said plates.

[0021] The actuators are located in correspondence with first faces of the plates and the articulated structures are located in correspondence with second faces of said plates; wherein said first faces and said second faces of the plates are located on opposite planes.

[0022] For the purpose of helping to make this specification more readily understandable, a set of drawings constituting an integral part of the same has been included below, wherein by way of illustration and not limitation the object of the invention has been represented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Figure 1 shows a perspective view of a piece of furniture that includes the convertible system for converting a sofa into a bed and vice versa, object of the invention; wherein the convertible system is in a folded position in sofa mode.

Figure 2 shows a perspective view of the system of the invention in an unfolded position in bed mode.

Figure 3 shows an elevation view of the convertible system in an intermediate position in the folding or unfolding process.

Figures 4a to 4c show the unfolding process of the system of the invention from the folded position in sofa mode to the unfolded position in bed mode.

Figure 5 shows a perspective view of an articulated structure that forms part of the system of the invention.

DESCRIPTION OF AN EXEMPLARY EMBODIMENT OF THE INVENTION

[0024] Considering the numbering adopted in the figures, the convertible furniture system 1 for converting a sofa into a bed and vice versa comprises straight lower guides 2 formed by slots and upper guides 3 formed by other slots that comprise straight sections 3a and arched sections 3b; wherein the lower guides 2 and the upper guides 3 are located on two parallel plates 4 fixed to sides 1a of a frame of the piece of furniture 1, such that each plate 4 has a pair of guides: a lower guide 2 and another upper guide 3.

[0025] An articulated structure 5 that connects a first seat frame 6 and a second backrest frame 7 is coupled and guided on each pair of lower 2 and upper 3 guides. Therefore, the system of the invention includes two articulated structures 5 located in correspondence with the two sides 1a of the frame of the piece of furniture 1.

[0026] Each articulated structure 5 comprises a first arm 5a and a second arm 5b coupled to each other by

means of a common joint 8 located above the respective lower guide 2.

[0027] In turn, each of the first arms 5a is guided on the lower guide 2 by means of a first connecting element 9 attached to the first arm 5a, while each of the second arms 5b is guided on the upper guide 3 by means of a second articulated connecting element 10 attached to the second arm 5b.

[0028] In this way, when acting on the convertible system of the invention, the first and second connecting elements 9, 10, along with the first and second arms 5a, 5b of the two articulated structures 5 move along and are guided on the lower guides 2 and upper guides 3.

[0029] In each of the articulated structures 5, the first connecting element 9 of the first arm 5a and the second articulated connecting element 10 of the second arm 5b are linked by means of an actuator 11 that is coupled to said connecting elements 9, 10, respectively, by means of a lower joint 12 and an upper joint 13. Said actuator 11 is pneumatic or hydraulic.

[0030] The two actuators 11 help convert the sofa to a bed and vice versa with minimum effort.

[0031] Each of the plates 4 have two opposite faces: a first face and a second face. The actuator 11 is located in correspondence with the first face of the plate 4, and the articulated structure 5 is located in correspondence with the second face of the plate 4.

[0032] In order to be able to house the actuators 11, in one embodiment of the invention it is envisaged that the sides 1a of the frame of the piece of furniture 1 include mortises which are not shown in the figures. In another embodiment for housing the actuators 11, separation spaces defined between the plates 4 and the sides 1a of the frame of the piece of furniture 1 are envisaged; wherein said separation spaces are also not shown in the figures.

[0033] On the other hand, the first seat frame 6 is coupled to parallel side guides 14 fixed to the sides 1a of the piece of furniture 1; wherein said side guides 14 are located under the lower guides 2, and wherein in one embodiment of the invention, said side guides 14 are straight and comprises a telescopic structure.

[0034] The first seat frame 6 is joined to the first arms 5a by means of first parts 15 and the second backrest frame 7 is joined to the second arms 5b by means of second parts 16. A seat element 6a is assembled on the first frame 6 and a backrest element 7a is mounted on the second frame 7.

[0035] In one embodiment of the invention, the seat element 6a and the backrest element 7a are independent elements; while in another embodiment of the invention, the seat element 6a and the backrest element 7a are two elements that are joined to each other by means of a hinge, such as for example two cushions joined by a common edge.

[0036] A longitudinal member 17 that is used to operate the convertible system for converting the sofa into a bed or vice versa is fixed on the first seat frame 6; wherein

said longitudinal member 17 is located in correspondence with a front side of the piece of furniture 1 through which the first frame 6 protrudes along with the seat element 6a in the unfolded position of the system of the invention in bed mode.

[0037] In a folded position of the convertible system in sofa mode, the second frame 7, as well as the backrest element 7a, are arranged in a substantially vertical position, while the first frame 6 as well as the seat element 6a are arranged in a horizontal position.

[0038] Conversely, in an unfolded position of the convertible system in bed mode, the second frame 7 as well as the backrest element 7a are arranged in a horizontal position, while the first frame 6 as well as the seat element 6a are also arranged in a horizontal position protruding outward with respect to the front side of the piece of furniture 1.

[0039] On the other hand, the lower guides 2 and the upper guides 3 are defined by opposite ends: rear ends and forward ends that are closer to the front side of the piece of furniture 1 than the rear ends; wherein the forward ends of the upper guides 3 form part of the curved sections 3b thereof that converge towards the front side of the piece of furniture 1 and also converge towards the lower guides 2.

[0040] With regard to the previous paragraph, the forward ends of the lower guides 2 are closer to the front side of the piece of furniture 1 than the forward ends of the upper guides 3, such that the lower guides 2 have additional sections 2a that protrude with respect to the forward ends of the upper guides 3; wherein said additional sections 2a and the arched sections 3b of the upper guides 3 enable the first arms 5a and the second arms 5b of the articulated structures 5 to join and come in contact with each other in the unfolded position in bed mode, ensuring that the first frame 6 and the second frame 7 are horizontally aligned in said unfolded position in bed mode.

[0041] Starting from the folded position in sofa mode and in order to convert it into bed mode, said longitudinal member 17 is pulled, such that with this operation the first frame 6, as well as the second frame 7 will be moved until reaching the complete unfolded position in which the two frames, first frame 6 and second frame 7, are placed on a horizontal plane to form a bed formed by the seat element 6a associated with the first frame 6 and the backrest element 7a associated with the second frame 7. In said complete unfolded position, the seat element 6a has a support surface that is coplanar to another support surface of the backrest element 7a.

[0042] In the complete unfolded position in bed mode, the positioning of the second backrest frame 7 is kept in a stable position due to the second arms 5b being in contact with the first arms 5a of the two articulated structures 5.

[0043] Likewise, starting from the unfolded position in bed mode and in order to convert it into sofa mode, said longitudinal member 17 is pushed towards the inside of

the piece of furniture 1, such that with this operation the first frame 6, as well as the second frame 7 will be moved until reaching the folded position in which the first frame 6 and the seat element 6a are kept in a horizontal position and the second frame 7 and the backrest element 7a are located in a substantially vertical position.

[0044] During the folding and unfolding operations to achieve sofa mode or bed mode by means of the convertible system of the invention, the first connecting elements 9 and the second connecting elements 10 of the two articulated structures 5 move along and are guided at all times on the lower guides 2 and upper guides 3; wherein the first arms 5a move in parallel directions along the lower guides 2, while the second arms 5b are pulled by the first arms 5a, at the same time that said second arms 5b pivot around the common joint 8, varying the relative positions thereof with respect to the first arms 5a.

[0045] During the folding and unfolding operations, the second backrest frame 7 is kept in a substantially vertical position, while the second connecting elements 10 of the second arms 5b are located along the straight sections 3a of the upper guides 3.

[0046] Conversely, when said second connecting elements 10 of the second arms 5b reach the arched sections 3b of the upper guides 3, the incline of the second backrest frame 7 varies progressively; all of this as shown in Figures 4a to 4c, such that when the second connecting elements 10 reach the ends of said arched sections 3b of the upper guides 3, the second backrest frame 7 is placed in the horizontal position.

[0047] During said folding and unfolding operations, the distance between the first joint 12 and the second joint 13 of each actuator 11 varies.

[0048] Thanks to the two actuators 11, minimal effort is made to convert the sofa into a bed and vice versa, in which the lower guides 2 and upper guides 3, as well as the side guides 14 also take part, such that the two actuators 11 help to move the two frames 6, 7, reducing the necessary effort to be applied.

[0049] Furthermore, it is worth noting that during the folding and unfolding operations, the lower frame 6 is guided at all times on the side guides 14 and it is also guided by the first arms 5a along the lower guides 2.

[0050] Thus, given the configuration and arrangement of the convertible system of the invention, going from sofa mode to bed mode is achieved by pulling the longitudinal member 17 outwards from the piece of furniture 1, such that with this operation the sofa mode of the piece of furniture 1 is converted into bed mode; whereas to go from bed mode to sofa mode, the longitudinal member 17 is pushed towards the inside of the piece of furniture 1, such that the bed mode returns to the original sofa position thereof, it being notable that it is not necessary to manually lift the unit of the second frame 7 and the backrest element 7a.

[0051] It is worth noting that no space of the lower area of the piece of furniture 1 under the lateral guides 14 is used, which makes it especially advantageous for storing

objects; even drawers 18 can be assembled to be able to store said objects.

[0052] It is also worth noting the advantage that the piece of furniture can be located in an area adjacent to a wall, such that there would be no problem at the time of converting the sofa into a bed, where it is not necessary to separate the piece of furniture with respect to said wall, since the folding of the unit of the second frame 7 and backrest 7a is carried out together with a forward movement towards the front side of the piece of furniture 1 wherein the longitudinal member 17 is found.

Claims

1. A convertible furniture system for converting a sofa into a bed and vice versa, **characterized in that:**

- it comprises a pair of lower guides (2) and a pair of upper guides (3) that are located in opposite side areas of the piece of furniture (1); wherein the upper guides (3) are located above the lower guides (2);
- it comprises two articulated structures (5) that connect a first seat frame (6) and a second backrest frame (7); wherein the articulated structures (5) are coupled to the lower guides (2) and the upper guides (3);
- each articulated structure (5) comprises a first arm (5a) connected to the first frame (6) and a second arm (5b) connected to the second frame (7);
- the first arm (5a) and the second arm (5b) are coupled to each another by means of a common joint (8); wherein the first arm (5a) is coupled to the lower guide (2) by means of a first connecting element (9), and the second arm (5b) is coupled to the upper guide (3) by means of a second articulated connecting element (10);
- the two articulated structures (5) can move along the lower guides (2) and the upper guides (3); wherein the convertible system is configured so that when the two articulated structures (5) move, the second arms (5b) pivot in an angular space with respect to the first arms (5a) around the common joints (8).

2. The convertible furniture system for converting a sofa into a bed and vice versa according to claim 1, **characterized in that** the upper guides (3) comprise initial straight sections (3a) and final arched sections (3b) that are a continuation of the initial straight sections (3a); wherein the convertible system is configured so that during the path of the second articulated connecting elements (10) of the second arms (5b) along the arched sections (3b) of the upper guides (3), the second arms (5b) pivot with respect to the first arms (5a).

3. The convertible furniture system for converting a sofa into a bed and vice versa according to any one of the preceding claims, **characterized in that** it comprises parallel side guides (14) located under the lower guides (2); wherein the first frame (6) is coupled in said side guides (14); and wherein the side guides (14) are configured to guide and support the first frame (6).

4. The convertible furniture system for converting a sofa into a bed and vice versa according to any one of the preceding claims, **characterized in that** the first seat frame (6) is joined to the first arms (5a) by means of first parts (15) and the second backrest frame (7) is joined to the second arms (5b) by means of second parts (16).

5. The convertible furniture system for converting a sofa into a bed and vice versa according to any one of the preceding claims, **characterized in that** each first connecting element (9) of the first arm (5a) and each second articulated connecting element (10) of the second arm (5b) are linked by means of an actuator (11) that is coupled to said connecting elements (9, 10), respectively, by means of a lower joint (12) and by means of an upper joint (13).

6. The convertible furniture system for converting a sofa into a bed and vice versa according to any one of the preceding claims, **characterized in that** the lower guides (2) and the upper guides (3) are located on two plates (4) fixed to sides (1 a) of a frame of the piece of furniture (1).

7. The convertible furniture system for converting a sofa into a bed and vice versa according to claim 6, **characterized in that** lower guides (2) and the upper guides (3) comprise through slots that pass through the plates (4).

8. The convertible furniture system for converting a sofa into a bed and vice versa according to preceding claims 5, 6 and 7, **characterized in that** the actuators (11) are located in correspondence with first faces of the plates (4) and the articulated structures (5) are located in correspondence with second faces of said plates (4); wherein said first faces and said second faces of the plates (4) are located on opposite planes.

9. The convertible furniture system for converting a sofa into a bed and vice versa according to claim 2, **characterized in that** the arched sections (3b) of the upper guides (3) are curved in a convergent way towards the lower guides (2).

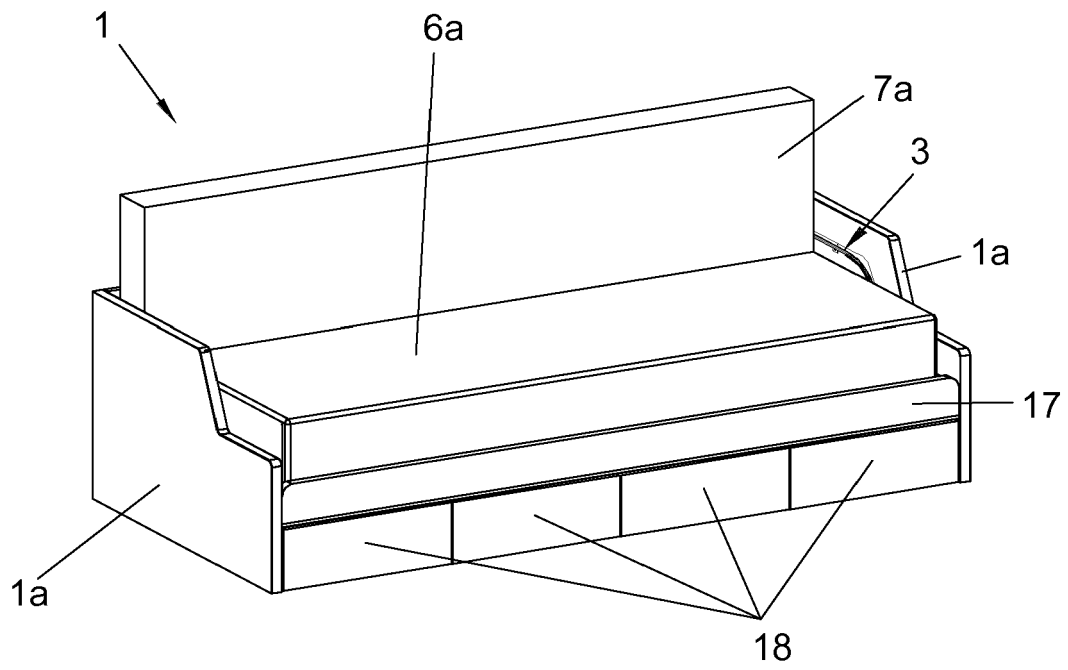


FIG. 1

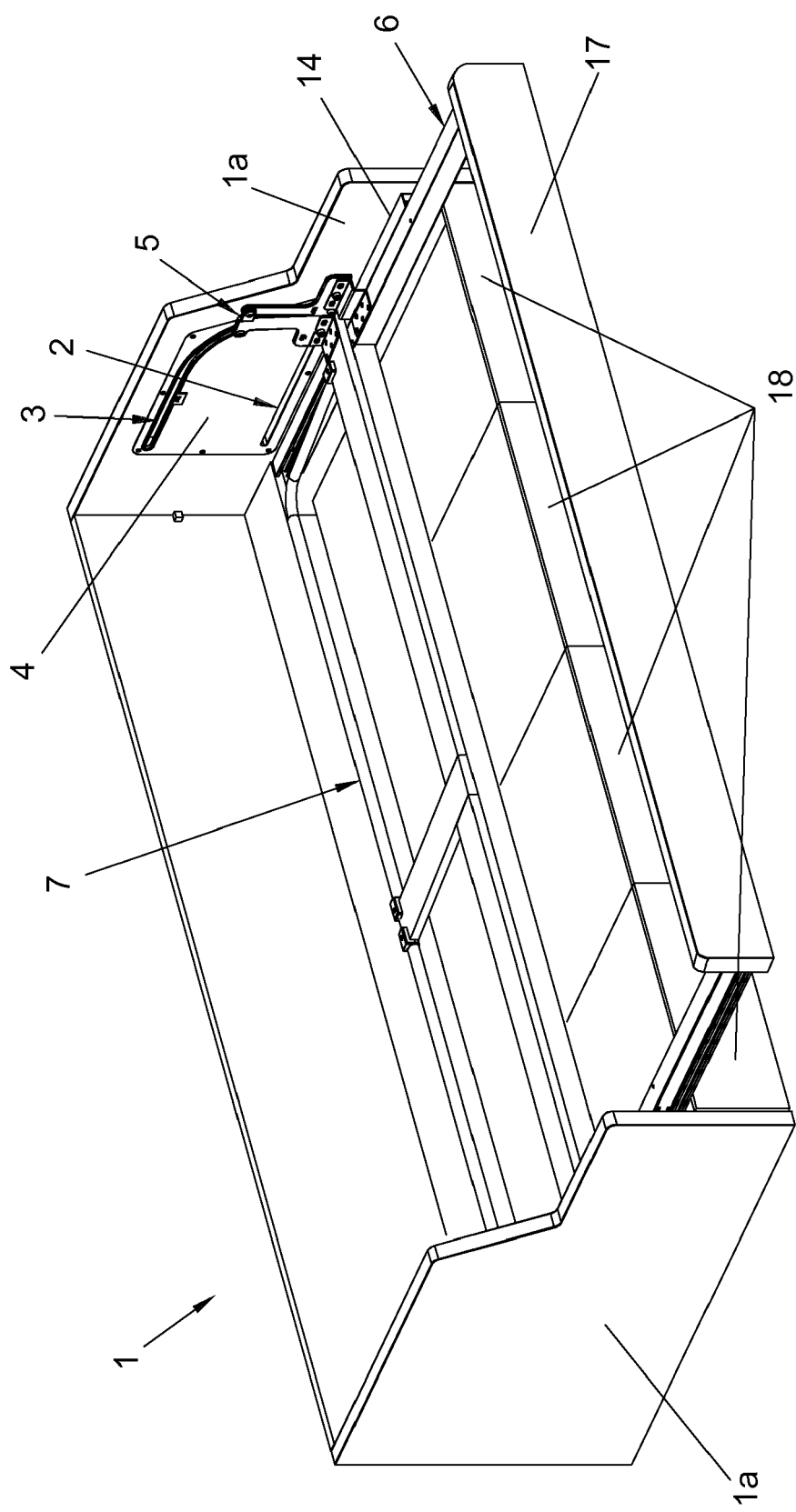


FIG. 2

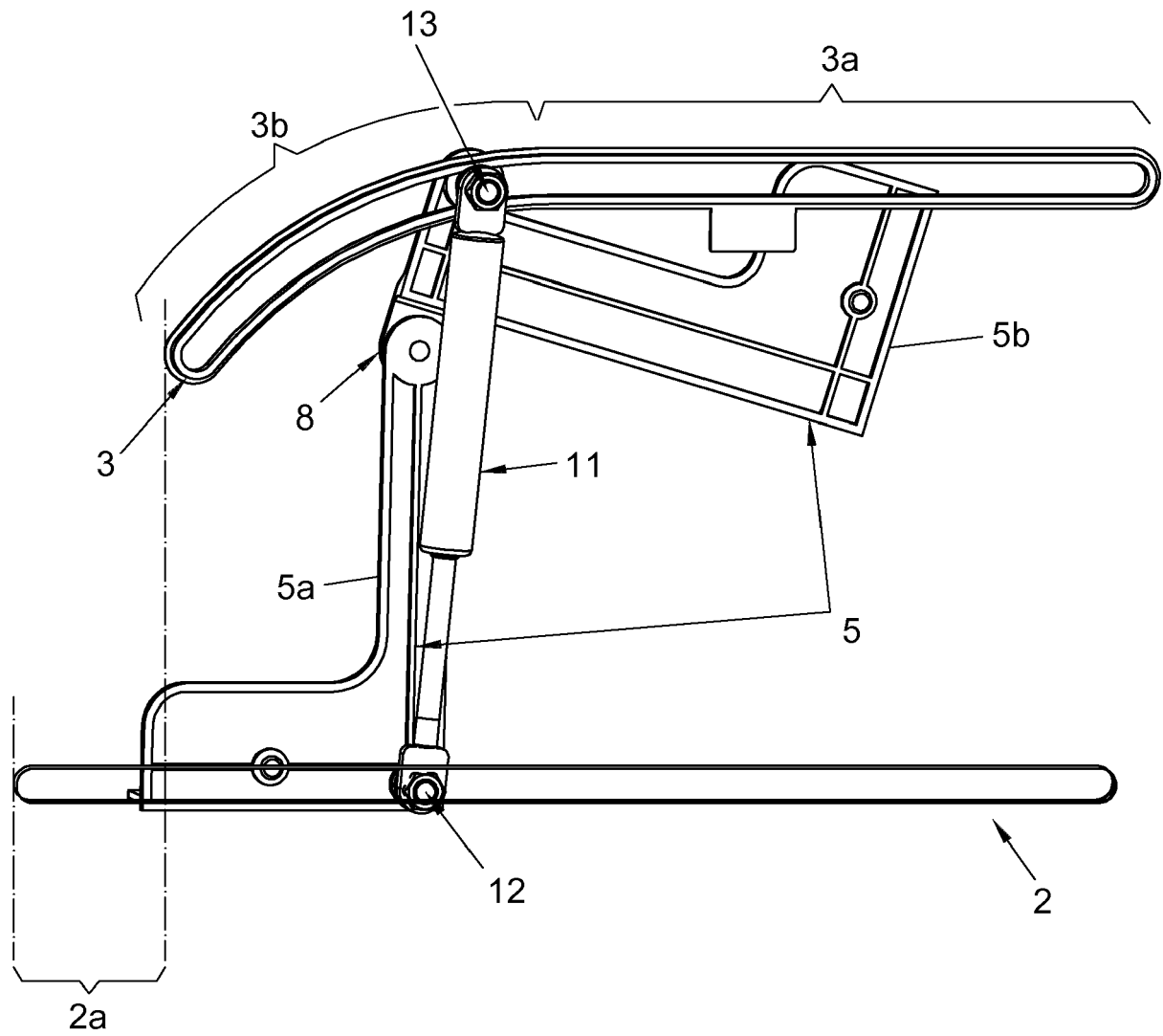


FIG. 3

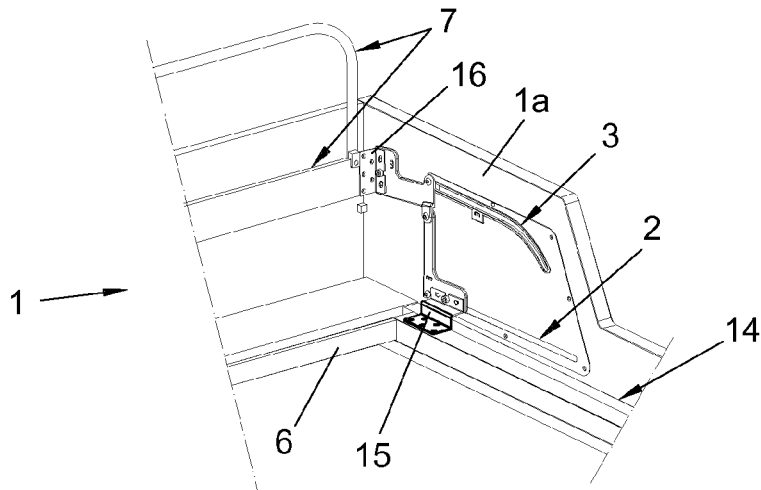


FIG. 4a

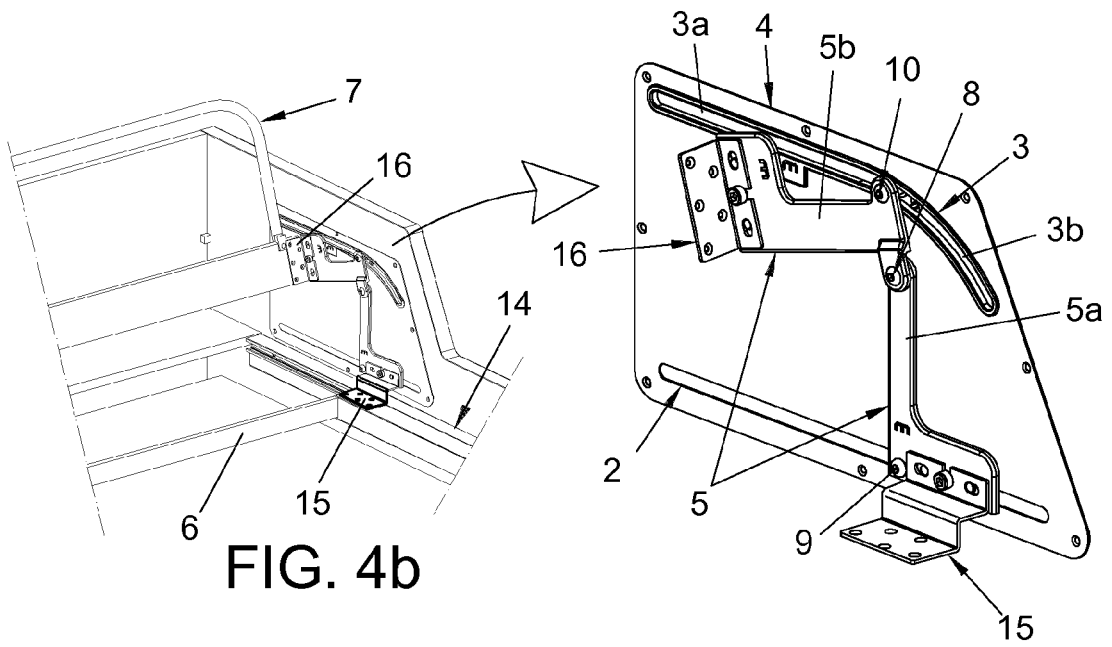


FIG. 4b

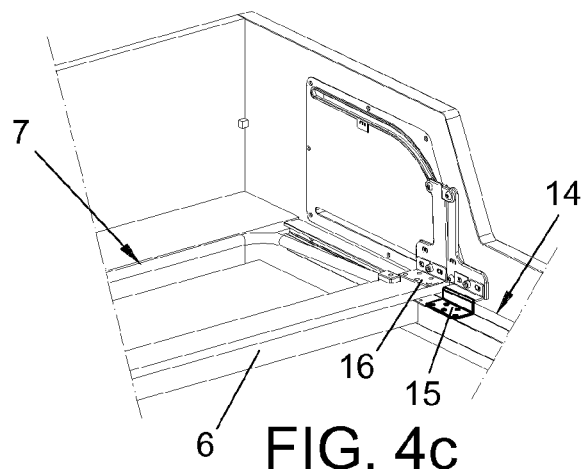


FIG. 4c

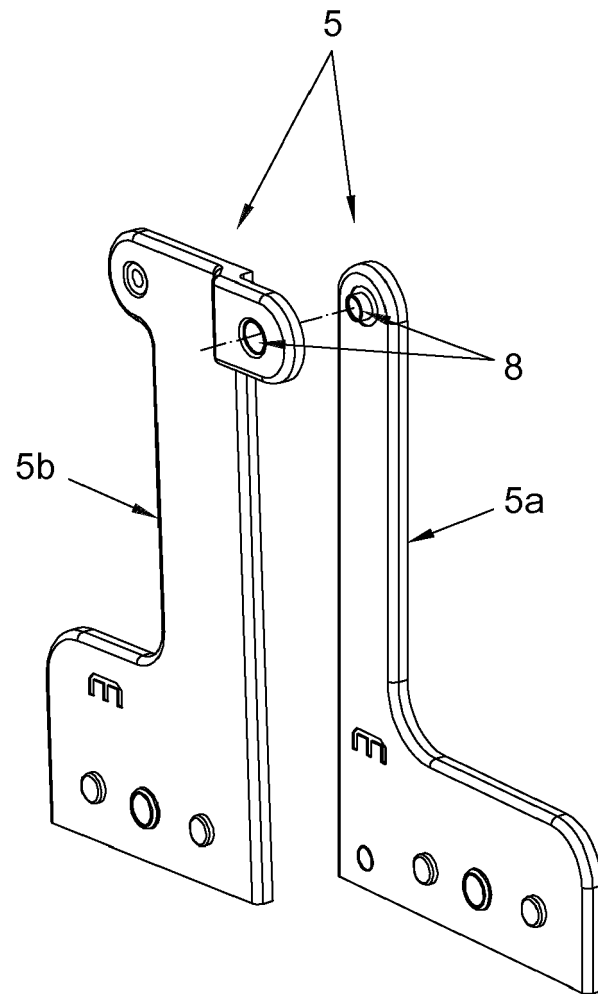


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 18 17 6025

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 543 675 A (SHROCK FRED J [US]) 1 October 1985 (1985-10-01)	1,4,6,7	INV. A47C17/175
A	* column 1, line 35 - column 2, line 51; figures 1-5 *	2,3,5,8,9	
A	DE 855 460 C (KELLERMANN G M B H) 13 November 1952 (1952-11-13) * column 1, line 35 - column 2, line 54 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
Place of search		Date of completion of the search	Examiner
The Hague		30 August 2018	Lehe, Jörn
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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30-08-2018

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82