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(54) **Mechanism for bunk beds and sofa-bed comprising this mechanism**

(57) Mechanism for bunk beds, which comprises at least one base (1), an upper frame (2) suitable for supporting a mattress (27) and a pair of first lever systems (3, 3') which can raise the upper frame (2) from the base (1) and are arranged on the two sides of the base (1) and

the upper frame (2), respectively, wherein at least one first lever system (3, 3') comprises a front lever (4) and a rear lever (5), which are pivoted between the base (1) and the upper frame (2) so that the upper frame (2) is reversed when it is raised from the base (1).

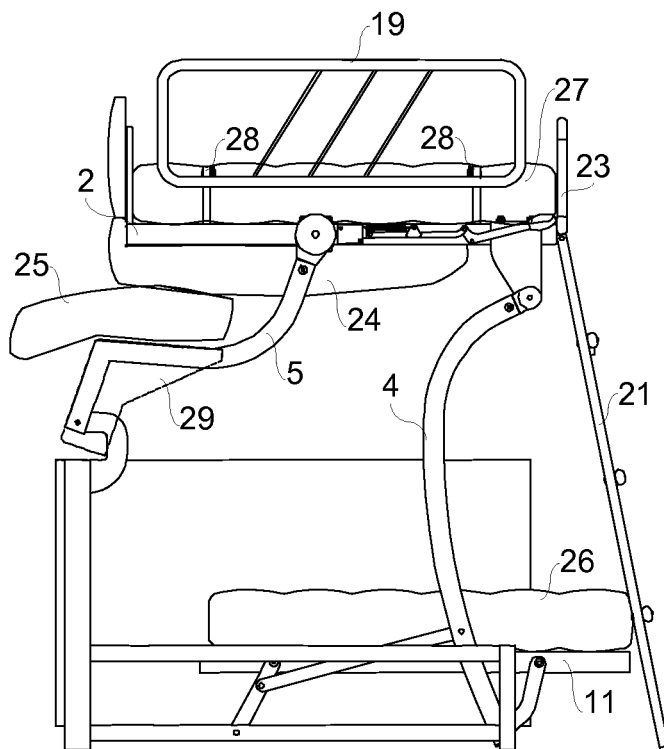


Fig.13

Description

[0001] The present invention relates to a mechanism for bunk beds, and in particular to a mechanism which allows to lower the upper bed for transforming the bunk bed into a sofa. The present invention also relates to a sofa-bed comprising this mechanism.

[0002] Known mechanisms for bunk beds comprise a base, an upper frame suitable for supporting a mattress and a pair of lever systems which are suitable for raising the upper frame from the base and are arranged on the two sides of the base and of the upper frame, respectively. Such lever systems comprise pantographs or other groups of levers which are relatively complex to be assembled and used. Furthermore, the stability of these known mechanisms is quite low, with consequent heavy problems of safety.

[0003] It is therefore an object of the present invention to provide a mechanism, which is free from said disadvantages. Said object is achieved with a mechanism and a sofa-bed, whose main features are disclosed in claims 1 and 15, respectively, while other features are disclosed in the remaining claims.

[0004] Thanks to the particular lever systems which is provided with, the mechanism according to the present invention is simple to assemble and use, as well as particularly safe, also thanks to the particular shape and arrangement of the levers forming the lever systems.

[0005] The mechanism according to the present invention can further be advantageously employed in a sofa bed, since when the upper frame is lowered, it is reversed and thus a conventional seat can be arranged on the side opposite to the upper mattress. Moreover, the mechanism allows to have a second bed which is preferably extracted and raised automatically together with the first one.

[0006] When the upper frame is raised, the seat and the back of the sofa do not obstruct the access to the upper bed and to the lower bed. The stability and the safety of the mechanism are preferably ensured by a particular articulation provided with a safety device.

[0007] Further advantages and features of the mechanism according to the present invention will become clear to those skilled in the art from the following detailed and non-limiting description of an embodiment thereof with reference to the attached drawings, wherein:

- figure 1 shows a top view of the open mechanism;
- figure 2 shows section II-II of figure 1;
- figure 3 shows section III-III of figure 1;
- figure 4 shows the mechanism of figure 3 during its closing;
- figure 5 shows a front view of the closed mechanism;
- figure 6 shows section VI-VI of figure 5;
- figure 7 shows section VII-VII of figure 5;
- figure 8 shows a side view of the closed mechanism;
- figure 9 shows a front view of the closed mechanism provided with accessories;

- figure 10 shows a front view of the mechanism of figure 9 in the open position;
- figure 11 shows the mechanism of figure 10 with the extended accessories;
- figure 12 shows a side view of the closed mechanism provided with accessories and paddings;
- figure 13 shows a side view of the mechanism of figure 12 in the open position;
- and
- figure 14 shows a front view of the mechanism of figure 13.

[0008] Referring to figures 1 to 3, it is seen that the mechanism according to the present invention comprises in a known way at least one base 1 with a substantially parallelepiped shape, an upper frame 2 with a substantially rectangular shape suitable for supporting a mattress and a pair of first lever systems 3, 3' which can raise upper frame 2 from base 1 and are arranged on the two sides of base 1 and upper frame 2, respectively.

[0009] According to the present invention, at least one first lever system 3, 3' comprises a front lever 4 and a rear lever 5, which are both pivoted between base 1 and upper frame 2 so that upper frame 2 is reversed, in particular substantially with a rotation of 180° around a transversal horizontal axis, when it is raised from base 1. In particular, front lever 4 is pivoted to the front portion of base 1 and to a plate 6 protruding under the front portion of upper frame 2 when it is in the raised position. Rear lever 5 is pivoted, directly or by means of an articulation 7, to the lateral edge of upper frame 2 in a substantially central position thereof and to a C-shaped member 8 fixed to a rear frame 1a of base 1. Articulation 7 is provided with a safety device 9 suitable for preventing the relative rotation of rear lever 5 with respect to upper frame 2. Safety device 9 automatically locks when upper frame 2 is completely raised and can be unlocked only with a manual drive 10, which can in turn be locked by means of a removable key (not visible in the figure). Front lever 4 is shaped with a concavity turned forward when upper frame 2 is raised, while rear lever 5 is shaped with a concavity turned upward when upper frame 2 is raised. Axes A1, A2 passing through the pivoting points of front lever 4 and rear lever 5, respectively, between base 1 and upper frame 2 are oriented forward and upward when upper frame 2 is raised.

[0010] A lower frame 11 with a substantially rectangular shape suitable for supporting a mattress is arranged under upper frame 2 and can be raised from base 1 by means of a pair of second lever systems 12, 12' arranged on the two sides of base 1 and lower frame 11, respectively. At least one second lever system 12, 12' comprises an auxiliary front lever 13 and an auxiliary rear lever 14, which are both pivoted between base 1 and lower frame 11 so that the latter is moved forward when it is raised from base 1. First lever systems 3, 3' and second lever systems 12, 12' are mechanically connected to each other, so that when upper frame 2 is raised, also lower frame

11 is raised, and vice versa. For this purpose, a connection rod 15 is pivoted to front lever 4 of at least one first lever system 3, 3' and to auxiliary rear lever 14 of at least one second lever system 12, 12'. A first parapet 16 is arranged along the rear edge of upper frame 2 when the latter is raised. One or more crossbars 17, 18 connect rear levers 5 of first lever systems 3, 3'.

[0011] Referring to figure 4, it is seen that during the lowering of upper frame 2, the latter rotates around a horizontal axis passing through articulation 7, unlocked by means of manual drive 10. For a way of the movement of upper frame 2, shown in figure 4, axis A1 passing through the pivoting points of front lever 4 between base 1 and upper frame 2 is oriented backward and upward, while axis A2 passing through the pivoting points of rear lever 5 between base 1 and upper frame 2 is oriented forward and upward.

[0012] Referring to figures 5 to 8, it is seen that when upper frame 2 is lowered, the latter is arranged in a substantially horizontal position, axes A1, A2 are oriented backward and upward, while the pivoting point of front lever 4 to upper frame 2, namely to plate 6, is arranged in a higher and more rear position with respect to the pivoting point of rear lever 5 to upper frame 2.

[0013] Referring to figures 9 to 11, it is seen that the lateral edges of upper frame 2 are provided with lateral parapets 19, 20 which can be folded toward upper frame 2 when the latter is lowered, so that a mattress can be arranged between the folded lateral parapets 19, 20 and upper frame 2. The front edge of the raised upper frame 2 is instead provided with a ladder 21 with a pantograph structure, so as to be folded along this front edge, as shown in figures 9 and 10. An upright of ladder 21 is pivoted to a horizontal bar 22 in turn connected to the front edge of upper frame 2 by means of a rod 23, so that when ladder 21 is extended, horizontal bar 22 and rod 23 move away from upper frame 2, thereby forming a front parapet.

[0014] Figures 12 to 14 show a sofa-bed comprising the mechanism according to the present invention, in which one or more seats 24 are arranged on upper frame 2 in its lowered position, or rather under it when it is raised. One or more backs 25 are arranged on rear levers 5, in particular on crossbars 17, 18 arranged between these levers 5. A lower mattress 26 is arranged on lower frame 11 while an upper mattress 27 is arranged on upper frame 2 and is fixed thereto through belts 28, so as not to fall when upper frame 2 is raised or lowered. One or more covers 29 (shown with broken lines in figures 12 and 13) partially cover at least one rear lever 5 and a C-shaped member 8, so as to hide them when upper frame 2 is lowered.

[0015] Possible modifications and/or additions may be made by those skilled in the art to the hereinabove disclosed and illustrated embodiment while remaining within the scope of the following claims.

Claims

1. Mechanism for bunk beds, which comprises at least one base (1), an upper frame (2) suitable for supporting a mattress (27) and a pair of first lever systems (3, 3') which can raise the upper frame (2) from the base (1) and are arranged on the two sides of the base (1) and the upper frame (2), respectively, **characterized in that** at least one first lever system (3, 3') comprises a front lever (4) and a rear lever (5), which are pivoted between the base (1) and the upper frame (2) so that the upper frame (2) is reversed when it is raised from the base (1).
2. Mechanism according to the previous claim, **characterized in that** the upper frame (2) is reversed substantially with a rotation of 180° around a transversal horizontal axis.
3. Mechanism according to one of the previous claims, **characterized in that** the front lever (4) is pivoted to the front portion of the base (1) and to the front portion of the upper frame (2) when the latter is in the raised position.
4. Mechanism according to one of the previous claims, **characterized in that** the rear lever (5) is pivoted to the rear portion of the base (1) and to the lateral edge of the upper frame (2) in a substantially central position thereof.
5. Mechanism according to one of the previous claims, **characterized in that** the rear lever (5) is pivoted to the upper frame (2) by means of an articulation (7) provided with a safety device (9) suitable for preventing the relative rotation of the rear lever (5) with respect to the upper frame (2).
6. Mechanism according to the previous claim, **characterized in that** the safety device (9) automatically locks when the upper frame (2) is completely raised and can be unlocked only with a manual drive (10).
7. Mechanism according to one of the previous claims, **characterized in that** the front lever (4) is shaped with a concavity turned forward when the upper frame (2) is raised, while the rear lever (5) is shaped with a concavity turned upward when the upper frame (2) is raised.
8. Mechanism according to one of the previous claims, **characterized in that** the axes (A1, A2) passing through the pivoting points of the front lever (4) and of the rear lever (5), respectively, between the base (1) and the upper frame (2) are oriented forward and upward when the upper frame (2) is raised.
9. Mechanism according to one of the previous claims,

characterized in that the a lower frame (11) suitable for supporting a mattress (26) is arranged under the upper frame (2) and can be raised from the base (1) by means of a pair of second lever systems (12, 12') arranged on the two sides of the base (1) and of the lower frame (11), respectively. 5

10. Mechanism according to the previous claim, **characterized in that** the first lever systems (3, 3') and the second lever systems (12, 12') are mechanically connected to each other, so that when the upper frame (2) is raised, also the lower frame (11) is raised, and vice versa. 10

11. Mechanism according to one of the previous claims, **characterized in that** when the upper frame (2) is lowered, the pivoting point of the front lever (4) to the upper frame (2) is arranged in a higher and more rear position with respect to the pivoting point of the rear lever (5) to the upper frame (2). 15 20

12. Mechanism according to one of the previous claims, **characterized in that** the front edge of the raised upper frame (2) is provided with a ladder (21) with a pantograph structure, so as to be folded along this front edge. 25

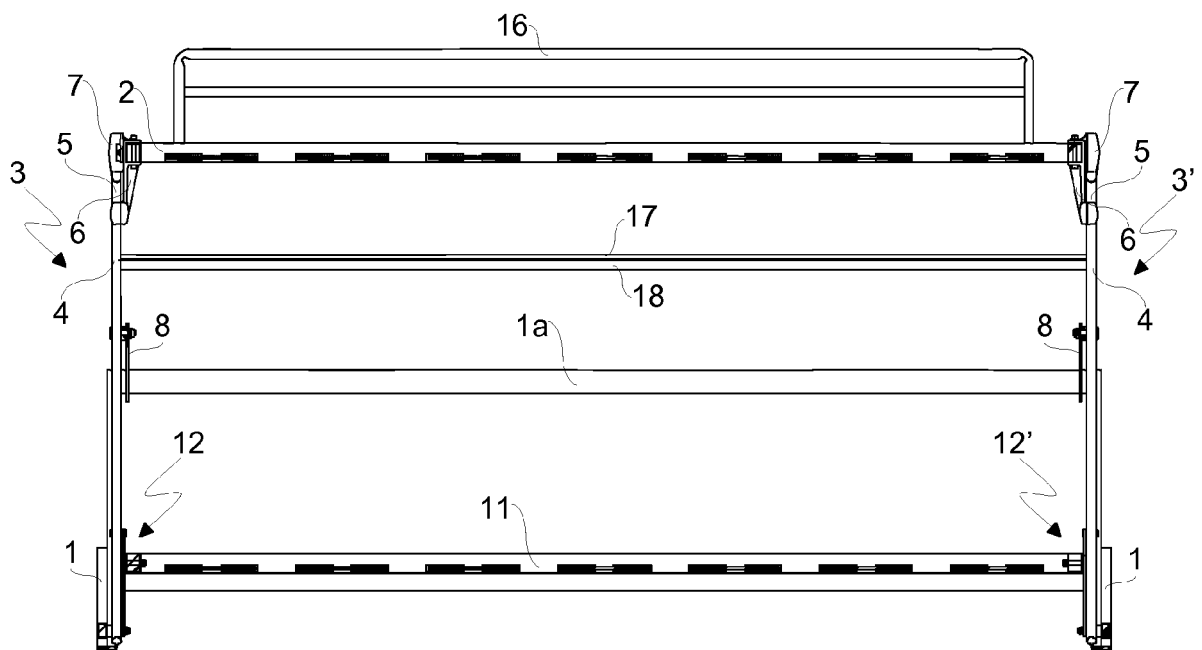
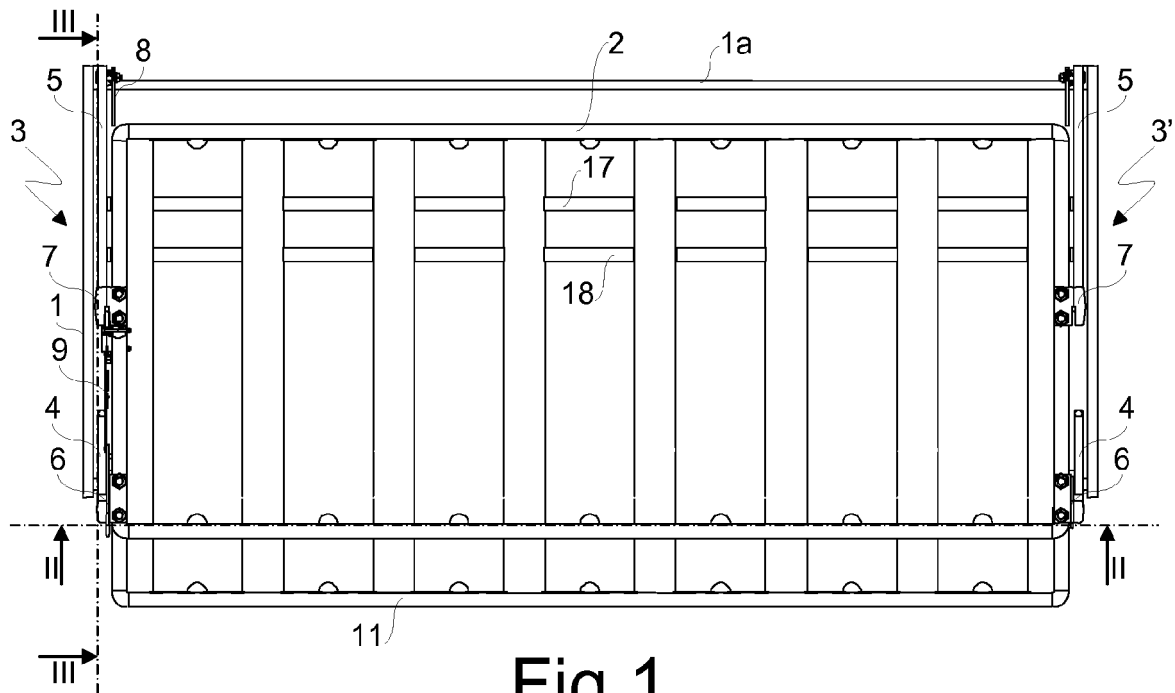
13. Mechanism according to the previous claim, **characterized in that** an upright of ladder (21) is pivoted to a horizontal bar (22) in turn connected to the front edge of the upper frame (2) by means of a rod (23), so that when the ladder (21) is extended, the horizontal bar (22) and the rod (23) move away from the upper frame (2), thereby forming a front parapet. 30 35

14. Mechanism according to one of the previous claims, **characterized in that** the lateral edges of the upper frame (2) are provided with lateral parapets (19, 20) which can be folded toward the upper frame (2), so that a mattress (27) can be arranged between the folded lateral parapets (19, 20) and the upper frame (2). 40

15. Sofa-bed, **characterized by** comprising a mechanism according to one of the previous claims. 45

16. Sofa-bed according to the previous claim, **characterized in that** one or more seats (24) are arranged on the upper frame (2) in its lowered position, while one or more backs (25) are arranged on the rear levers (5) of the first lever systems (3, 3'). 50

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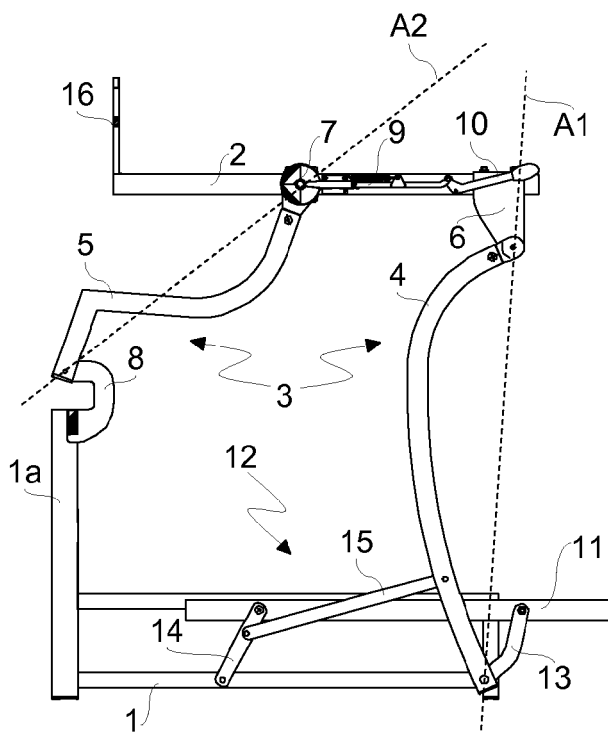


Fig.3

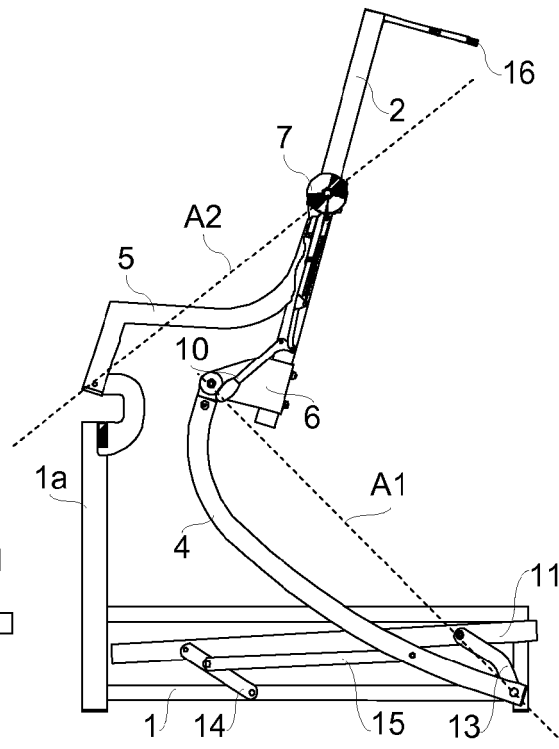


Fig.4

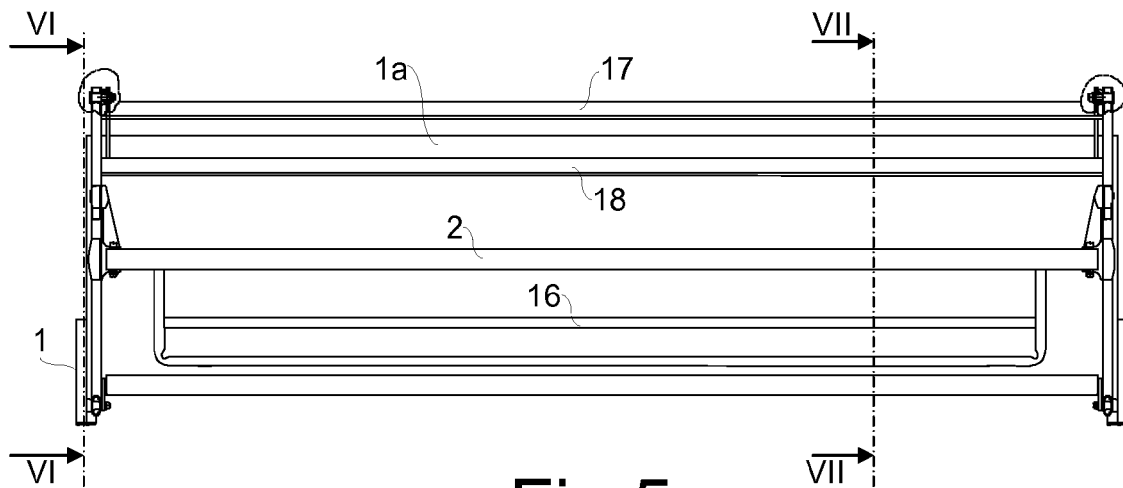


Fig.5

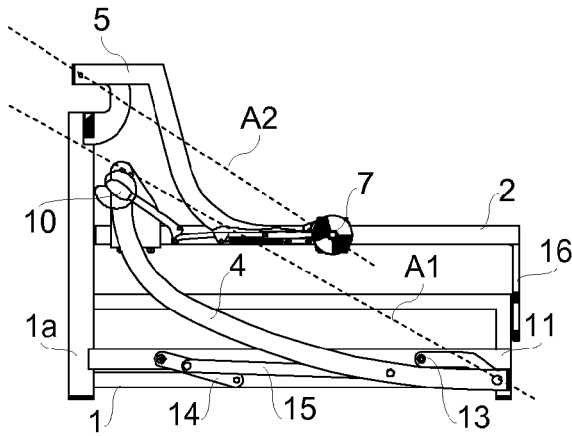


Fig.6

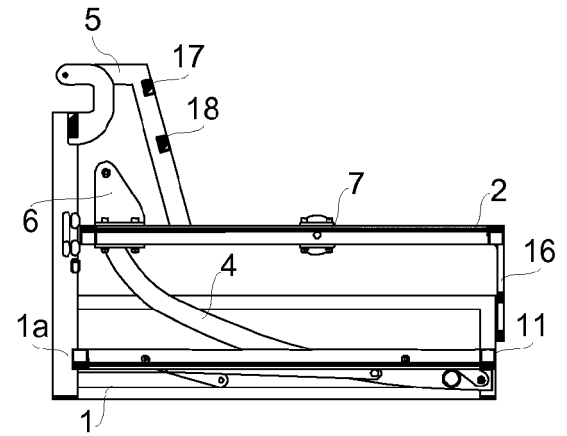


Fig.7

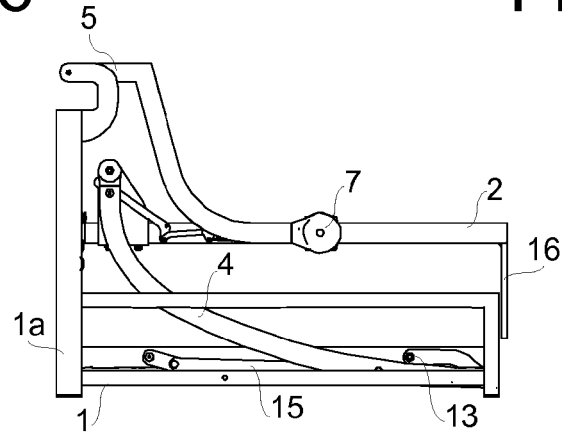


Fig.8

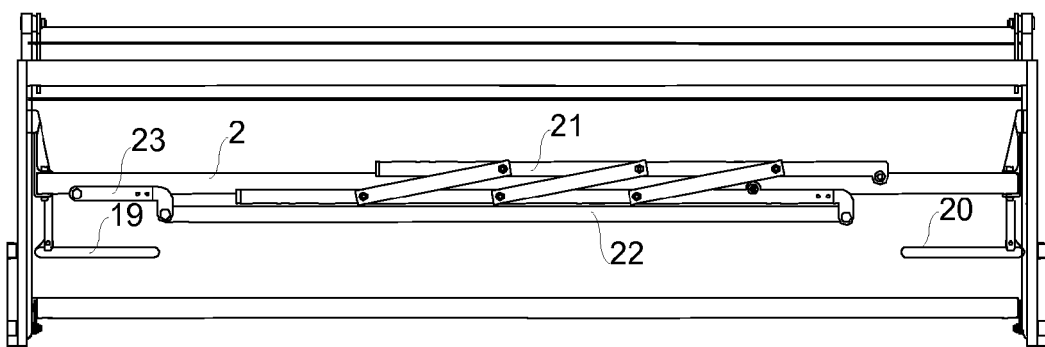


Fig.9

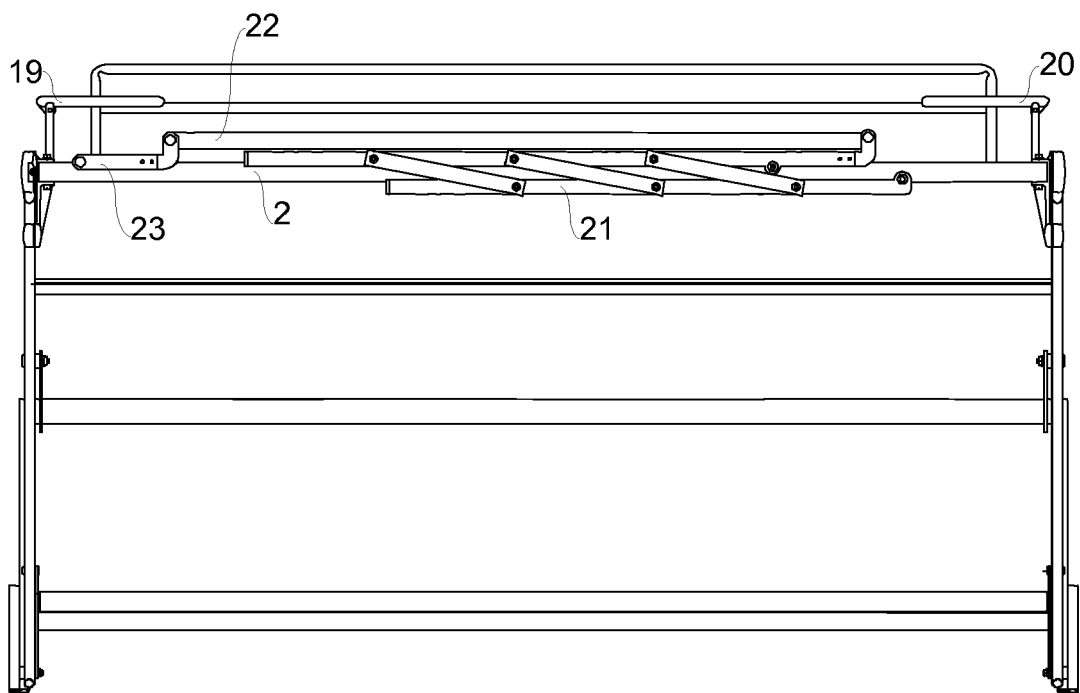


Fig.10

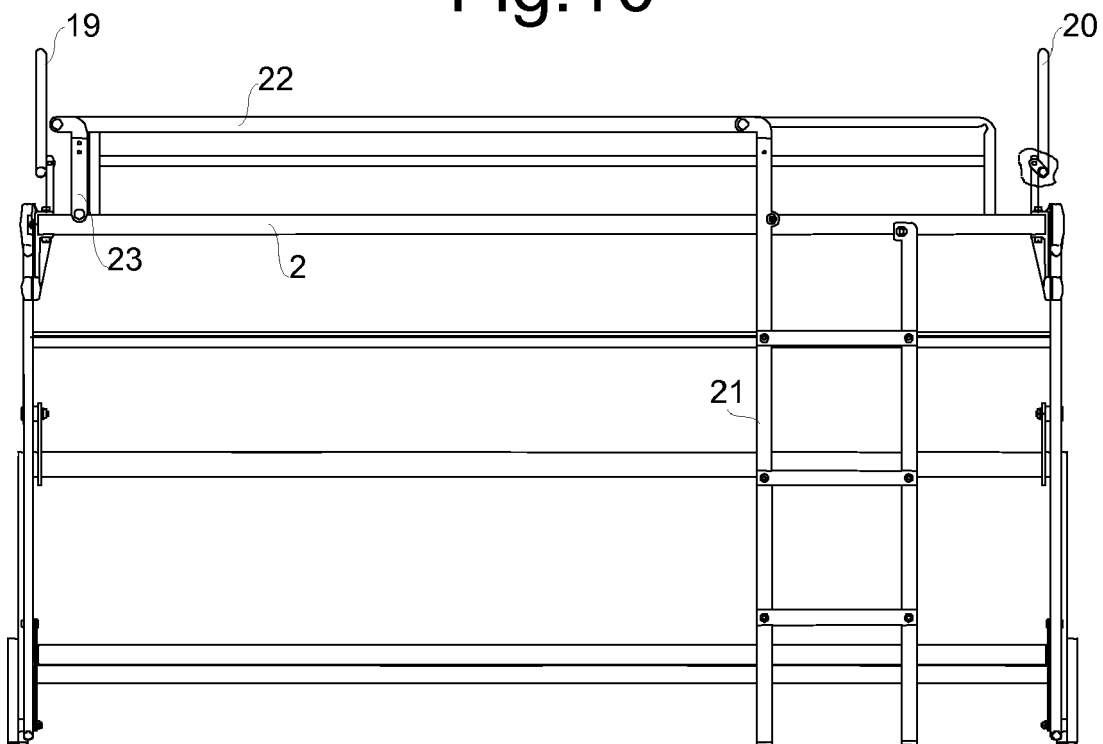


Fig.11

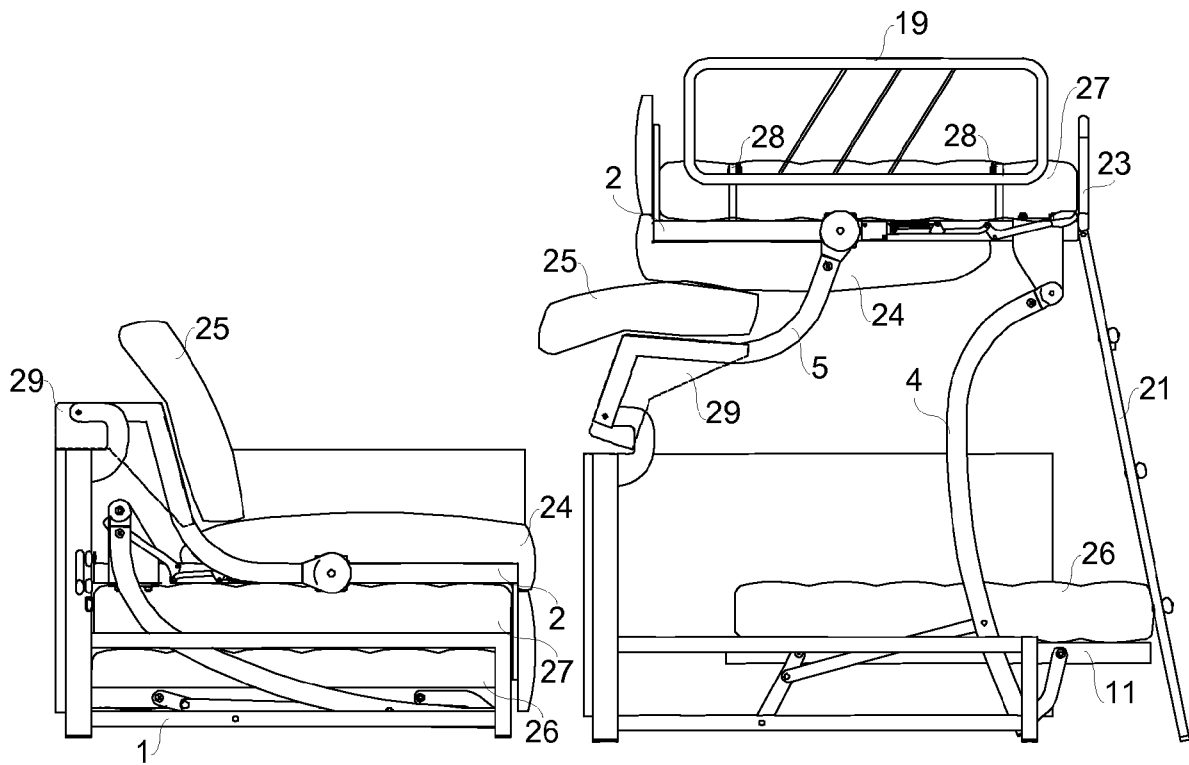


Fig.12

Fig.13

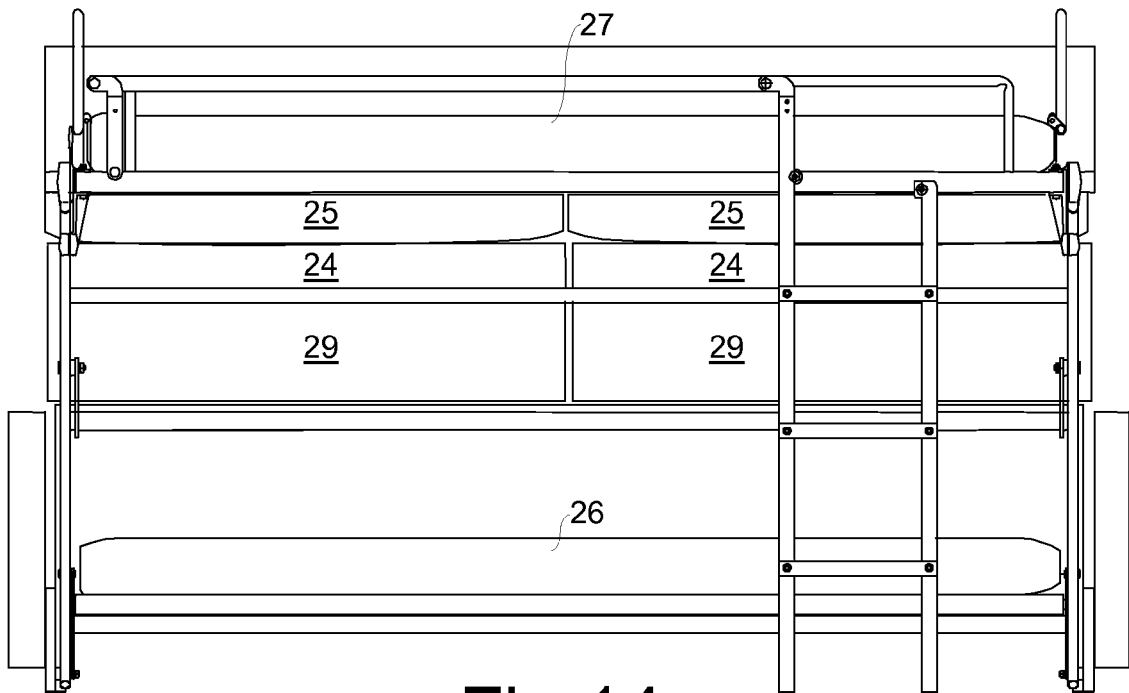


Fig.14



EUROPEAN SEARCH REPORT

Application Number
EP 09 15 7929

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	EP 1 169 948 A1 (SPIRALFLEX S N C DI PACCAGNELL [IT]) 9 January 2002 (2002-01-09) * paragraph [0008] - paragraph [0018]; figures 1-14 *	1-4,7, 15-16	
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X		1-4,7-8, 11,15-16	
A		5-6, 9-10, 12-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 August 2009	Examiner Klintebäck, Daniel
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 15 7929

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18-08-2009

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