



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**12.04.2023 Bulletin 2023/15**

(51) International Patent Classification (IPC):  
**A47C 17/48 (2006.01)**

(21) Application number: **22199739.8**

(52) Cooperative Patent Classification (CPC):  
**A47C 17/48**

(22) Date of filing: **05.10.2022**

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA**  
Designated Validation States:  
**KH MA MD TN**

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(30) Priority: **08.10.2021 IT 202100025772**

(54) **PULL DOWN BED**

(57) A pull down bed (1) comprising: a cabinet (2) which is provided with a bed compartment; a plate-shaped bed frame (3) which is adapted to support a mattress and is hinged on the cabinet (2) so that it can rotate between a raised position in which the bed frame (3) is substantially vertical and is lodged inside said bed compartment, and a lowered position in which the bed frame (3) is substantially horizontal, at least partially outside said bed compartment; a leg (18), which is hinged onto the bed frame (3), and a synchronization mechanism (20) which is structured so as to synchronize the rotation of the leg (18) between a first and a second operating position with the rotation of the bed frame (3) between the lowered position and said raised position, respectively. In the first operating position, the leg (18) extends cantilevered below the lying plane of the bed frame (3) so as to be arranged resting on the ground (S), and in the second operating position, the leg (18) protrudes cantilevered from the bed frame (3) so as to be transverse to the lying plane of the bed frame (3) so as to be housed inside the bed compartment.

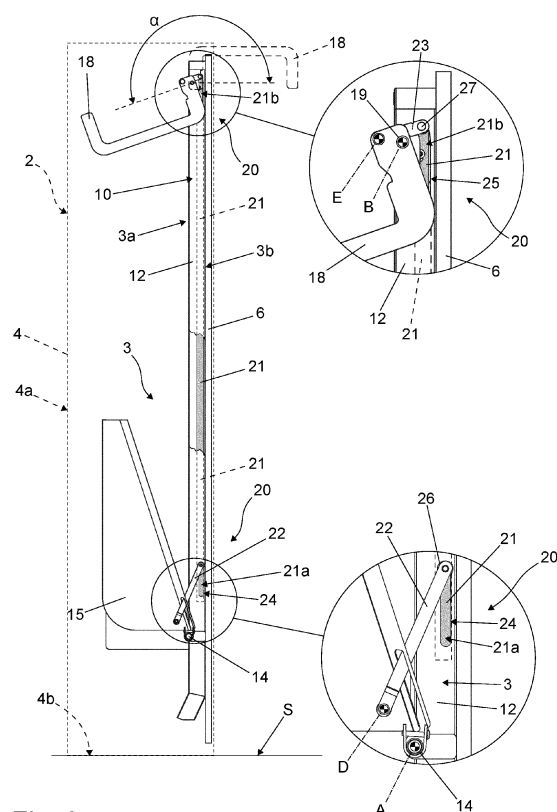


Fig. 3

## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims priority from Italian Patent application No. 102021000025772 filed on October 8, 2021.

### TECHNICAL FIELD

**[0002]** The present invention concerns a pull down bed.

**[0003]** More in detail, the present invention relates to a pull down bed comprising a reclining bed frame, ground resting legs and a synchronization mechanism that is adapted to synchronize the rotation of the legs with the rotation of the bed frame.

### BACKGROUND ART

**[0004]** As is known, pull down beds are items of furniture consisting of a cabinet that contains in the inside a reclining support bed frame that is adapted to support a mattress.

**[0005]** More in detail, the bed frame of the pull down bed is generally hinged to the cabinet by a side, so as to rotate between a closed position wherein the bed frame is arranged vertically and is entirely lodged inside the cabinet, thus freeing the space otherwise used for other potential uses, and an open position wherein the bed frame is arranged horizontally at a predetermined height from the ground, to be used as a bed.

**[0006]** The cabinet, in particular, is generally shaped like a rectangular parallelepiped and is sized so as to entirely house the bed frame and one or more mattresses inside.

**[0007]** In addition, the cabinet is equipped with a rectangular-shaped front access opening, and the bed frame can be moved, between the open position and the closed position, at the front opening.

**[0008]** Generally, the bed frame is also provided with a pair of ground resting side legs, which are hinged onto the bed frame, and, in their open position, support the weight of the bed. The ground resting legs, in particular, consist of a metal plate that is oblong and rectangular in shape and are hinged on the two opposite sides of the bed frame, on opposite sides of the vertical midplane of the bed frame.

**[0009]** More in detail, the ground resting legs are hinged to the bed frame so as to rotate between an extracted position in which they are arranged coplanar and against one side of the bed frame, and a retracted position, in which they are arranged orthogonal to the lying plane of the bed frame, with their free end resting on the ground.

**[0010]** In addition, the pull down bed usually also comprises a plate-shaped panel, which is fixed to the lower face of the bed frame and is intended to form the front

door of the cabinet when the bed frame is arranged in the closed position.

**[0011]** More in detail, the panel has a shape that is complementary to that of the front opening, and is sized so as to close the front opening of the cabinet when the bed frame is arranged in the closed position, so as to conceal the bed frame inside the cabinet.

**[0012]** In addition, to enable the legs to rotate freely between the extracted position and the retracted position, the panel is provided with two side undercuts, which are realized on two opposite side edges of the panel, immediately below the legs, and are sized so as not to hinder the rotation of the legs between the extracted and the retracted positions.

**[0013]** Unfortunately, the side undercuts negatively impact the exterior appearance of the cabinet, since they interrupt the continuity and uniformity of the cabinet's front door. The side undercuts, in addition, always leave the legs visible, even when the bed frame is in the closed position inside the cabinet.

**[0014]** In addition, the side undercuts allow mites, dust, and other foreign particles suspended in the air to easily penetrate the cabinet when the bed frame is arranged in the closed position, with all the problems that this entails.

### SUMMARY OF THE INVENTION

**[0015]** Aim of the present invention is, thus, to provide a pull down bed that is able to overcome the drawbacks described above.

**[0016]** In accordance with the above indicated aims, according to the present invention, a pull down bed is realized as defined in claim 1 and, preferably, but not necessarily, in any of the claims thereby dependent.

**[0017]** Preferably, according to the present invention, the pull down bed comprises: a cabinet which is provided with a bed compartment; a plate-shaped bed frame which is adapted to support a mattress and is hinged on the cabinet so that it can rotate about a first axis, between a raised position in which the bed frame is substantially vertical and is lodged inside the bed compartment, and a lowered position in which the bed frame is substantially horizontal, at least partially outside the bed compartment; at least one ground resting leg, which is hinged to the bed frame so that it can rotate about a second axis between a first operating position, in which the leg extends cantilevered below the lying plane of the bed-frame, so as to be arranged resting on the ground, and a second operating position, in which the leg extends cantilevered from the bed-frame so as to be transverse to the lying plane of the bed-frame so as to be lodged inside the bed compartment; and a synchronization mechanism, which is interposed between the cabinet and the leg, and is adapted to synchronize the rotation of the leg between the first and second operating position with the rotation of the bed frame between the lowered position and the raised position, and vice versa; the synchronization mechanism comprises: a control rod which is coupled in

an axially slidable manner to the bed frame, so as to be able to slide back and forth along a side of the bed frame; a first swinging arm which is interposed between the cabinet and the control rod; and a second swinging arm which is interposed between the leg and the control rod; said control rod being adapted to synchronize the movement of the second swinging arm with the movement of the first swinging arm, so as to synchronize the rotation of the bed frame between the lowered position and the raised position with the rotation of the leg between said first and said second operating positions, respectively.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0018]** The present invention will now be described with reference to the attached drawings that illustrate a nonlimiting embodiment thereof, in which:

- Figure 1 is a perspective view of a pull down bed produced according to the teachings of the present invention, in the open configuration with parts removed for clarity;
- Figure 2 is a perspective view of the pull down bed illustrated in Figure 1, in the closed configuration with parts removed for clarity;
- Figure 3 is a raised side view of the pull down bed illustrated in Figure 1, in the closed configuration, with parts in cross-section and parts removed for clarity;
- Figures 4 and 5 are two raised side views of the pull down bed illustrated in Figure 1, in two corresponding intermediate angular positions located between the open and the closed configuration, with parts in cross-section and parts removed for clarity;
- Figure 6 is a raised side view of the pull down bed illustrated in Figure 1, in the open configuration, with parts in cross-section and parts removed for clarity;
- Figure 7 is a raised side view, on an enlarged scale, of a part of the pull down bed illustrated in Figure 1, in the closed configuration, with parts in cross-section and parts removed for clarity; while
- Figure 8 is a perspective view, on an enlarged scale, of a part of the pull down bed illustrated in Figure 1, in the open configuration, with parts in cross-section and parts removed for clarity.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0019]** With reference to Figures 1 and 2, reference number 1 denotes, as a whole, a pull down bed, preferably of the retractable kind.

**[0020]** In the first place, the pull down bed 1 comprises: a cabinet 2; and a bed frame 3, which is hinged to cabinet 2, so as to rotate about a rotation axis A that is substantially horizontal, so as to be arranged, alternatively, in an open configuration (Figures 1 and 6) or in a closed configuration (Figures 2 and 3). In the open configuration,

bed frame 3 is arranged, almost in its entirety, outside cabinet 2, in a lowered position in which it is substantially horizontal, at a predetermined height from a resting plane or ground S, so as to be able to perform the function of a bed. In the closed configuration, on the other hand, bed frame 3 is arranged in a raised position, in which it is substantially vertical and is preferably wholly lodged/contained/housed inside cabinet 2.

**[0021]** With reference to Figures 1 and 2, cabinet 2 comprises a bed compartment that is preferably sized so as to house/receive bed frame 3 and, optionally, one or more mattresses (not illustrated) resting above it when bed frame 3 is in the raised position.

**[0022]** More in detail, the cabinet 2 preferably comprises a large box-shaped casing 4, which has a rigid, self-supporting structure and is preferably sized so as to entirely house/receive bed frame 3 and the mattresses inside when bed frame 3 is in the closed configuration.

**[0023]** Preferably, box-shaped casing 4 is substantially rectangular parallelepiped-shaped.

**[0024]** In addition, cabinet 2, or, better, box-shaped casing 4, is equipped with a front access opening 5, which is preferably substantially rectangular in shape. Bed frame 3 can be moved, between the raised position and the lowered position, at the access opening 5. Preferably, the shape of access opening 5 approximates the shape of bed frame 3 by excess.

**[0025]** In addition, rear wall 4a of box-shaped casing 4 is preferably structured to be permanently anchored to a generic wall. Lower wall 4b of the box-shaped casing 4, in contrast, is preferably structured to be stably resting on and also, optionally, firmly anchored to the ground S.

**[0026]** With reference to Figures 1 and 3-6, bed frame 3, in contrast, preferably has a plate-shaped structure and/or a substantially rectangular shape.

**[0027]** More in detail, bed frame 3 preferably comprises an upper face 3a on which, in use, the mattresses are arranged. Bed frame 3, in addition, preferably comprises a lower face 3b, parallel and opposite to upper face 3a, which is substantially parallel and facing the ground S when bed frame 3 is in the open configuration.

**[0028]** With reference to Figures 1 and 2, in addition, pull down bed 1 is preferably provided with a plate-shaped panel 6, which is firmly fixed to the lower face 3b of the bed frame 3 and is adapted to form the front door 7 of cabinet 2 when bed frame 3 is in the closed position.

**[0029]** More in detail, plate-shaped panel 6 preferably has a complementary shape to that of access opening 5. In other words, panel 6 is preferably substantially rectangular in shape.

**[0030]** Preferably, the shape of panel 6 approximates the shape of bed frame 3 by excess, so as to completely conceal bed frame 3 inside cabinet 2 when bed frame 3 is in the closed configuration.

**[0031]** With reference to the example illustrated in Figure 2, in particular, panel 6 is preferably sized so as to approximate the shape of the access opening 5 by default, so as to delimit, with cabinet 2, a thin perimeter slit

8 when bed frame 3 is in the closed configuration.

**[0032]** The perimeter slit 8, in particular, preferably surrounds, substantially without interruptions, the whole panel 6. The perimeter slit 8, in addition, has a width that is preferably less than approximately 15 mm.

**[0033]** With reference to the example illustrated in Figure 1, bed frame 3 is preferably made of metal and is preferably sized so as to support one or more mattresses (not illustrated) placed one aside the other.

**[0034]** More in detail, bed frame 3 preferably comprises: a perimeter frame 10 that is substantially rigid and preferably of substantially rectangular in shape, which extends along a longitudinal axis C; and a plate-shaped support structure 11, which is lodged/accommodated within the perimeter frame 10 and is permanently connected to the perimeter frame 10, so as to form the resting base of the mattresses.

**[0035]** Preferably, perimeter frame 10 comprises at least two straight side members 12, which are parallel and facing each other, on opposite sides of the longitudinal axis C; and preferably a series of connecting cross members, which extend astride the two side members 12, rigidly connecting them to each other.

**[0036]** With reference to the example illustrated, in particular, side members 12 are straight section bars that are preferably made of metal and preferably with a tubular structure. Preferably, side members 12 have tubular profiles with a square cross-section.

**[0037]** It remains understood that the side members 12 could have an open cross-section, such as, for example, a C- or I-shaped cross-section, or the like.

**[0038]** The support structure 11, on the other hand, preferably comprises multiple slats 13 arranged in a known way.

**[0039]** With reference to Figure 1, bed frame 3 is preferably hinged by a side on the opposite side walls or vertical shoulders 4c of cabinet 2.

**[0040]** In the example illustrated, in particular, bed frame 3 is preferably provided with two pins 14, which extend cantilevered on opposite sides of bed frame 3, or better of frame 10, coaxial to the rotation axis A, and are jointed to the side walls 4b of cabinet 2.

**[0041]** More in detail, cabinet 2 is preferably equipped with two anchoring plates 15, which are adapted to be firmly fixed to the side walls 4c of cabinet 2, and the pins 14 are preferably engaged, in a freely rotatable manner, on the anchoring plates 15.

**[0042]** With reference to Figures 1 and 3-8, in addition, pull down bed 1 comprises at least one leg, and more conveniently a pair of rigid and oblong ground resting legs 18, each of which is hinged/jointed to bed frame 3, so as to rotate about a rotation axis B that is substantially horizontal, between a first operating position (Figures 1, 6, and 8) and a second operating position (Figure 3).

**[0043]** In addition, pull down bed 1 also comprises at least one synchronization mechanism 20, which is interposed between cabinet 2, or, better, anchoring plate 15, and leg 18, and is adapted to synchronize the rotation of

leg 18 between the first and the second operating position with the rotation of bed frame 3 between the lowered position and the raised position, and vice versa.

**[0044]** More in detail, synchronization mechanism 20 is adapted to arrange the leg 18 in the first operating position when bed frame 3 is in the lowered position; and in the second operating position when bed frame 3 is in the raised position.

**[0045]** In the first operating position, the leg 18 extends cantilevered from the bed frame 3, below and transverse to the lying plane of the bed frame 3 and/or the panel 6, so as to be arranged resting on the ground S. In other words, in the first operating position, the leg 18 extends cantilevered below the lower face 3b of the bed frame 3. Preferably, in the first operating position, leg 18 is substantially orthogonal to the lying plane of bed frame 3 and/or to panel 6.

**[0046]** In addition, in the first operating position, leg 18 is preferably arranged at least partially in front of the distal edge 6a of the panel 6, i.e. to the panel 6 edge farthest from the rotation axis A.

**[0047]** In the second operating position, on the other hand, leg 18 extends cantilevered from bed frame 3 so as to be transverse to the lying plane of bed frame 3 and/or to the panel 6, so as to be housed inside the bed compartment. More in detail, in the second operating position, the leg 18 is preferably wholly lodged/housed/contained inside the cabinet 2, and is hidden/covered by the panel 6.

**[0048]** In addition, in the second operating position, leg 18 is preferably rotated above the lying plane of the bed frame 3 and/or the panel 6. More in detail, in the second operating position, the leg 18 is preferably rotated above the upper face 3a of the bed frame 3, beside the mattresses.

**[0049]** In other words, in the first operating position, the leg 18 preferably projects cantilevered on one side of the lying plane of the bed frame 3, or, better, of the panel 6. In the second operating position, on the other hand, the leg 18 preferably projects cantilevered on the opposite side of the lying plane of the bed frame 3, or, better, of the panel 6.

**[0050]** With reference to the example illustrated, in addition, the leg 18 is preferably jointed on one side of the bed-frame 3, or better on a side member 12, so as to rotate about the rotation axis B preferably remaining on one plane locally, substantially parallel to the vertical mid-plane of pull down bed 1 and/or substantially orthogonal to the rotation axis A of bed-frame 3. Preferably, the rotation axis B of the leg is also substantially parallel to the rotation axis A of the bed-frame.

**[0051]** In addition, the leg 18 is preferably hinged to the distal portion of the bed frame 3, or, better, to the distal end of the side member 12.

**[0052]** With reference to Figures 1 and 3-7, in addition, the leg 18 preferably has a substantially plate-shaped structure, and is preferably hinged to the bed frame 3 via a pin 19 that is coaxial to the rotation axis B.

**[0053]** More in detail, the leg 18 is preferably substantially U-shaped (or C-shaped or horse shoe-shaped), and is preferably made of metal.

**[0054]** It is understood that the leg 18 could also be substantially L-shaped.

**[0055]** In other words, the leg 18 is preferably shaped so as to be arranged, in the first operating position, at least partially in front of the distal edge 6a of the panel 6, or at the edge of the panel 6 furthest from the rotation axis A.

**[0056]** With reference to the example illustrated in Figure 3, in contrast, synchronization mechanism 20 is structured so as to rotate leg 18, between the first and the second operating positions, by an angle  $\alpha$ , which is preferably greater than  $150^\circ$ , and, more conveniently, equal to approximately  $200^\circ$ .

**[0057]** With reference to Figures 3 to 6, in particular, the synchronization mechanism 20 preferably comprises: a rigid and oblong control strut or rod 21, which is slidably coupled to the bed frame 3, so as to be able to slide back and forth along one side of the bed frame 3; a driving swinging arm 22 which is interposed between the cabinet 2, or, better, the anchoring plate 15, and the control rod 21; and a driven swinging/tilting arm 23, which is interposed between the leg 18 and the control rod 21.

**[0058]** Preferably, control rod 21 is adapted to synchronize the movement of the driven swinging arm 23 with the movement of the driving swinging arm 22, so as to synchronize the rotation of the bed frame 3 between the lowered position and the raised position with the rotation of the leg 18 between the first and second operating positions.

**[0059]** With reference to the example illustrated, in particular, driving swinging arm 22 preferably has the proximal end jointed/hinged to the cabinet 2, or, better, to the anchoring plate 15, in a position eccentric to the rotation axis A, so as to be able to rotate/swing about a rotation axis D locally, substantially parallel to the rotation axis A of the bed frame 3.

**[0060]** More in detail, driving swinging arm 22 is preferably jointed to the cabinet 2, or, better, to the anchoring plate 15, so as to rotate/swing about the axis D, remaining on one plane locally, substantially parallel to the vertical midplane of the pull down bed 1 and/or substantially orthogonal to the rotation axis A of the bed-frame.

**[0061]** In addition, the driving swinging arm 22 preferably has the distal end jointed/hinged to the proximal end 21a of the control rod 21.

**[0062]** The distal end of the driving swinging arm 22, in addition, is preferably coupled slidably to one side of the bed frame 3.

**[0063]** Driven swinging arm 23, in contrast, preferably has the proximal end hinged/jointed to the leg 18, in a position eccentric to the rotation axis B of the leg, so as to rotate/swing about a rotation axis E locally, substantially parallel to the rotation axis B of the leg.

**[0064]** More in detail, driven swinging arm 23 is preferably jointed to the leg 18 so as to rotate/swing about

the axis E, remaining on one plane locally, substantially parallel to the vertical midplane of the pull down bed 1 and/or substantially orthogonal to the rotation axis B of the leg.

**[0065]** In addition, driven swinging arm 23 preferably has the distal end jointed/hinged to the distal end 21b of the control rod 21.

**[0066]** Distal end of the driven swinging arm 23, in addition, is preferably coupled slidably to one side of the bed frame 3.

**[0067]** With reference to Figures 3 to 6, in addition, bed frame 3 is preferably provided with a first guide member (or cam or track) 24 that is positioned on one side of the bed frame 3, preferably near the rotation axis A of bed frame 3. The proximal end 21a of control rod 21 is preferably coupled slidably to the guide member 24, with the possibility of moving forwards and backwards along the side of the bed frame 3 substantially in a rectilinear manner.

**[0068]** More in detail, guide member 24 is preferably formed on the side member 12, close to rotation axis A and/or to the proximal end of the same side member 12.

**[0069]** In addition, with reference to Figures 3 to 6, bed frame 3 is preferably provided with a second guide member (or cam or track) 25 that is located on one side of the bed frame 3, preferably near the rotation axis B of the leg 18.

**[0070]** The distal end 21b of the rod 21 is preferably coupled slidably to the guide member 25, with the possibility of moving forwards and backwards along the side of the bed frame 3 substantially in a rectilinear manner.

**[0071]** More in detail, the guide member 25 is preferably formed on the side member 12, close to the rotation axis B and/or the distal end of the same side member 12.

**[0072]** In the example illustrated, in particular, the guide member 24 preferably comprises a first oblong-shaped through-slot or groove, which is formed on side member 12.

**[0073]** Similarly, the guide member 25 preferably comprises a second through-slot or oblong-shaped groove, which is formed on the side member 12.

**[0074]** With reference to Figures 3 to 6, in addition, guide member 24 preferably comprises a first cam-follower pin 26, which is inserted in a slidable manner inside the first through slot, and connects in a rotatable manner the distal end of the driving swinging arm 22 to the proximal end 21a of the control rod 21. Guide member 25, on the other hand, preferably comprises a second cam follower pin 27, which is inserted in a slidable manner inside the second through slot, and connects in a rotatable manner the distal end of the driven swinging arm 23 to the distal end 21a of the control rod 21.

**[0075]** With reference to the example illustrated in Figures 3 to 8, control rod 21 is preferably inserted in a slidable manner and with clearance inside one side of the bed frame 3, or inside a side member 12.

**[0076]** Driving swinging arm 22 and driven swinging arm 23, on the other hand, are preferably arranged out-

side the bed frame 3, or, better, outside the side member 12.

**[0077]** In addition, cam follower pin 26 is preferably engaged in the first through slot so as to project cantilevered on opposite sides of the same. Cam follower pin 26, in addition, preferably has its ends jointed, on one side, on the proximal end 21a of the control rod 21, and, on the other side, on the distal end of the driving swinging arm 22.

**[0078]** Cam follower pin 27, on the other hand, is preferably engaged in the second through slot so as to project cantilevered on opposite sides of the same. Cam follower pin 27, in addition, preferably has its ends jointed, on one side, on the distal end 21b of the control rod 21, and, on the other side, on the distal end of the driven swinging arm 23.

**[0079]** With reference to the example illustrated in Figure 7, in addition, the distal end of the second through slot is preferably at least partially bent/curved/arched upwards.

**[0080]** More in detail, the second slot is preferably divided longitudinally into a proximal segment/section that is substantially rectilinear and a distal segment/section that is bent/curved/arched upwards.

**[0081]** With reference to the example illustrated, in Figures 3 and 7, when the bed frame 3 is approximately in the raised position, the arched section of guide member 25 forces the distal end 21a of control rod 21 and the driven swinging arm 23 to make an arched movement towards the upper surface 3a of the bed frame 3.

**[0082]** This arched movement conveniently accelerates the rotation of leg 18 towards the second operating position (Figure 3) and has the technical effect of avoiding the free end of the leg 18 from impacting the cabinet 2, or, better, the upper wall of the casing 4, when the bed frame 3 is approximately in the raised position.

**[0083]** With reference to Figure 7, in addition, the driven swinging arm 23 is preferably also equipped with a throat or undercut 23a, which has a complementary shape to the shape of the pin 19 of the leg, and is adapted to abut against the same pin 19 when the bed frame 3 is in the raised position.

**[0084]** More in detail, the undercut 23a is preferably shaped and sized so as to conveniently increase the width of the arch that the driven swinging arm 23 traces about the rotation axis E, and has the technical effect of allowing the leg 18 to reach the second operating position.

**[0085]** With reference to Figure 8, in addition, the control rod 21 preferably has an adjustable structure in length.

**[0086]** In other words, the control rod 21 preferably has a telescopic structure that can be adjusted in length.

**[0087]** More in detail, the control rod 21 is preferably divided longitudinally into at least two segments 28 and 29, which are coupled together in an axially slidable manner and can be selectively locked together, for example using screws and/or other similar anchoring members.

**[0088]** By varying the overall length of the control rod 21, in particular, it is possible to adjust the synchronism between the rotation of the leg 18 and the rotation of the bed frame 3. More in detail, by adjusting/regulating the overall length of the control rod 21, it is possible to adjust the inclination that the leg 18 assumes in relation to the bed frame 3 when the latter is in the open configuration.

**[0089]** The adjustment of the length of the rod 18, therefore, makes it possible to compensate for any manufacturing tolerances and/or coupling clearances of the synchronization mechanism 20, so as to arrange the leg 19 perfectly orthogonal to the bed frame 3, i.e. perfectly vertical, when the bed frame 3 is in the open configuration.

**[0090]** Finally, it is understood that, in a simpler embodiment, control rod 21 could also be a rigid, monolithic body of a predetermined length.

**[0091]** With reference to Figures 3 to 6, the operation of the leg synchronization mechanism 20 will now be described, imagining starting from the closed configuration of the bed frame 3 (Figure 3).

**[0092]** With reference to Figure 3, in the closed configuration, the control rod 21 is arranged in a completely forward position along the first and second through slot, i.e. at the maximum distance from the axis A.

**[0093]** More in detail, in the closed configuration, cam follower pins 26 and 27 are preferably positioned substantially against and/or abutting the distal ends of the corresponding through slots.

**[0094]** In the closed configuration, in addition, the driven swinging arm 23 is preferably rotated in a position substantially transverse to the lying plane of the bed frame 3, and locks/keeps the leg 18 in the second operating position.

**[0095]** With reference to Figures 4 and 5, during the rotation of the bed frame 3 from the raised position to the lowered position, synchronization mechanism 20 rotates the leg 18 about the axis B in the direction W, from the second to the first operating position.

**[0096]** More in detail, during the rotation of the bed frame 3 from the raised position towards the lowered position, driving swinging arm 22 rotates about the rotation axis D. At the same time, distal end of the driving swinging arm 22 translates along the first through slot towards the rotation axis A.

**[0097]** As a result, driving swinging arm 22 pulls/draws the control rod 21 towards the rotation axis A, which translates along the through slots towards the rotation axis A. Control rod 21, in turn, determines the translation of the distal end of the driven swinging arm 23 along the second slot towards the axis A.

**[0098]** Driven swinging arm 23, therefore, rotates in relation to the rotation axis E, dragged by the control rod 21, and swings about the pin 19, determining the rotation of leg 18 about its axis B.

**[0099]** Finally, with reference to Figure 6, when the bed frame 3 reaches the open configuration, the control rod 21 is arranged in a completely retracted position along

the two through slots, i.e. at the minimum distance from the rotation axis A.

**[0100]** More in detail, in the open configuration, cam follower pins 26 and 27 are preferably positioned substantially against and/or abutting the proximal ends of the corresponding through slots.

**[0101]** In the open configuration, in addition, driven swinging arm 23 is preferably arranged substantially coplanar to the lying plane of the bed frame 3, locking/keeping the leg 18 in the first operating position.

**[0102]** The advantages deriving from the particular structure of the synchronization mechanism 20 are considerable and apparent.

**[0103]** In the first place, the translation of the control rod 21 along the side of the bed frame 3 makes it possible to rotate, between the first and the second operating position, the leg 18 by a wide angle, which is greater by at least 150°. In this way, it is possible to rotate the leg 18 above the panel 6, and to arrange it in the second operating position, in which the leg is positioned in front of the distal edge 6a of the panel 6.

**[0104]** The panel 6, thus, can be free of side undercuts and may be shaped to completely cover the legs 18 and the bed frame 3 in the closed configuration, so as to close the front opening 5 of the cabinet 2 and to hinder mites, dust, and other foreign particles suspended in the air from penetrating the cabinet 2 when the bed frame 3 is in the closed configuration.

**[0105]** In addition, the absence of the side undercuts significantly improves the aesthetic look of the pull down bed 1 when the bed frame 3 is in the closed position, since the panel 6 delimits, with the cabinet, a slit of a substantially uniform width along the whole perimeter of the panel 6 and conceals the legs 18 inside the cabinet 2.

**[0106]** Finally, since the control rod 21 is concealed inside the bed frame 3, the synchronization mechanism 20 is almost wholly hidden from view, even when the bed frame 3 is in the open configuration, with all the benefits in terms of exterior look that result from this.

**[0107]** Finally, it is clear that the pull down bed 1 described above may be altered, or variations may be produced thereof, without, as a result, departing from the scope of the present invention.

## Claims

### 1. A pull down bed (1) comprising:

a cabinet (2), which is provided with a bed compartment,  
a plate-shaped bed frame (3), which is adapted to support a mattress and is hinged on the cabinet (2) so that it can rotate about a first axis (A), between a raised position in which the bed frame (3) is substantially vertical and is lodged inside said bed compartment, and a lowered position in which the bed frame (3) is substantially hori-

zontal, at least partially outside said bed compartment,

at least one leg (18), which is hinged onto the bed frame (3) so that it can rotate about a second axis (B), and

a synchronization mechanism (20) which is structured so as to synchronize the rotation of the leg (18) between a first operating position and a second operating position with the rotation of the bed frame (3) between said lowered position and said raised position, respectively, in said first operating position, said leg (18) extends cantilevered below the lying plane of the bed frame (3) so as to be arranged resting on the ground (S),

in said second operating position, said leg (18) protrudes cantilevered from the bed frame (3) so as to be transverse to the lying plane of the bed frame (3) so as to thus be lodged/contained inside the bed compartment.

2. The pull down bed according to Claim 1, wherein said synchronization mechanism (20) comprises: a control rod (21), which is coupled in axially slidable manner to the bed frame (3), so as to be able to slide back and forth along a side of the bed frame (3); a first swinging arm (22), which is interposed between the cabinet (2) and the control rod (21); and a second swinging arm (23), which is interposed between the leg (18) and the control rod (21); said control rod (21) being adapted to synchronize the movement of the second swinging arm (23) with the movement of the first swinging arm (22), so as to synchronize the rotation of the bed frame (3) between the lowered position and the raised position with the rotation of the leg (18) between said first and said second operating positions.
3. The pull down bed according to Claim 2, wherein the first swinging arm (22) has a first end pivotally jointed to the cabinet (2), in a position eccentric to the first axis (A), so as to be able to rotate/swing about a third axis (D) locally substantially parallel to said first axis (A).
4. The pull down bed according to Claim 3, wherein the first swinging arm (22) has a second end, opposite to the first, pivotally jointed to the proximal end (21a) of said control rod (21).
5. The pull down bed according to Claim 2, 3 or 4, wherein the second swinging arm (23) has a first end pivotally jointed to the leg (18), in a position eccentric to the second axis (B), so as to be able to rotate/swing about a fourth axis (E) locally substantially parallel to said second axis (B).
6. The pull down bed according to Claim 5, wherein the

second swinging arm (23) has a second end, opposite the first, pivotally jointed to the distal end (21b) of said control rod (21).

7. The pull down bed according to any one of the claims from 2 to 6, wherein the proximal end (21a) of said control rod (21) is coupled in slidable manner to a first guide member (24), which is located on the side of the bed frame (3), close to the first axis (A), and allows the proximal end (21a) of said control rod (21) to move back and forth substantially in a rectilinear manner, and/or the distal end (21b) of said control rod (21) is coupled in slidable manner to a second guide member (24) which is located on the side of the bed frame (3), close to the second axis (B), and allows the distal end (21a) of said control rod (21) to move back and forth substantially in a rectilinear manner. 5  
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8. The pull down bed according to any one of the claims from 2 to 6, wherein said side comprises a substantially straight side member (12), and said control rod (21) is inserted inside said side member (12) in axially slidable manner. 20  
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9. The pull down bed according to Claim 8, wherein the first guide member (24) comprises a first oblong-shaped through-slot or groove, which is realized on said side member (12) and/or the second guide member (25) comprises a second oblong-shaped through-slot or groove that is realized on said side member (12). 30
10. The pull down bed according to Claim 9, wherein the distal end of the second through slot is at least partially bent/curved upwards. 35
11. The pull down bed according to Claim 9 or 10, wherein the first guide member (24) also comprises a first pin (26) which is inserted in slidable manner inside said first through-slot or groove, and connects the second end of said first swinging arm (22) to the proximal end (21a) of said control rod (21); and/or the second guide member (25) comprises a second pin (27) which is inserted in slidable manner inside said second through-slot or groove, and connects the second end of said second swinging arm (23) to the distal end (21b) of said control rod (21). 40  
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12. The pull down bed according to any one of the claims from 2 to 11, wherein said control rod (21) has a structure adjustable in length. 50
13. The pull down bed according to any one of the preceding claims, wherein the leg (18) is substantially U- or C- or L-shaped. 55
14. The pull down bed according to any one of the pre-

ceding claims, comprising a plate-shaped panel (6) which is stably fixed below the bed frame (3), and is shaped so as to close said bed compartment when the bed frame (3) is in the raised position, so as to delimit, with said cabinet (2), a perimeter slit (8), which has a predetermined and substantially uniform thickness, and surrounds substantially without interruptions said plate-shaped panel (6), said plate-shaped panel (6) being adapted to conceal said bed frame (3) and said leg (18) inside said bed compartment when said bed frame (3) is in the raised position.



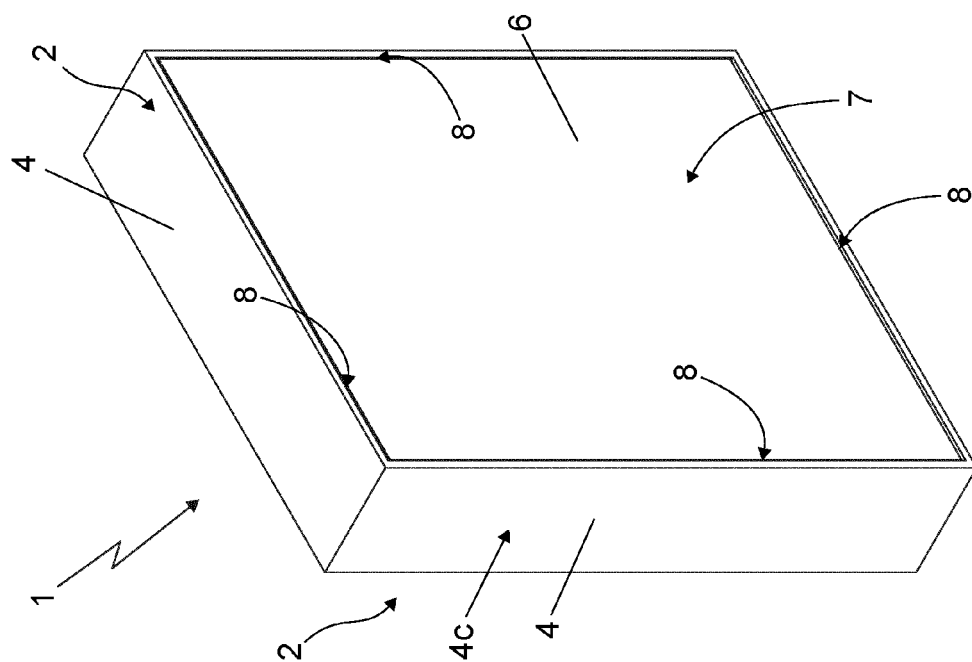


Fig. 2

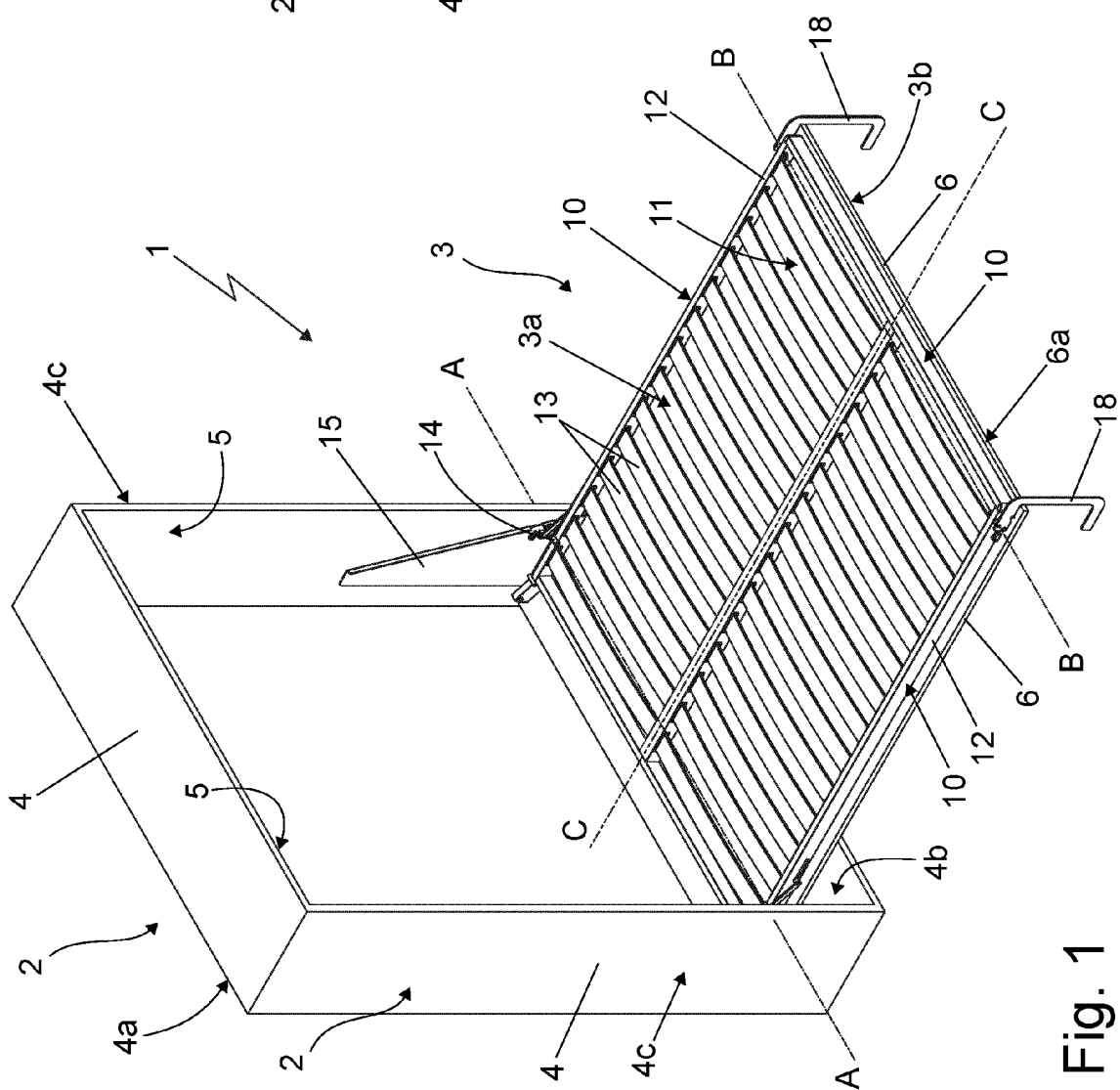


Fig. 1

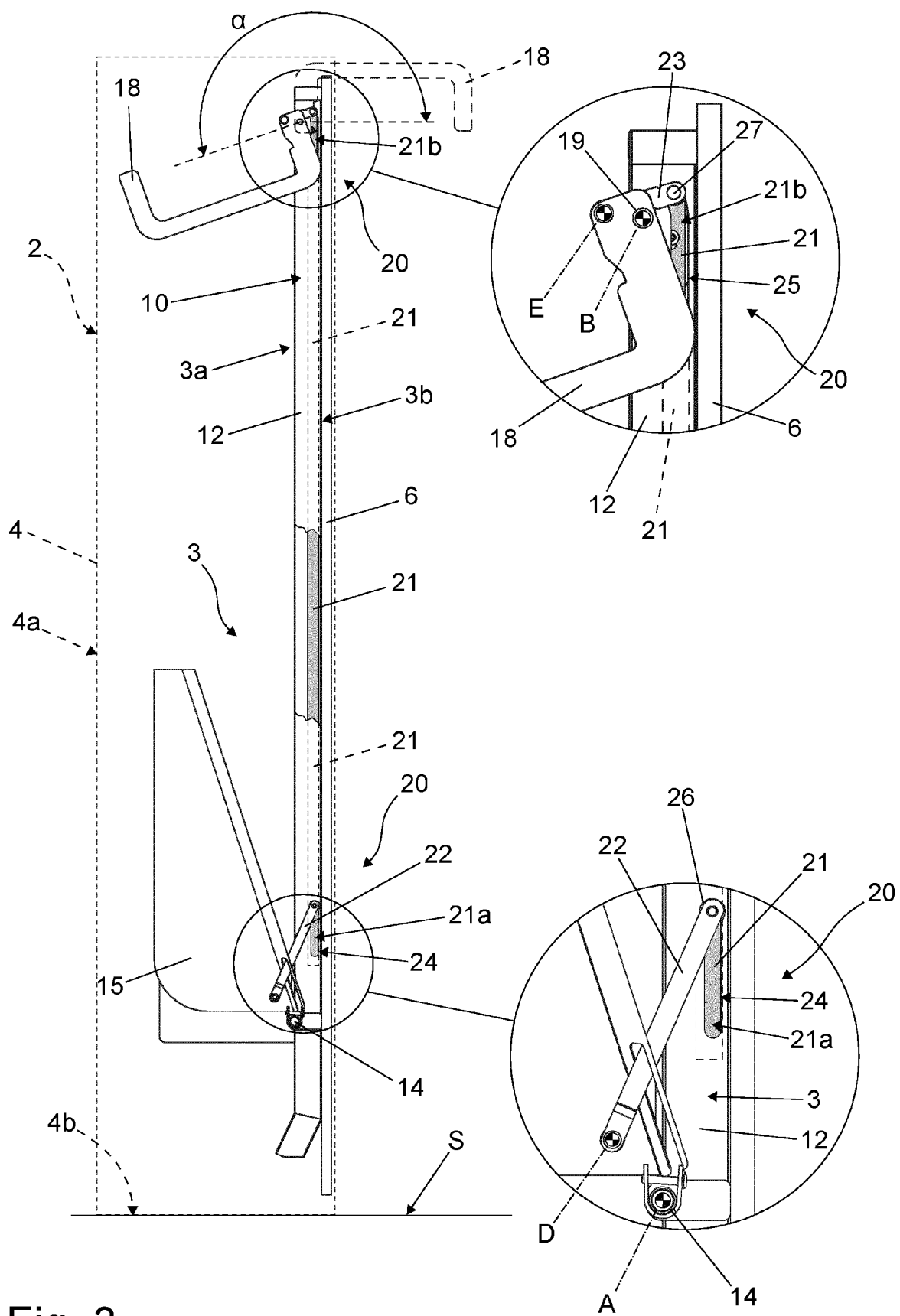


Fig. 3

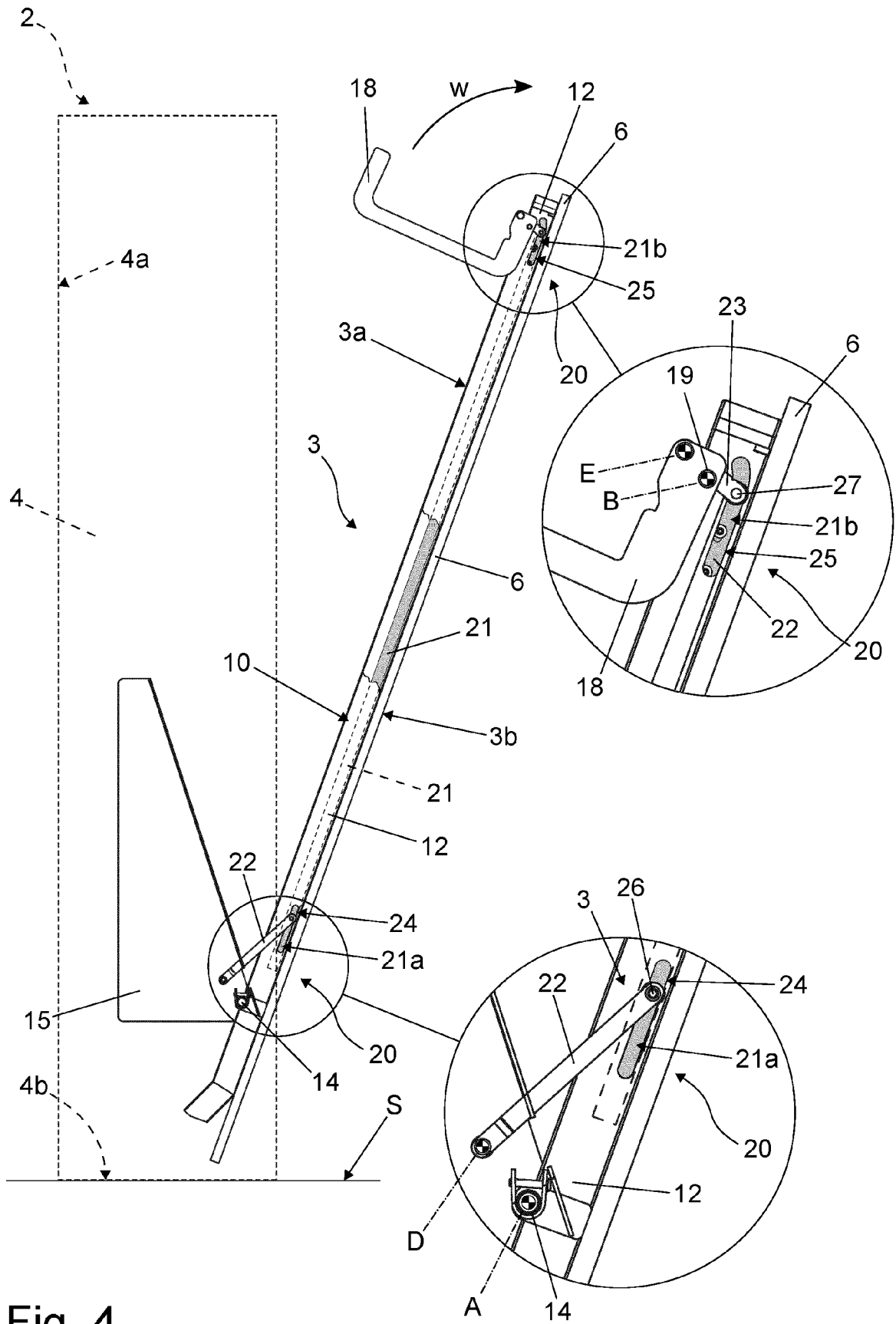


Fig. 4

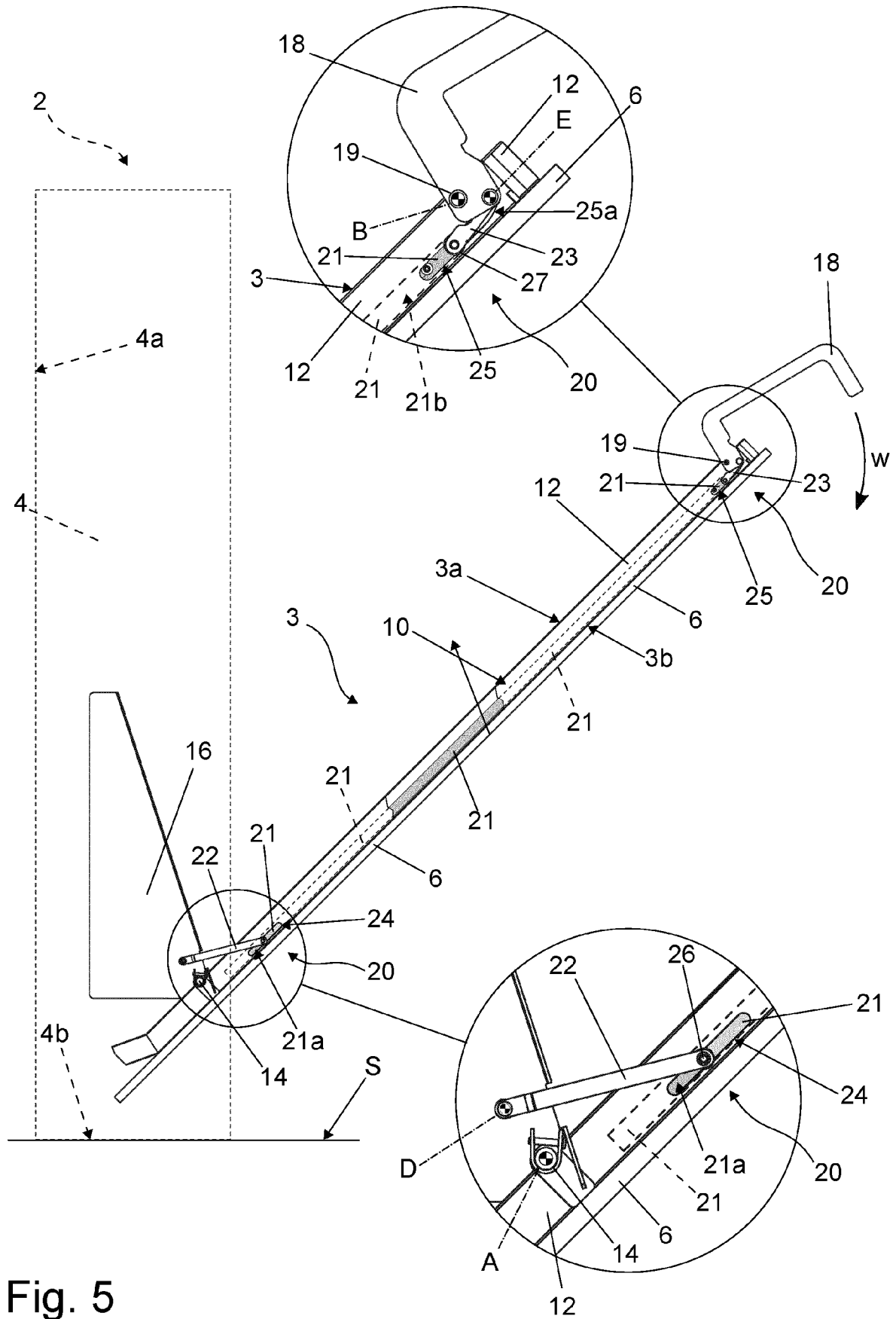


Fig. 5

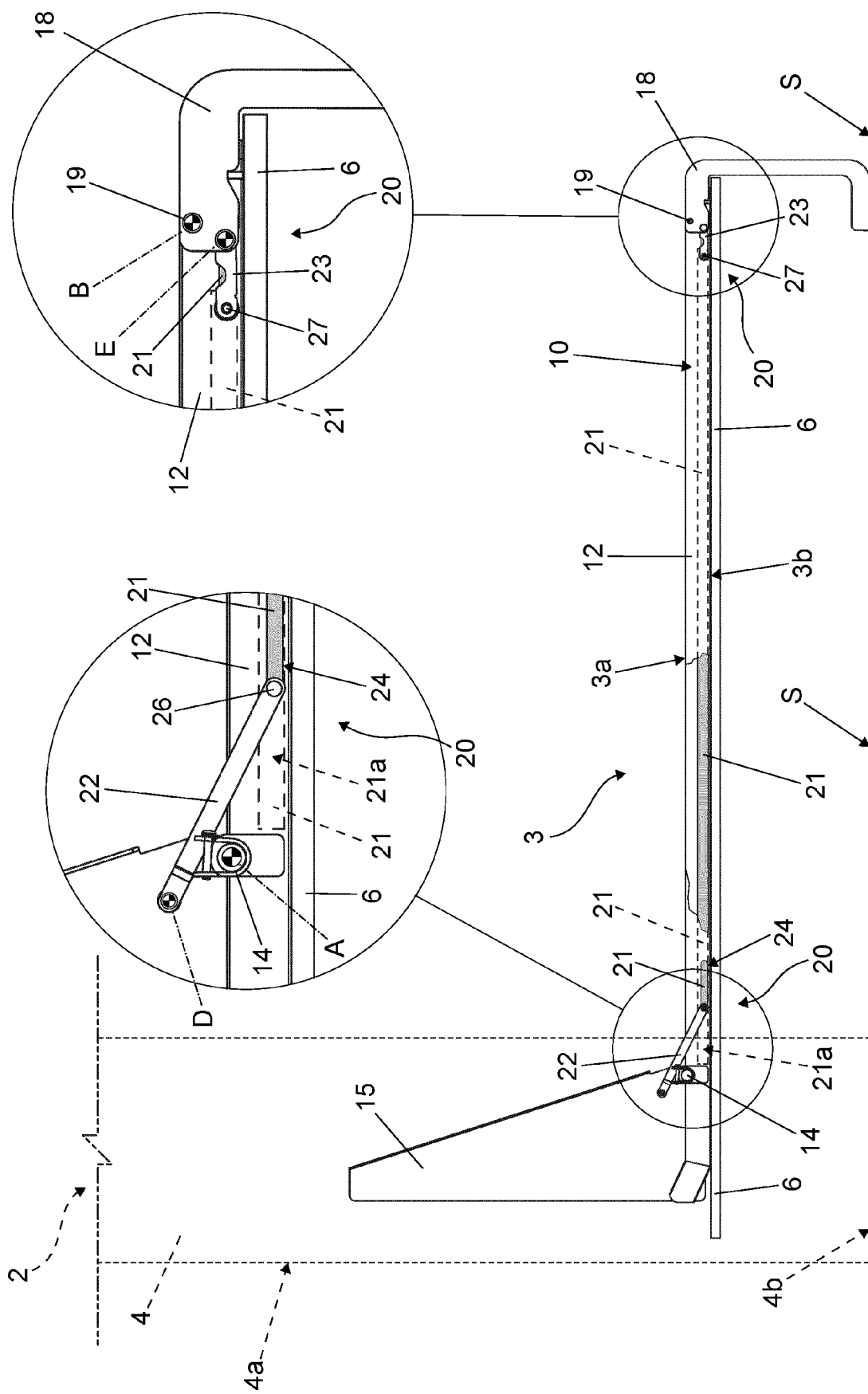


Fig. 6

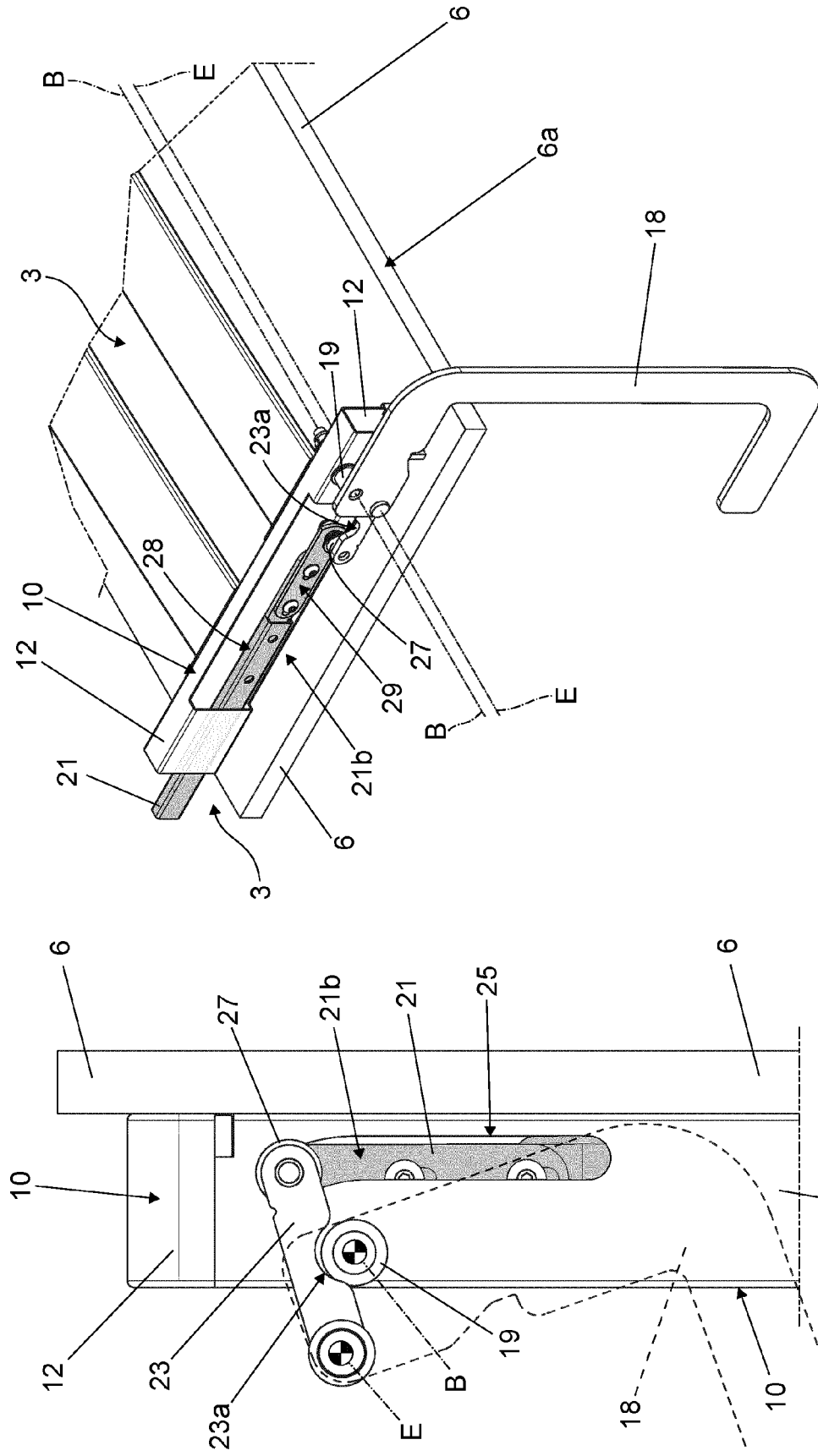


Fig. 7

Fig. 8



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Application Number

EP 22 19 9739

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The present search report has been drawn up for all claims

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Place of search

The Hague

Date of completion of the search

11 January 2023

Examiner

Linden, Stefan

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