LOCKING MECHANISM FOR FOLDABLE SOFA BED

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This invention relates generally to foldable sofa bed constructions, and more particularly to mechanisms for locking bed frame sections in folded relationship.

An object of the present invention is to provide an improved sofa bed having a foldable bed frame and locking means for releasably locking the frame in folded position.

Another object is to provide combination locking means for assuring the proper folding of the bed frame sections and for releasably securing the frame sections in that folded relationship.

Another object is to provide a bed frame adapted to be folded with a mattress thereon and having distinct, but cooperative, locking means one of which locks a pair of bed frame sections in folded position and the other of which locks the folded pair of bed frame sections to a third bed frame section during folding movement of the three sections into seat-forming position in the sofa frame.

These and other objects and advantages will become apparent hereinafter.

Briefly, the invention is embodied in a sofa bed including an articulated foldable bed frame having first and second sections adapted to be folded into substantially parallel seat-forming relationship, support means carried by one of the sections and adapted to extend in bracing position from the one section into contact with the other of the sections when the sections are in folded relationship, a folding lever for moving the support into bracing position relative to the one section, gravity locking means adapted to engage the folding lever to maintain the support in bracing position, and other locking means adapted to lock the support in contacting position on the other section during folding movement of the bed frame sections into seat-forming position in the sofa frame.

The invention also consists in the parts and in the combinations and arrangements of parts hereinafter described and claimed. In the accompanying drawings which form a portion of this specification and wherein like numerals refer to like parts wherever they occur:

Fig. 1 is a side elevational view of a sofa bed assembly embodying the present invention with the bed frame in unfolded position for use as a bed.

Fig. 2 is a fragmentary top plan view showing the unfolded sofa bed with the mattress removed.

Fig. 3 is a side elevational view showing in broken lines the bed frame members in the position of the first fold, and in full lines in a more advanced fold position of the bed frame members.

Fig. 4 is a view similar to that in Fig. 3, but showing the bed frame members in the position of the second full fold.

Fig. 5 is a view similar to that of Fig. 3, but showing the bed frame members when the bed is about fully folded within the sofa frame.

Fig. 6 is another view similar to that of Fig. 3 showing the bed frame members in fully folded position in the sofa frame, and

Fig. 7 is a fragmentary perspective view of the bed frame members in fully folded position.

Referring now to the drawings in detail, it will be seen that the present embodiment of the invention has been illustrated in connection with a sofa bed 10 having a sofa frame 11 and a bed frame 12, the latter being foldable into the former to provide a seat cushion support and being releasable therefrom to form a bed structure on which a mattress 13 is supported.

The sofa frame 11 includes a side or arm structure 14, a base structure 15 supported by legs 16, and a back structure 17. The base structure includes a front upholstery board 18 with which a movable upholstery board 19 mounted on the bed frame 12 is adapted to cooperate when the bed frame is folded into the sofa frame 11.

The foldable bed frame 12 includes a plurality of articulated frame sections 23, 24, 25 and 26 that are hingedly connected (Fig. 2) at their adjacent ends by pins 27, 28 and 29. The foot section 23 has side pieces interconnected by a transverse or cross bar 30 (Figs. 2 and 7), and the head section 26 also has side pieces connected by a cross bar 31. A suitable mattress supporting fabric 32 is mounted on the several frame sections by a plurality of springs 33.

Inasmuch as the structure for supporting and folding the bed frame 12 into the sofa frame 11 is identical on both sides of the frame, the following description will refer to only one side. A supporting leg 34 is provided for the bed frame 12 at the outer end of the foot or first section 23 and an intermediate supporting leg 35 is provided for the body or second section 25. These supporting legs 34 and 35 are pivotally connected to the frame sections 23 and 25, respectively, by pins 36 and 37, and means are provided for folding the legs when the bed frame 12 is folded into the sofa frame 11. The intermediate or third section 24 interconnects and is supported by the first and second sections 23 and 25, and the head or fourth section 26 is pivotally connected by an arm 38 to a brace 39 secured to the base structure 15 of the sofa frame 11.

As shown in Fig. 1, when the foldable bed frame 12 is in extended or bed forming position, the frame sections are horizontally coplanar and the sections 23 and 25 are supported by the legs 34 and 35, respectively. In folding the bed frame 12 into the sofa frame 11, the first section 23 is raised into vertical position (as shown in broken lines in Fig. 3) and folded over or pushed inwardly and downwardly into a horizontal position in spaced parallel relation with the second section 25 (Fig. 4). This latter folding section brings the third section 24 into a vertical position substantially perpendicular to both the first and second sections 23 and 25. The folded first, second and third sections are then rocked downwardly and inwardly (Figs. 5 and 6) into seat-forming position, the fourth section 26 pivoting into a vertical position adjacent to the back structure 17 of the sofa frame 11.

The linkage or lever means for controlling the folding of the bed frame 12 into the sofa frame 11 includes a bell crank 42 having a short leg 43 and a long leg 44, the bell crank 42 being pivotally connected to the second section 25 by a pin 45. The end of the short leg 43 is pivotally connected by a pin 46 to one end of a link 47, the other end of which is pivotally connected to the intermediate bed frame supporting leg 35 by a pin 48. The end of the long leg 44 of the bell crank 42 is pivotally connected by a link 49 to the sofa frame 11, and a lever bar 50 has one end pivotally connected to the long leg
44 inwardly of its end by a pin 51. The other end of the lever bar 50 is pivotally connected by a pin 52 to another brace 53 or the like secured to the base structure 15 of the sofa frame 11. The link 49 and lever bar 50 coast to control the clockwise folding action of the bell crank 42 to cause the bed frame 12 to rock into seat-forming position in the sofa frame 11, as shown in Figs. 4, 5 and 6. As the bell crank 42 is turning in a clockwise direction to fold the bed frame 12 into the sofa frame 11, the link 47 connected to the supporting leg 35 is turning in a counterclockwise direction to fold the leg 35 about its pivot pin 37 into parallel position along the frame 25. A tension spring 54 is provided to assist the movement of the bed frame 12 into and out of the sofa frame 11, and another tension spring 55 assures that the leg 35 is in position for supporting the second section 25 in bed forming position.

The supporting leg 34 for the first section 23 has a support member 56 secured to its upper end and extending at right angles thereto. When the bed frame 12 (Figs. 1 and 2) is in bed forming position, the support member 56 is substantially parallel with the first section 23. A lever 57 has one end pivoted to the support member 56 by a pin 58 and its other end pivotally connected by a pin 59 to the third section 24. When the first section 23 is moved to a right angular position (Fig. 3) relative to the third section 24, the lever 57 causes the leg 34 and support member 56 to pivot about the pin 36 so that the leg 34 is parallel to the first section 23 and the support member 56 extends at right angles or perpendicular thereto.

The movable upholstery board 19 is supported by a rigid frame including an angle piece 60 secured to a plate 61 having pivotal connections with the first section 23 and the lever 57. When the first section 23 is folded relative to the third section 24, the portion of the first section adjacent to its pivotal connection with section 27 moves into alignment with the angle piece 60, as at 62 (Figs. 3 and 4). The upholstery board 19 is thus held in fixed spaced relation with the third section 24 in position to be carried with the bed frame 12 into abutting coeterious position with the fixed upholstery board 18 of the sofa frame 11.

The present invention is embodied in cooperative locking assemblies 64 and 65 for locking the first and second sections 23 and 25 in fixed substantially parallel seat-forming relationships. It is well known that when a mattress is folded into the bed frame of a sofa bed construction, it is compressed and therefore exerts an upward force tending to move the upper or first section of the bed frame into an angular position relative to the normal folded position that the first section should assume with respect to the second and third sections of the bed frame. Inasmuch as the seat cushions of the sofa are supported on the first section, it is necessary to lock the first section in fixed folded position relative to the second and third sections in order to prevent downward movement of the first section when a person sits upon the sofa seat.

The locking assembly 64 is provided to secure the first and second sections 23 and 25 in fixed relationships. The locking assembly 64 includes the support member 56, a seat plate 66 (Figs. 2 and 7) secured to the second section 25 and a lever actuated latch member 67. Referring to Figs. 4, 5 and 6, it will be seen that the free end 68 of the support member 56 is positioned on the seat plate 66 when the first and second sections 23 and 25 are in proper folded relationship. A pin or stud 69 is secured to the support member 56 adjacent to the free end 68. The latch member is pivoted to the plate 66 by a pin 70 and has an arcuate margin 71 adapted to be moved over the stud 69 to hold the support member 56 secured in the locking relationship. A lever 72 pivotally connected to the latch member 67 into and out of engagement with the stud 69 includes a lever 72 pivotally connected to the lever 72 and to the end of the arm 38 to assure the proper folding action of the latch member 67.

When the frame sections 23, 24 and 25 have been folded into seat-forming relation (Fig. 4) and the support 66 is seated on the plate 66, the latch member 67 in an unlocked condition to cause the bed frame 12 is rocked into the sofa frame 11. Referring to Figs. 5 and 6 it will be seen that as the bed frame 12 is rocked into the sofa frame 11, the second and fourth sections 25 and 26 fold about the pivot pin 29 into an angular relation so that the lever 57 and leg 34 of the first section 23 engage with the stud 69. Accordingly, the first section 23 is locked in fixed spaced relation with the second section 25 to hold the mattress 13 in compressed folded position therebetweem. The angular pitch of the bed frame and mattress tends to cause the mattress to move section 23 away from section 25. This is caused also by the resiliency of the mattress especially with an inner spring construction.

The locking assembly 65 comprises gravity operating means for assuring that the support 56 is substantially perpendicular to the first section 23 so that the free end 68 of the support 56 will rest on the seat plate 66 and be locked thereon by the latch member 67. When the first and third sections 23 and 24 are folded relative to the second section 25 and assume the position shown in Fig. 3, the natural resiliency of the mattress 13 tends to unfold or move the first section 23 out of perpendicular folded relationship with the third section 24 or causes the first section to tend to open up relative to the third section so that these sections define an obtuse angle. It is apparent from the drawings that the first and third sections, the support 56 and the lever 57 form a parallelogram. Therefore, if the action of the mattress causes the first section 23 to unfold relative to the third section 24, the support 56 will be pivoted into the same angular relation with the first section 23 as the second section 24. The angular relationship would cause the lower end 68 of the support 56 to draw away from or miss the seat plate 66 so that the stud 69 would not be contacted by the latch member 67, whereby the first and second sections 23 and 25 would not be locked together. The angular relationship between the first and third sections would also cause the movable upholstery board 19 to be positioned out of alignment with the fixed upholstery board 18, and the free end of the first section 23 would be in a position to damage the back rest sections 28 and 29 on the sofa frame 11. Accordingly, the locking assembly 65 is provided to obviate these problems by assuring the proper folded relationship between the first and third sections 23 and 24 and the support 56.

The locking assembly 65 comprises a ratchet or gravity latch element 78 having a latch pin engaging recess or margin 79, the latch element 78 being freely pivotally mounted on the supporting leg 34 by a pin 80. A pin or stud 81 is secured to the lever 57 in position to be engaged by the edge 79 of the latch element 78 during the folding movement of the first and third sections 23 and 24 relative to the second section 25. This locking action takes place substantially at the position shown in full lines in Fig. 3 and before the pressure exerted by the mattress 13 on the first section 23 can cause the objectionable action noted and move it out of perpendicular folded relation with the third section 24.

It is now apparent that a simplified efficient combination locking arrangement has been provided for assuring the proper folding relation of the bed frame sections and maintaining them in fixed folded position during use of the sofa bed as a sofa. Unfolding of the bed frame 12 from the sofa frame 11 operates a latch mechanism for pivoting the latch member 67 into and out of engagement with the stud 69, the latch member 67 being pivoted to an engaged position as the bed frame 12 is rocked up and out of the sofa frame and the gravity latch element 78 pivoting to a disengaged condition with the stud 81 as the first
third sections 23 and 24 are unfolded relative to the second section 25.

It is now apparent that the present invention obviates the problems that have arisen in the past with regard to maintaining the upper seat cushion supporting frame section of a foldable bed in fixed position so that a mattress compressed between the folded frame sections will not move it out of cushion supporting position. It is also obvious that the cooperation between the locking mechanisms 64 and 65 assures the proper folding and locking of the bed frame 12 within the sofa frame 11.

This invention is intended to cover all changes and modifications of the present disclosure which will be readily apparent to one skilled in the art, the present invention being limited only by the claims which follow.

What I claim is:

1. In combination with an articulated bed frame having first, second and third relatively foldable sections adapted to move between an extended bed defining position and a folded seat forming relationship wherein said first and second sections are substantially parallel and are interconnected by said third section which is substantially perpendicular thereto; a support member pivotally attached at one end to said first section and carrying first stud means adjacent to the other end, a support member adapted to seat the other end of said support member when said first and second sections are in folded seat forming relationship, a lever pivotally connected to said support member and said third section for moving the former to a substantially perpendicular position relative to said first section, second stud means secured to said lever, gravity operating means for engaging said second stud means to lock said lever in fixed position with said first section and said support member and said third section in perpendicular relationship to said first section, said gravity operating means engaging said second stud means during folding movement of said first section toward folded seat forming position with said second section, and lever actuated means for releasably engaging said first stud means to secure said support member on said support seating member.

2. In combination with an articulated bed frame having first, second and third relatively foldable sections adapted to be moved into a seat supporting position in a sofa frame; a leg pivotally connected to said first section; a support member having one end secured in right angular relation to said leg adjacent to the pivotal connection thereof, said leg being pivotable to said first section when in bed forming position and said support member being in substantially parallel relation with said first section; a lever connected between said support member and said third section for folding said support member into a position substantially perpendicular to said first section and substantially parallel with said third section and for folding said leg into substantially parallel relation with said first section; a gravity locking assembly including a stud member on said lever and a latch element freely pivotally mounted on said leg in position to swing into locking engagement with said stud during folding movement of said first and third sections relative to said second section for maintaining said support member substantially perpendicular to said first section; a seat plate mounted on said second section for seating the other end of said support member when said first and second sections are in folded seat supporting position; another stud member secured to said support member adjacent to the other end thereof; and lever actuated latch means adapted to engage said other stud member upon folding movement of said first, second and third sections into said sofa frame whereby said support member is maintained in fixed position extending between said first and second sections.

3. In an articulated bed frame construction having first and second frame sections interconnected by a third frame section and foldable from an extended position into substantially parallel relation with said third section perpendicular thereto, and a leg pivotally mounted on said first section for supporting it in extended position and foldable by a lever connected to the third section to a position along side of the first section when said bed frame is folded, and a mattress carried on said bed frame and doubled on itself when said bed frame is folded; the improvement which comprises gravity locking means including a stud on said lever, and a latch element freely swingably mounted on said leg and movable into latching engagement with said stud as said bed frame is folded, whereby spring-back of said mattress in folded condition is resisted and said first and third sections are maintained in substantially perpendicular folded relationship.

4. In an articulated bed frame having first and second frame sections interconnected at one end by a third frame section and being foldable into substantially parallel relation with said third frame section substantially perpendicular thereto, a mattress carried on said bed frame and doubled on itself in folded condition when said frame sections are folded, a frame supporting leg having a free end and a pivotal connection with the other end of the first frame section and adapted to be positioned adjacent to said frame section in parallel relation with said first frame section when it is in folded parallel relation with said second frame section, and a lever having one end pivoted to the third frame section and having its other end pivoted to said leg at a point spaced from the pivotal connection between the leg and the first frame section in the side of the pivotal connection toward the second frame section when said first and second frame sections are in parallel relation whereby relative unfolding action between said first and third frame sections toward straight-line position through an obtuse angular relationship effects movement of the free end of said leg away from said first and second frame sections toward a perpendicular position with the first frame section; the improvement which comprises gravity locking means between said leg intermediate its ends and said lever for releasably locking said leg in substantially parallel position with said first frame section to prevent the movement of said first frame section to an obtuse angular position relative to said third frame section under pressure of said mattress when said bed frame and mattress are in folded condition, said gravity locking means comprising a stud on said lever and a latch element freely pivoted on said leg and swingable into latching engagement with said stud as said bed frame is folded.

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