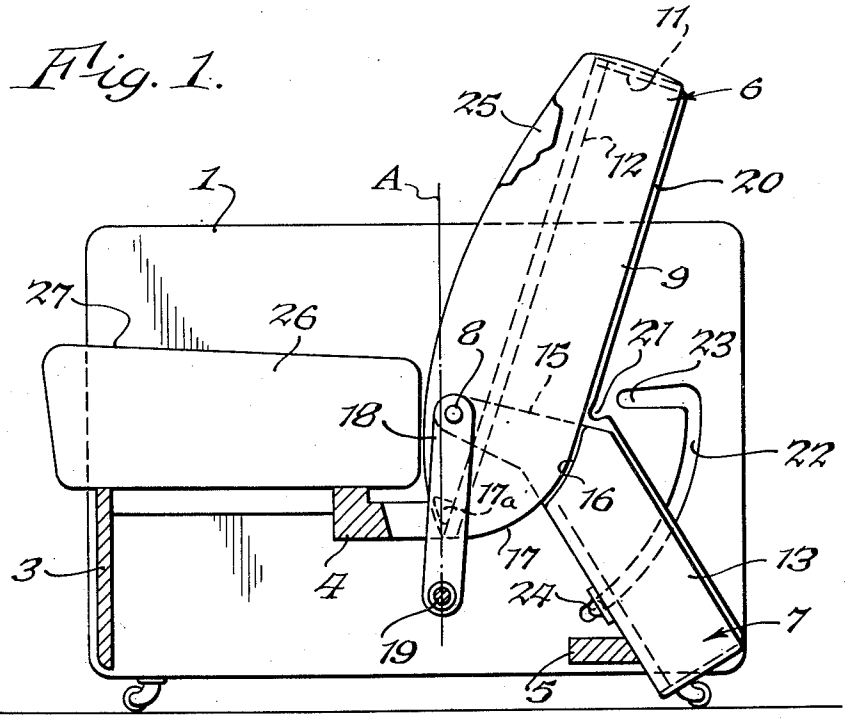
Dec. 12, 1950 A. LORENZ ET AL 2,534,177

COMBINED SOFA SEAT AND BED

Filed Dec. 18, 1948 3 Sheets-Sheet 1

Fig. 1.



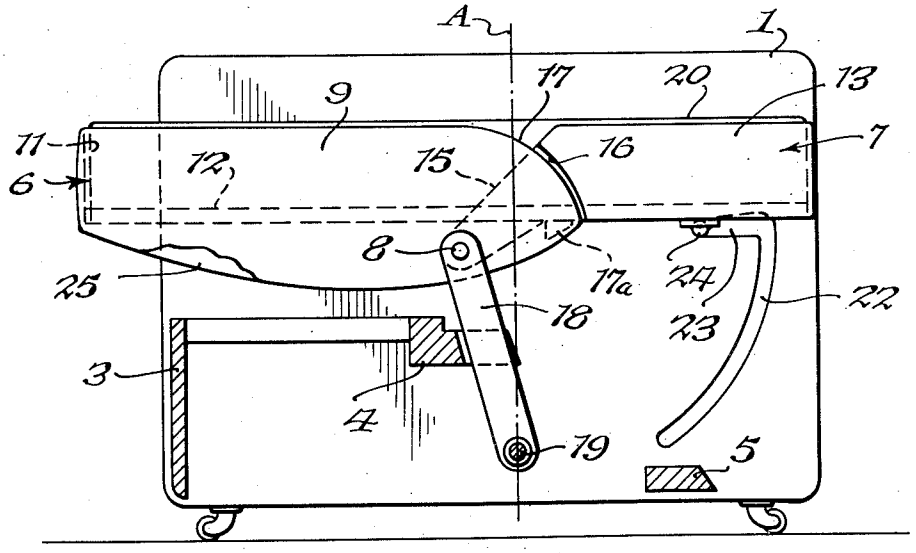


Fig. 2.

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Filed Dec. 18, 1948 3 Sheets-Sheet 2

Fig. 3.

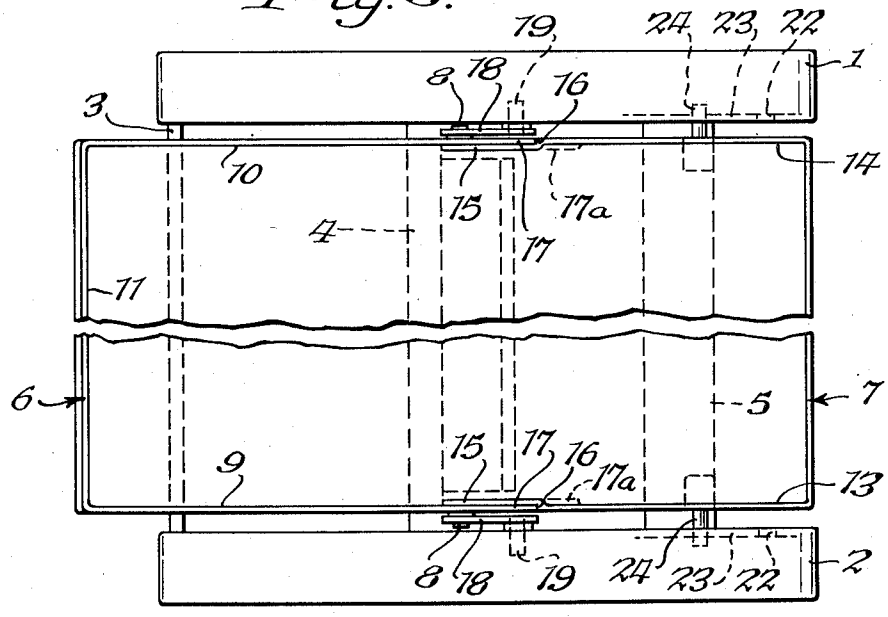
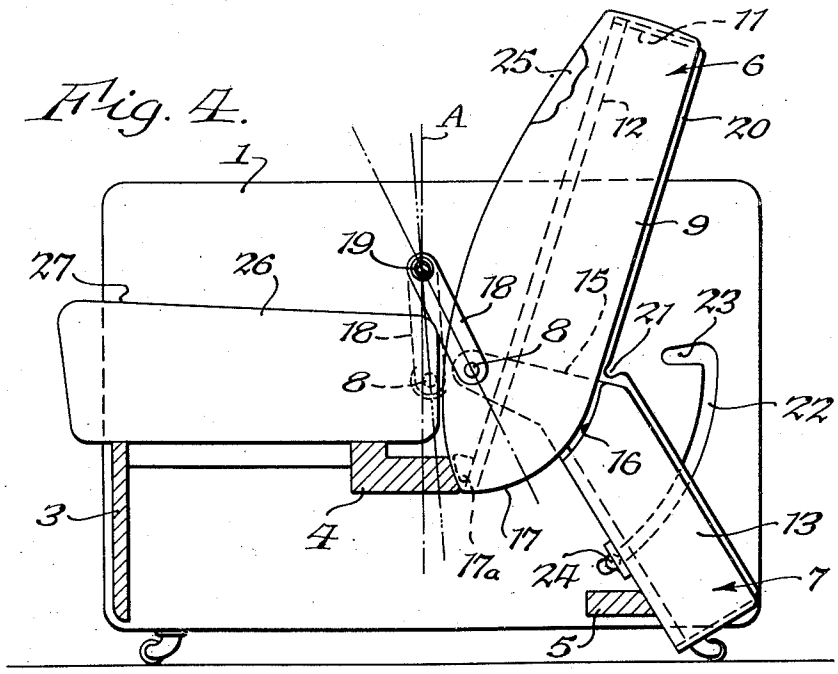


Fig. 4.



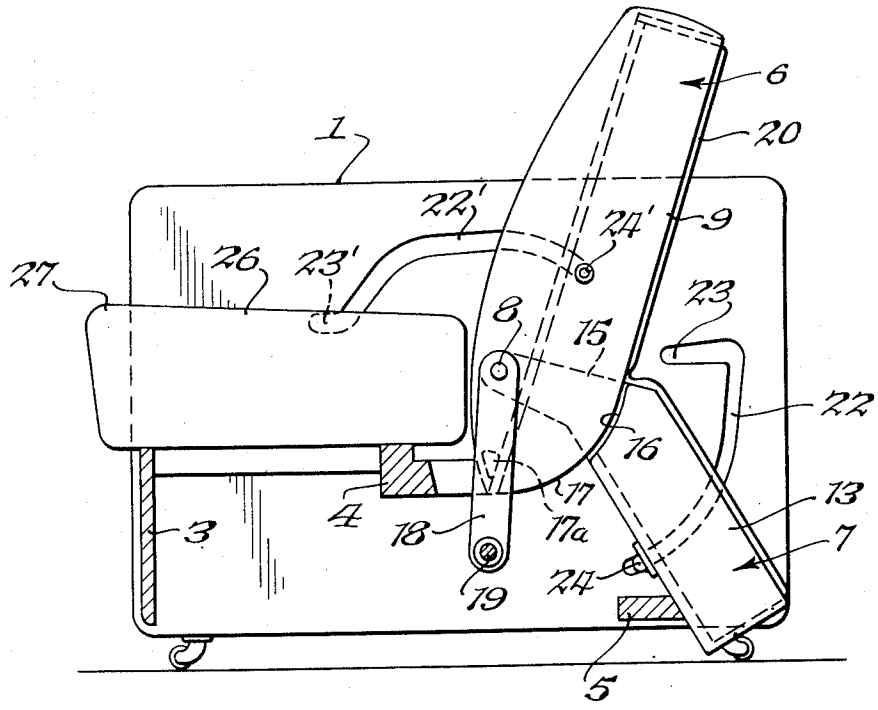
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Fig. 5.



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COMBINED SOFA SEAT AND BED

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8 Claims. (Cl. 5—43)

1

This invention relates to sofa beds which may be converted between sofa seats and beds selectively.

An object of the invention is to provide an improved sofa bed which may be made into a comfortable sofa seat or a comfortable bed selectively by simple manipulations and with a minimum of operating effort; which resembles an ordinary sofa seat in appearance and size; which requires no locking mechanism to hold various parts in the sofa seat or bed positions; in which the seat and the bed have the usual desired seat and mattress levels in use; which will be relatively stable in both sofa and seat and bed positions, so that regardless of where one lies on the bed there is no danger of unintentional release of the parts for return to sofa seat positions; and which is relatively simple, compact, durable, practical, convenient and inexpensive.

Various other objects and advantages will be apparent from the following description of two embodiments of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawing:

Fig. 1 is a transverse, sectional elevation through a sofa bed constructed in accordance with this invention, the section being taken approximately along the inside face of one of the end members of the support or main frame, and looking toward the other end member, the parts being in the positions occupied when the device is used as a sofa seat;

Fig. 2 is a similar elevation, but with the parts converted for use as a bed;

Fig. 3 is a plan of the same, with the parts in the bed position shown in Fig. 2;

Fig. 4 is a sectional elevation similar to Fig. 1, but illustrating a slight modification thereof, and

Fig. 5 is a sectional elevation similar to Fig. 1, but illustrating still another modification thereof.

In the embodiment of the invention illustrated in Figs. 1 to 3, the device includes a support formed of end members 1 and 2 which are arranged face to face but spaced apart and united by an intermediate portion formed of cross members 3, 4 and 5, Fig. 1. The cross members and end members form a rigid structure or support. A mattress-supporting frame, such as a shallow bow with an open face, is disposed between the end members 1 and 2, and formed of a front section 6 and a rear section 7 which are hinged together on trunnions or pivot pins 8. The front section 6 has end walls 9 and 10 which are deeper than the chamber 11 of the box and which extend

2

below or beyond the bottom wall 12 of the box, as shown in Fig. 1. The pivots 8 rockably support the end walls 9 and 10 at the opposite side of the bottom 12 of the chamber 11. End walls 13 and 14 of the rear section 7 also pivotally engage with pivots 8. The walls 13 and 14 are in the same planes respectively as the end walls 9 and 10.

The rear section 7 has angularly extending arms 15 offset inwardly so as to lie along and overrun with the pivoted ends of the end walls 9 and 10, as shown in Fig. 3, and these arms 15 are pivoted on the pivots 8 to mount the rear section 7 thereon. The walls 13 and 14, where the offset arms 15 begin, are provided with concave edges or seats 16 whose centers of curvature are approximately in the axes of the pivots 8. The adjacent end edges 17 of the end walls 9 and 10 are arcuately convex, with their centers of curvature also in the axes of the pivots 8, and the convex edges 17 lie in close proximity to the concave edges 16.

The pivots 8 rockably connect sections 6 and 7 to the ends of links 18 that are pivoted at their other ends on bearing studs 19 carried by the inside upstanding faces of the end members 1 and 2. When the front section 6 is rocked on the pivots 8 toward bed position, stops 17a mounted below the convex ends 17 will engage with the lower edges of the arms 15 of the rear section when the sections make a straight angle, and the front and rear sections then move as a unit in their straight angle position into a horizontal or bed position, shown in Fig. 2. When front section 6 was in its upstanding and rearwardly inclined position shown in Fig. 1, the rear section 7 depended downwardly and rearwardly from pivots 8 and rested against the frame member 5. When the front section 6 was pulled forwardly and to the left in Fig. 1, it moved along until the angle between the faces of the front and rear sections became a straight angle, at which time the stops 17a engaged the arms 15, and thereafter continued movement of the front section 6 in the same direction carried with it the rear section 7 into the horizontal position of both sections. A flexible mattress 20 is confined within the shallow box formed by sections 6 and 7, and when the sections 6 and 7 are in the angular relation shown in Fig. 1, the mattress 20 is flexed at 21, which aids in keeping the mattress confined within the shallow box-like chamber 11 in the two sections.

The inside face of each end member 1 and 2 is provided with a cam groove 22 having a long arcuate portion with its concave side facing the axes of the pivots 8. The upper end of each cam

groove 22 turns abruptly and extends forwardly at 23, preferably at a slightly downward and forward inclination. Each end wall 13 and 14 is provided with a lug or cam follower 24 that extends endwise from the rear section and enters and rides along the adjacent cam groove 22. When the parts are in the sofa seat positions shown in Fig. 1, the lugs 24 are near the bottoms of the grooves 22, and when the front section 6 is swung to the left in Fig. 1, the grooves 22 will control movement of the links 18 to the left until the lugs 24 reach the generally horizontal and forwardly extending branches 23, which is when sections 6 and 7 are approximately horizontal. If desired, the upper part of the arcuate portion 22 may be curved well toward the front of the sofa so that the roller 24 will push the rear box section 7 forwardly and carry with it, the front section 6 and the links 18, during which the links will pass dead center positions. With such an arrangement, the sections 6 and 7 may have a forward falling tendency as the lugs or rollers 24 move along the upper parts of the arcuate portions of grooves 22. This reduces the amount of forward pull necessary to be applied to the upper section when converting the device into a sofa bed.

The mattress-supporting frame formed of sections 6 and 7 may then be pulled forwardly into the position shown in Fig. 2, during which time the lugs 24 move along the forwardly and somewhat downwardly inclined branches 23. During this forward movement of the sections 6 and 7, permitted by the branch grooves 23, the links 18 will pass from the upwardly and rearwardly inclined position shown in Fig. 1, forwardly into forwardly and upwardly inclined positions shown in Fig. 2. During this movement of the links 18, the pivots 8 will rise somewhat and pass forwardly through a vertical plane, represented by the dot and dash line A, that passes upwardly through the axes of the bearing studs 19 into a position in front of that plane. The pivots 8 thus pass forwardly through vertical dead center positions, so that any weight of sections 6 and 7, when the parts are in the Fig. 2 position, will urge the links 18 forwardly and keep the lugs 24 in the grooves 23. The grooves 23 may be horizontal, but they are preferably slightly forwardly and downwardly inclined.

The engagement of the lugs 24 in the forward ends of the branch grooves 23 limits the forward movement of the links 18, and since any weight on the bed urges the links 18 forwardly, no lock is necessary to prevent unintentional return of links 18 to their rearward positions. To change the device back to the sofa seat condition, one merely pushes rearwardly on the front section 6, which raises pivots 8 and the sections 6 and 7 with rocking of links 18, thus moving both sections 6 and 7 rearwardly until the lugs 24 again become alined with the upper ends of the arcuate portions of the grooves 22. The section 6 is then rotated upwardly and rearwardly, during which the section 7 rocks downwardly and rearwardly, guided by the lugs 24 in the arcuate grooves 22. When section 7 again engages cross member 5, section 7 will be stopped, but the front section 6 may continue alone into its rearwardly inclined position shown in Fig. 1.

Since the pivots 8 rise when the section 6 is pushed rearwardly, until the pivots 8 pass vertical dead center positions, substantial effort will be required to lift the sections 6 and 7 during this movement, and there is little or no danger that the frame formed of sections 6 and 7 will

be accidentally pushed rearwardly sufficiently to cause the lugs 24 to become alined again with the upper ends of the grooves 22. While the stops 17a are engaged with the arms 15, the rear section 7 will partially counterbalance the front section 6, and this counterbalancing will continue until the front section 6, in rising, nearly reaches a straight-up vertical position. During continued movement in the same direction, the major part of the load of the front section 6 is carried on the pivots 8 so that minimum of effort is then required to push the front section 6 past the vertical dead center position and into the position shown in Fig. 1. Gravity will hold the section 6 in this rearwardly inclined position shown in Fig. 1.

A cushion 25 is confined against the under face of the bottom wall 12 of section 6, between the end walls 9 and 10, so that when the section 6 is upstanding, as in Fig. 1, the cushion 25 will serve as the rear wall of a sofa seat. A seat cushion 26 is removably mounted on the front cross piece 3 and an intermediate cross piece 4, as shown in Fig. 1, with the rear edge of the seat cushion approximately abutting against the lower part of the front face of cushion 25. The seat cushion 26 is first removed when one desires to pull the section 6 forwardly into the bed position. The seat cushion 26 has its upper surface 27 at the desired level above the floor for maximum comfort in sofa seats or chairs, and the upper surface of the mattress 20, when the mattress is in the horizontal bed position shown in Fig. 2, as at the level usually desired for mattresses of beds.

It will be observed that there are no manually operable latches or bolts that must be manipulated to lock the parts in either sofa seat or bed positions, and that the front section 6 is counterbalanced as it approaches horizontal position, so that at all times a minimum of rotative effort is required to rock the section 6 between the sofa seat position of Fig. 1 and the bed position of Fig. 2.

In the embodiment of the invention shown in Fig. 4, the construction is similar to that shown in Figs. 1 to 3, similar parts having similar reference numerals, except that the links 18, instead of depending from the pivots 8 are upstanding therefrom, and in this case the bearing studs 19 are at higher levels. The links 18 extend downwardly and rearwardly from studs 19 when the upper section 6 is in the sofa seat position, and when the section 6 is rocked forwardly, the pivots 8 move toward the vertical dead center position but never pass it. Hence, it will be necessary to raise the pivots 8 in their arcuate paths when the sections 6 and 7 are moved rearwardly while in their horizontal positions, in order to carry the lugs 24 out of the horizontal ends 23 of the cam grooves 22.

In the modification shown in Fig. 5, the construction is similar to that shown in Figs. 1 and 2 except that the upper parts of the grooves 22 extend forwardly faster as they rise than they do in Fig. 1, so that the rollers 24 will tend to urge the sections 6 and 7 forwardly during their rotation on pivots 8, thus reducing the effort to pull the front section 6 forwardly when converting the device into a bed. This would push the section 6 and the links through vertical dead center positions during the turning movements of the sections. One may also provide a follower 24' on each end of the front section 6 and extending towards the end elements 1 and 2

and each element is provided with a groove 22' on its inside face, in which the adjacent follower 24' runs. These grooves 22' correspond to the courses of the followers 24' as the sections 6 and 7 move from sofa seat positions into bed position, and terminate in forwardly, and preferably, but not essentially downwardly inclined ends 23' that correspond to groove portions 23. Use of rollers 24 and 24' to guide and support both sections 6 and 7 is advantageous but in the simpler constructions, either the grooves 22 or 22' may be omitted, together with the followers 24 or 24' that run in the eliminated grooves.

It will be understood that various changes in the details and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

We claim:

1. A sofa bed comprising a support having upstanding, parallel, end members arranged face to face but spaced apart and united by an intermediate portion, a mattress-supporting frame formed of two sections hinged together by axially alined pivots, and extending between said members, one of said sections being rockable on said pivots between an upstanding and slightly rearwardly inclined position and a horizontal position, the other of said sections being rockable on said pivots between a horizontal position and a downwardly and rearwardly inclined position, links pivotally connected to said support in generally vertical positions and articulately connected to said sections through said pivots, said links being disposed rearwardly of a vertical plane through their pivotal connections to said support when said one frame section is in its upstanding position and the pivots being movable forwardly and downwardly in the last part of the opening movement while the frame sections are opened up into a straight angle position, a flexible mattress confined to said frame on that face thereof which is uppermost when the frame is horizontal, said frame sections having overrunning portions that interengage and limit opening movement beyond a straight angle, and thereafter cause rocking movement together as said one section is moved from its upstanding to its horizontal position, and means limiting movement of said sections together beyond horizontal positions and bodily forwardly after the pivots have passed forwardly downwardly for a desired distance.

2. A sofa bed comprising a support having upstanding, spaced end members connected by an intermediate portion, a shallow box of two sections, each of which extends approximately between said end members, and having their ends hinged together on axially alined pivots for relative movement about the pivots between an oblique angle in which the front section is upstanding and a straight angle in which both sections are horizontal, a flexible mattress confined in said box to flex into an acute angle with the box, links pivoted on said support and mounting the pivots for limited forward and rearward movements, and with the pivots passing downwardly in the last part of their forward movement, a stop limiting forward movement of said links and box, and a seat cushion removably mounted on said support in front of said sections and at its rear edge approximately abutting against the front section when the latter is upstanding

3. A sofa bed comprising a support having upstanding, parallel, end members arranged face to face but spaced apart and united by an intermediate portion, a mattress-supporting frame formed of two sections hinged together by axially alined pivots and extending between said members, one of said sections being rockable on said pivots between an upstanding and slightly rearwardly inclined position and a horizontal position, the other of said sections being rockable on said pivots between a horizontal position and a downwardly and rearwardly inclined position, links pivotally connected to said support in generally vertical positions and articulately connected to said sections through said pivots, said links being disposed rearwardly of a vertical plane through their pivotal connections to said support when said one frame section is in its upstanding position and the pivots being movable forwardly while the frame sections are opened up into a straight angle position, a flexible mattress confined to said frame on that face thereof which is uppermost when the frame is horizontal, said frame sections having overrunning portions that interengage and limit opening movement beyond a straight angle, and thereafter cause rocking movement together as said one section is moved from its upstanding to its horizontal position, a cam follower and a cam with a cam groove, one of which is carried by one of said sections, and the other by one of said members, said groove having an initial portion progressing upwardly and then forwardly and generally horizontally, whereby said sections are controlled in their forward movement with said links until they reach approximately horizontal positions and said follower reaches and moves forwardly along said horizontal portion of said groove.

4. A sofa bed comprising a support having upstanding, spaced end members connected by an intermediate portion, a shallow box of two sections, each of which extends approximately between said end members, and having their ends hinged together on axially alined pivots for relative movement about the pivots between an oblique angle in which the front section is upstanding and a straight angle in which both sections are horizontal, a flexible mattress confined in said box to flex into an oblique angle with the box, links pivoted on said support and mounting the pivots for limited forward and rearward movements, and with their pivots passing downwardly in the last part of their forward movement, a seat cushion removably mounted on said support in front of said sections and at its rear edge approximately abutting against said front section when the latter is upstanding, a cam follower and a cam with a cam surface guiding the follower, one of which is carried by one of said sections, and the other is carried by one of said members, said groove having an initial rising portion and at its remote end extending forwardly at a level in which the follower when therein holds said sections approximately horizontal.

5. A sofa bed comprising a support having upstanding, parallel, end members arranged face to face but spaced apart and united by an intermediate portion, a mattress-supporting frame formed of two sections hinged together by axially alined pivots, and extending between said members, one of said sections being rockable on said pivots between an upstanding and slightly rear-

wardly inclined position and a horizontal position, the other of said sections being rockable on said pivots between a horizontal position and a downwardly and rearwardly inclined position, links pivotally connected to said support in generally vertical positions and articulately connected to said sections through said pivots, said links being disposed rearwardly of a vertical plane through their pivotal connections to said support when said one frame section is in its upstanding position and the pivots being movable forwardly when the frame sections are opened up into a straight angle position, a flexible mattress confined to said frame on that face thereof which is uppermost when the frame is horizontal, said frame sections having overruning portions that interengage and limit opening movement beyond a straight angle, and thereafter cause rocking movement together as said one section is moved from its upstanding to its horizontal position, one of said frame sections and an end member having cooperating cam surface and follower for guiding the sections in their movements in either direction between sofa bed and sofa seat positions, whereby said sections are guided in their movements with said links until they reach approximately horizontal positions.

6. A sofa bed comprising a support, a pair of links hinged to said support, one adjacent each end of said support and disposed generally vertically, a mattress-supporting frame hinged to said links, said frame having front and rear sections hinged to said links on axially alined axes, said front section being rockable on said axes between an upstanding and rearwardly inclined position and a horizontal position, said rear section being rockable on the same axes between a horizontal position and a rearwardly and downwardly inclined position, said sections having interengaging portions that limit their relative movement beyond a straight out position from an oblique position, said links moving forwardly while said sections are moved to straight out, horizontal positions, means limiting said frame from rocking movement beyond horizontal position and to a selected bodily forward position with said links, a flexible mattress confined to said frame on the face thereof which is uppermost when the frame is horizontal, and a seat cushion removably mounted on said support in front of said front section when the latter is upstanding, said front section having a cushion on the face thereof opposite from said mattress.

7. A sofa bed comprising a support, a pair of links hinged to said support, one adjacent each end of said support and disposed generally vertically, a mattress-supporting frame hinged to said links, said frame having front and rear sections hinged to said links on axially alined axes, said front section being rockable on said axes between an upstanding and rearwardly inclined position and a horizontal position, said rear section being rockable on the same axes between a horizontal position and a rearwardly and downwardly inclined position, said sections having interengaging portions that limit their relative movement beyond a straight out position from an acute position, said links moving forwardly while said sections are moved to straight out, horizontal positions, a cam and a cooperating follower carried one by one of said sections and the other by said support, said cam having a cam surface with its center of curvature at one end approximately in said axes when said links are in their rearmost position, and as it approaches its other end extending forwardly to guide said follower forwardly and guide said frame forwardly with said links, and a seat cushion removably mounted on said support in front of said front section when the latter is upstanding.

8. A sofa bed comprising a support, a pair of links hinged to said support, one adjacent each end of said support and disposed generally vertically, a mattress-supporting frame hinged to said links, said frame having front and rear sections hinged to said links on axially alined axes, said front section being rockable on said axes between an upstanding and rearwardly inclined position and a horizontal position, said rear section being rockable on the same axes between a horizontal position and a rearwardly and downwardly inclined position, said sections having interengaging portions that limit their relative movement beyond a straight out position from an acute position, a cam and a cooperating follower carried one by one of said sections and the other by said support, said cam having an arcuate cam surface with the center of curvature of one end portion approximately in said axes when said links are in their rearmost position and at the remote end extending forwardly in a path selected to guide said follower forwardly and release said frame for similar forward movement with said links, a flexible mattress confined to said frame on the face thereof which is uppermost when the frame is horizontal, and a seat cushion removably mounted on said support in front of said front section when the latter is upstanding.

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