

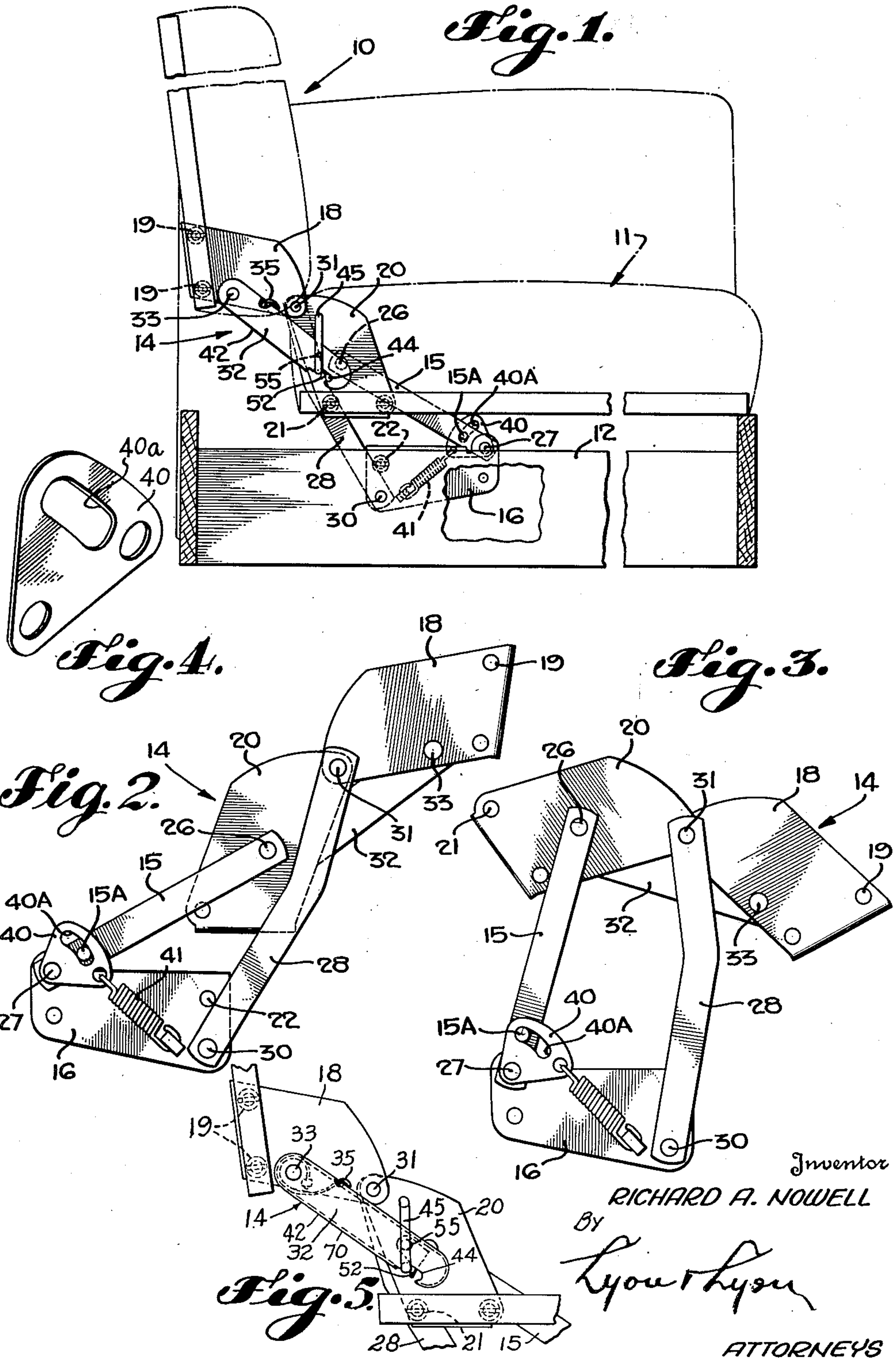
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SOFA BED HINGE

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SOFA BED HINGE

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The present invention relates to hinge structures for sofa beds of the type wherein a seat section is hinged to the back section and both sections may be moved either into a bed forming position or a sofa forming position.

In hinge structures of this type, usually there is provided three hinge members, i. e., a rear hinge member attached to the back, a front hinge member attached to the seat, and a third base hinge member attached to the carrier rail of the base. Usually, in such cases, the rear and front hinge members are connected through linkage to the carrier rail. Further, such linkage is spring biased with respect to the carrier rail by a tension spring having one of its ends stationarily mounted with respect to the carrier rail and the other one of its ends connected to such linkage to bias the front hinge member or connected seat member with respect to the carrier rail, in order to achieve conventional operation of such hinge structure.

Such spring is normally effective only when the back portion of the sofa bed is moved from its seat forming position to its bed forming position, and difficulties have arisen when such back portion is moved from its bed forming position to its seat forming position. Such difficulties arise from the fact that such spring, which is usually a coil tension spring, is subjected to compression forces which result in buckling of the coil spring and even development of permanent undesirable sets in the spring. Further, when such spring is buckled, some of the convolutions of the spring separate to allow bedding material such as sheets to be lodged therebetween, so that subsequent movement of the back section of the combination sofa bed may result in clamping and tearing of such sheets.

Also, some energy is required to compress the coil spring to produce such objectionable buckling thereof.

It is therefore an object of the present invention to provide an improved hinge structure of the character outlined above, characterized by the ease with which the sofa bed may be converted to a bed or to a seat, or vice versa, as the case may demand.

Another object of the present invention is to provide an improved hinge structure of the character outlined above, characterized by the fact that the spring biasing the linkage with respect to the carrier rail or base hinge member is never subjected to compression forces to cause undesirable buckling.

Another object of the present invention is to

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provide an improved hinge structure incorporating as a feature thereof a lost motion connection between such linkage and the base hinge member to avoid the above mentioned difficulties.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a sectional view of a combination sofa bed and seat having incorporated therein a hinge structure embodying features of the present invention,

Figures 2 and 3 show the relative positions of the various elements of the hinge structure shown in Figure 1 in progressive order as the sofa is converted from the seat shown in Figure 1 to a bed,

Figure 4 is a perspective view showing the lost motion pivoted plate element incorporated in the structure shown in the previous figures for achieving important features of the present invention.

Figure 5 is an enlarged view of some of the mechanism illustrated in Figure 1.

The combination sofa bed and seat includes a back portion 10, a seat portion 11, and a carrier rail 12, each interconnected, in conventional manner, by the improved hinge structure having the general reference numeral 14.

Broadly, such hinge structures 14 are well known in the art, and the present invention concerns itself particularly with the provision of a lost motion connection between the link member 15 and the base hinge member 16 upon which such link member 15 is pivoted to achieve the above indicated results, and also to avoid difficulties encountered in prior art structures of this type.

The connecting hinge 14 permits movement of the seat 11 and back 10, together with the upholstery, springs, cushions or mattresses carried thereby into either a seat forming position or into a bed forming position.

In the position shown in Figure 1, corresponding to the seat forming position of the parts, the back 10 is in its back forming position and the seat 11 is in its seat forming position. The back 10 may be moved by lifting the front edge of the seat 11, whereupon the seat and back may be swung as a unit progressively into the inter-

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mediate positions shown in Figures 2 and 3, to ultimately realize the bed forming position of the parts (not shown) wherein the planes of such back and seat portions 10 and 11 are substantially coplanar, as is well known and understood in viewing the prior art practice.

The hinge controlling the above described movement of the parts includes a rail hinge member 18 fastened to the back portion 10 by bolts 19, a front hinge member 20 fastened to the seat 11 by means such as bolts 21, a base hinge member 16 fastened to the carrier rail, as for example, by bolts 22, a first link member 15 having its opposite ends pivoted, by suitable pivot pins 26, 27 on the hinge members 20, 16 respectively, a second link member 28 having its lower end pivoted by means of pivot pin 30 to the base hinge member 16, and the upper one of its ends pivoted by means of pivot pin 31 to the corners of the overlapping hinge members 18, 20. Also, such hinge structure includes a spring biased lever 32 which is pivotally mounted by pivot pin 33 to the rear hinge member 18, with the torque spring 35 having one of its ends engaging such lever 32 and the other one of its ends fastened to the hinge member 18 to bias the lever 32 in the clockwise direction in Figure 1.

Also pivotally mounted on the pivot pin 27 is the plate 40 having the lost motion slot 40A therein. This lost motion slot 40A cooperates with a stop member 15A in the form of a rivet mounted on the arm 15 to limit the pivotal movement of the plate 40 with respect to the arm 15. This plate 40 is connected to one end of the coil tension spring 41, the other end of such spring 41 being secured to the base hinge member 16.

It will thus be seen that when the hinge members 18 and 20 are held against relative movement, the seat and back pivot on the links 15 and 28 and the base hinge member 16. The seat 11 and back 10 may consequently be moved as a unit without changing the relative positions thereof. During such movement, the links 28 and 15 swing about the pivot pins 27 and 30 at the lower ends thereof and about the pivot pins 26 and 31 at their upper ends. In other words, during the movement of the seat and back from the sofa forming position, there is no relative movement of the hinge members 18 and 20 which swing as a unit, but there is relative movement of the links 28 and 15, as indicated in Figures 2 and 3.

When the seat 11 is moved into its bed forming position, as indicated in Figures 2 and 3, to the position of Figure 1, the hinge member 18 is unlocked from the hinge member 20, whereby it and the back secured thereto may move relatively to the hinge member 20 which does not change its position. Means are therefore provided on the hinge, first to lock the back 10 and seat 11 together during movement of these parts from the position of Figure 3 to that of Figure 2 and then to that of Figure 1, and second to unlock or release the hinge members 18 and 20 from each other for relative movement from the position of Figure 1 to that of the bed forming position, on proper manipulation.

Such locking means is conventional and may include the main plate-like locking member 32 suitably pivoted near its left end on the pivot pin 33 carried on the hinge member 18. Such locking member 32 is provided with the lower edge 42 leading to the locking notch or recess 44 which is arranged near the free end of the locking member. The free end or right hand portion (Figure 1) of said locking member passes through

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the space defined by the legs and cross bar of the U-shaped bail 45, which is secured to the hinge member 20 by means of its legs by conventional means. The locking member 32 goes back and forth through the bail 45 and swings on its pivot 33 between the legs of said bail when permitted to do so on the relative movement of the hinge members 18, 20, or in other words, on the opening or closing of the hinge.

The spring 35 and the weight of the locking member 32 serves to urge the shoulder or edge of the notch 44 into contact with the lower leg of the bail 45 in the normal positions of the parts wherein the hinge members 18 and 20 are locked against relative movement.

Carried by the free end portion of said locking member 32 in a position to guide the lower leg of the bail member 45 out of the locking notch 44 at the proper time is the auxiliary release member pawl or trigger lever 52. The operation of the pawl 52 is conventional and per se forms no part of the present invention. It is noted that the pawl 52 is pivoted about the pivot 55 and is gravity-actuated. The counterclockwise motion of the pawl 52 in Figures 1 and 5 is limited by engagement of the pawl 52 with the flange 70 of the lever 32. The pawl 52 serves as a cam during certain phases of operation of the device. Such lever, in accordance with conventional practice, is pivotally and loosely mounted on the main locking member 32 by means of the pivot pin 55. Suitable stops are provided to limit such pivotal movement of the trigger lever 52 for the intended purpose.

In the normal or sofa position of the parts, as shown in Figure 1, the back 10 is locked to the seat 11 in a position substantially perpendicular thereto. In this position the lower leg of the bail 45 has entered the notch 44 and rests against the rear edge or shoulder of such notch. Release lever 52 also rests against the bail owing to the lever having swung in a clockwise direction about its pivot 55 under the influence of gravity. The shoulder of the pawl is to the right of the bail leg and hence the parts are adequately locked together as shown in the enlarged view illustrated in Figure 5.

However, if the front edge of the seat 11 is raised, the bail leg, if not already in such contact, may move slightly in the notch 44 into contact with the front edge of the notch but no further, and the locking member 32 remains effective to hold the hinge members 18 and 20 against further relative movement. Continued movement of the seat in a counter-clockwise direction about the pivot pin 31 therefore causes the back 10 to move with the seat 11 in a counter-clockwise direction until the seat is in the intermediate inclined position. In said position the hinge members 18 and 20 have not moved relatively to each other.

Now if it is desired to move the seat relatively to the back into the position of Figure 3, the seat is further moved slightly rearwardly about the hinge pivot pin 31 sufficiently to release the locking member 32 as illustrated in connection with Figure 1 and the enlarged view in Figure 5. On such movement, the bail 45 moves in the notch 44 of the locking member raising lever 52 until the bail leg is far enough to the right to reach a point at the end of the notch 44, permitting lever 52 to drop clockwise by gravity forces acting thereon, such lever at this time being to the left of the leg of the bail 45. On movement of the seat now in reverse or clockwise direction, the leg of said bail 45 travels with the lever arm

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52 moving away from the notch 44 to a point outwardly beyond the line of the edge 42 of the locking member 32, and is carried completely out of the notch and along such edge 42 whereby the hinge member 20 is completely released from the hinge member 18 and swings relatively thereto, the locking member at this time passing further through the bail.

The action of the locking member 32 with its associated lever member 52 is in accordance with conventional practice, and features thereof per se form no part of the present invention. The present invention may be practiced, of course, with other types of locking members 32, and the one outlined above is merely exemplary and may equally well be substituted.

As mentioned hereinabove, when the unit is converted from a sofa to a bed there is relative movement between the link 15 and the hinge member 16. In the bed forming position of the unit it is desired that the seat 11 be pressed downwardly by means such as the coil tension spring 41. Such spring 41, as such, performs no useful function in the sofa position of the unit. In accordance with conventional practice, such spring 41 had one of its ends attached to the base hinge 16 and the other one of its ends attached to the arm 15. Such construction led to the undesirable results indicated in the first part of this specification. In order to avoid the difficulties arising from such construction in accordance with features of the present invention, one end of the spring 41 is attached to the lost motion plate 40 arranged to cooperate with the stationary abutment 15A on the arm 15, in such a manner that the spring 41 is tensioned only when the unit is being formed as a bed. In other words, the spring 41 is not tensioned when the unit is in the sofa forming position.

Thus, as is evident from inspection of Figures 1, 2 and 3, the lost motion connection thus provided between the spring 41 and the arm 15 prevents buckling of the spring 41 when the unit is in the sofa forming position shown in Figure 1 or 2, but such lost motion connection yet causes the spring 41 to be desirably tensioned for its intended purpose of initially biasing the seat forming member 11 downwardly to the bed forming position of the unit.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. In a hinge structure of the character described for use with sofa beds having a seat and a back, said hinge structure incorporating a pair of hinge members which are pivotally connected, one adapted for connection to the seat and the other for connection to the back, whereby the seat and back are adapted to be arranged for pivotal movement relatively to each other, means for locking the hinge members against such movement to permit the seat and back to be swung as a unit, said means comprising an automatically actuated locking member, an unlocking member for such hinge members operative upon relative movement between the back and seat elements, said hinge structure comprising also a base hinge member for attachment to the

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carrier rail of the sofa bed, and a link having one of its ends connected to the base hinge member and the other one of its ends pivoted to the hinge member which is arranged for attachment to the seat element, a tension spring having one of its ends affixed to said base hinge member and having the other one of its ends attached to said link through a lost motion connection and a second link having one of its ends connected to said base hinge member and the other one of its ends connected to said pair of hinge members.

2. In a hinge structure of the character described for use with sofa beds, said hinge structure incorporating a rear hinge member for attachment to the back portion of the sofa bed, a front hinge member for attachment to the seat element of said sofa bed, a base hinge member for attachment to the carrier rail of said sofa bed, means pivotally connecting said rear hinge member to said front hinge member, latching means between said rear hinge member and said front hinge member, automatically operated to lock said front and rear hinge members together for movement as a unit or to allow independent pivotal movement in accordance with relative movement of the back and seat elements when attached, a first arm having its lower end pivotally attached to said base hinge member and the upper end of said first arm being pivotally connected to said front and rear hinge members, a second arm having its lower end pivotally connected to said base hinge member and its upper end pivotally connected to said front hinge member, and a tension spring having one of its ends connected to said base hinge member and the other one of its ends attached to said second arm through a lost motion connection arranged to stress said spring only in the initial stages of the bed forming position of said sofa bed.

3. In a hinge structure of the character described for use with sofa beds, having a rear hinge member for attachment to the back element of said sofa bed, a front hinge member for attachment to the seat element of said sofa bed, a base hinge member for attachment to a relatively stationary portion of said sofa bed, the subcombination comprising a link having its opposite ends pivotally connected to said front hinge member and said base hinge member and a tension spring having one of its ends connected to said base hinge member and the other one of its ends connected to said link through a lost motion connection arranged to provide stressing of said spring only when said link is moved a predetermined angular distance with respect to said base hinge member.

4. In a hinge structure of the character described for use with sofa beds, a rear hinge member for attachment to the back element of said sofa bed, a front hinge member for attachment to the seat element of said sofa bed, a base hinge member for attachment to the base of said sofa bed, means pivotally connecting said rear and front hinge members, automatic latching means operated in accordance with the relative movement of the back and seat elements when attached for either locking said front and rear hinge members for joint movement or to allow independent movement of said front and rear hinge members, means pivotally mounting said front and rear hinge members with respect to said base hinge member, said last mentioned means comprising a link having its opposite ends pivotally connected respectively to said front hinge member and said base hinge member, and

a spring connected through a lost motion connection to said link and arranged to bias said link with respect to said base hinge member only in the initial stages of the bed forming position of the sofa bed, one end of said spring being connected to said base hinge member.

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