Oct. 27, 1953

E. E. WOLLER

2,656,877

CHAIR BED

Filed Nov. 8, 1950

2 Sheets-Sheet 1

Fig. 1

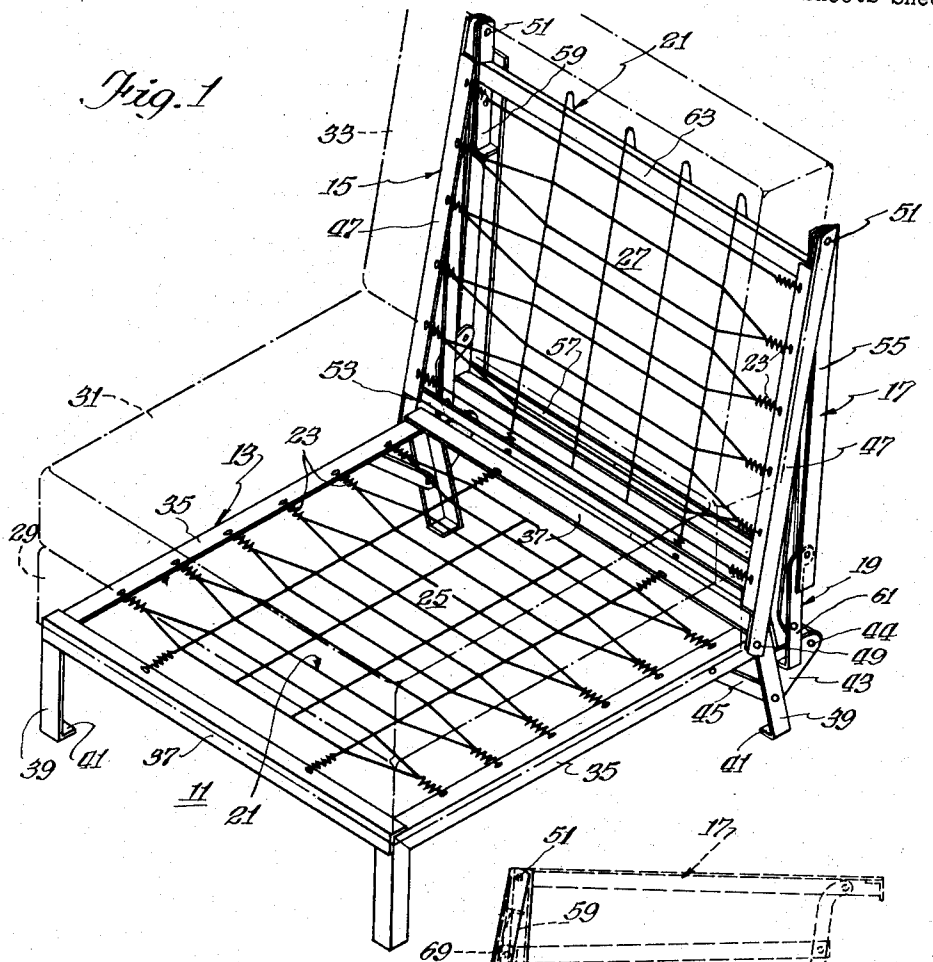
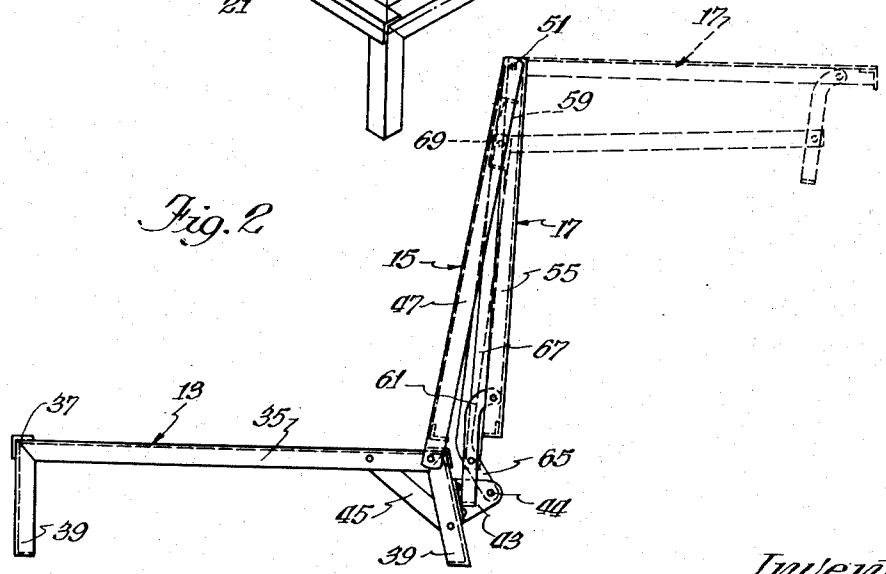


Fig. 2



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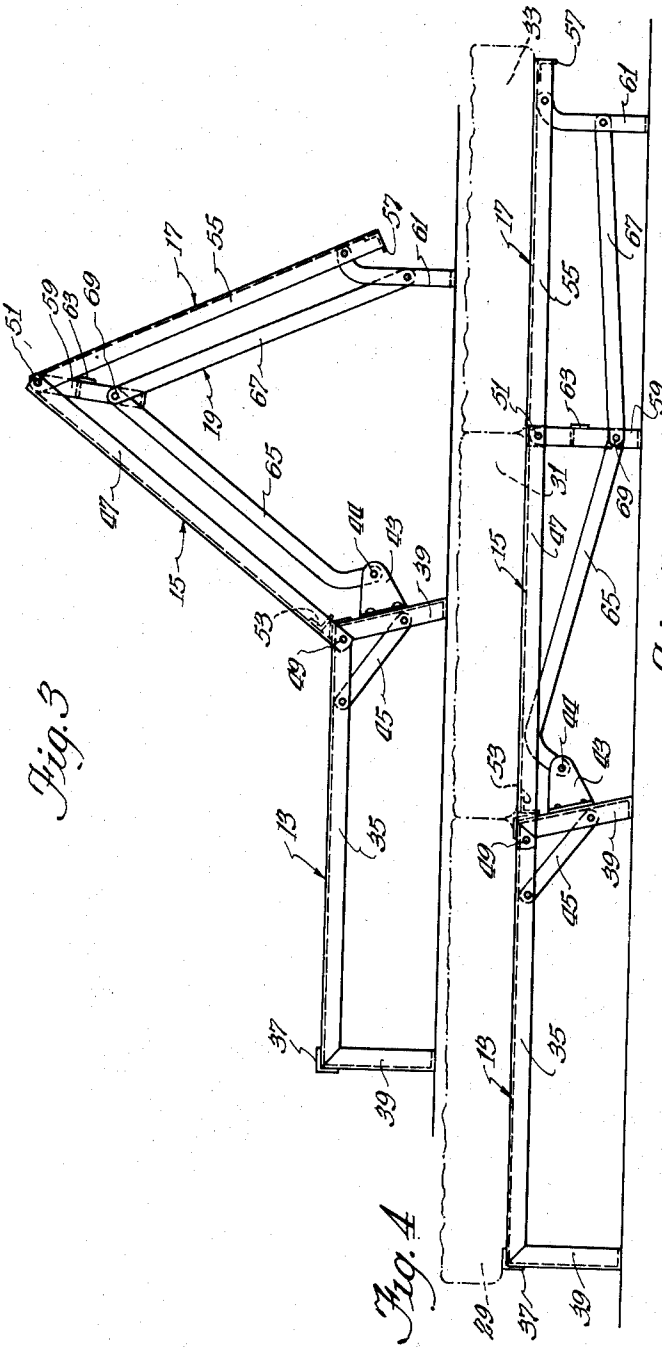


Fig. 3

Fig. 4

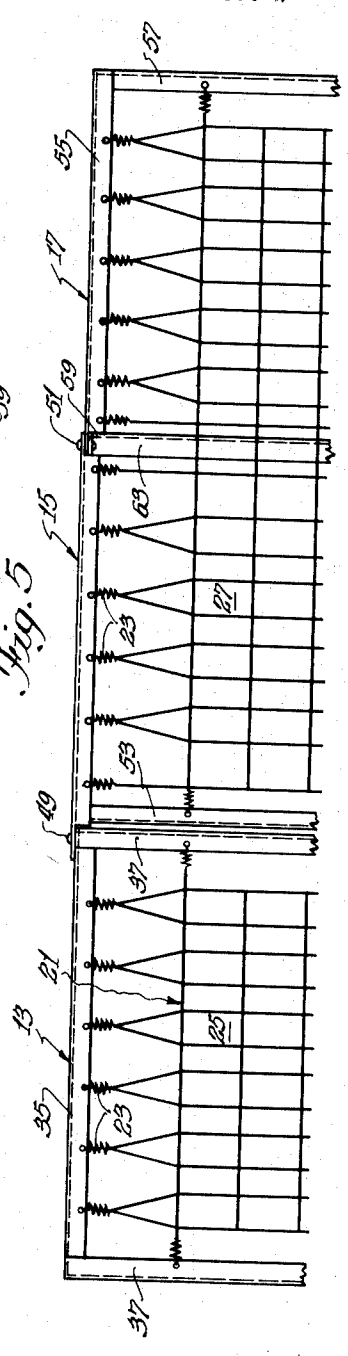


Fig. 5

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4 Claims. (Cl. 155—47)

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This invention relates generally to convertible furniture and is concerned particularly with a chair or sofa which may be converted into a bed.

More specifically, the type of convertible chair or sofa which embodies the present invention is one which comprises three hingedly-connected sections which are longitudinally extensible into co-planar relationship to form a bed, and in which two of those sections are foldable into overlapping relation with one another and to a position at right angles with the third section to form the chair or sofa. It is the principal object of the present invention to provide, in a convertible chair or sofa of this type, improved and simplified means for effecting the conversion of the chair or sofa into a bed, and vice versa, and more specifically to provide a unit of this type wherein the conversion may be effected by manipulation of only one of the foldable sections and without the need for engaging and disengaging any locks or latches.

Other objects of the invention will become apparent and the invention will be understood by reference to the following specification and the accompanying drawings in which there is illustrated one form of convertible unit embodying the invention.

In the drawings, Figure 1 is a perspective view of a convertible chair unit in accordance with the invention, showing the unit in chair position;

Figure 2 is a side elevation of the unit in chair position, showing by means of broken lines the path of movement of one of the sections of the unit during the conversion from chair to bed, or vice versa;

Figure 3 is a side elevation similar to Figure 2, but showing the movable sections at an intermediate position;

Figure 4 is a similar side elevation showing the sections of the unit extended into co-planar relation to form a bed; and

Figure 5 is a fragmentary plan view of the unit illustrated in Figure 4.

Briefly, the embodiment of the invention illustrated in the drawings is a chair 11 which comprises three relatively foldable sections, viz. a stationary seat section or base 13, a back section 15, and an end section 17, and an operating linkage 19 by means of which the sections may be locked in chair position, or converted into a bed by manipulation of the end section 17 only.

The sections 13, 15 and 17 are desirably constructed of angle iron frame members to which a cushion-supporting fabric 21 is attached by means of short helicals 23. As illustrated, the

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fabric 21 is of the wire link type comprising longitudinal and transverse sections of wire suitably interconnected and joined to the helicals 23 to provide a resilient support for cushions or the like, and includes a seat panel 25 and a unitary panel 27 which is common to the back section 15 and end section 17 of the chair. Three removable cushions (Fig. 1) 29, 31 and 33 are provided, two of which are superimposed on the seat section 13 to form a seat, the other reclining against the back section 15 to form a back rest. When the sections are aligned to form a bed, the cushions 29, 31 and 33 are spread out as a mattress, as shown in Fig. 4.

The seat section or base 13 includes a pair of opposed side members 35, and opposed front and rear members 37 rigidly connected to the side members by means of welding or otherwise. Short legs 39 are provided at each of the four corners of the seat section 13 and may, as illustrated, be formed integrally with the opposed side members 35. One of the flanges of the legs is desirably turned under so as to form a foot or pad 41 for distributing the load over the supporting surface. Extending rearwardly from each of the rear legs and rigidly secured thereto is an angle bracket 43 to which the operating linkage 19 is pivotally attached at 44. The rear legs are preferably inclined downwardly to the rear so that the linkage 19 may be attached to the seat section 13 a substantial distance rearwardly of the hinged connection between the seat and back sections without requiring an excessively long mounting bracket, and a corner brace 45 is secured to the side member 35 and to the rear leg to strengthen the leg against the downward thrust of the operating linkage on the bracket 43 when the unit is used as a chair, as will later be described.

The back section 15 comprises a pair of opposed side members 47, each having one end hinged at 49 to the seat section 13 and having its other end hinged at 51 to the end section 17. A cross member 53 rigidly connected between the opposed side members 47 adjacent their hinged connection to the seat section 13 serves the dual purpose of anchoring one end of the fabric panel 27 which extends between the back and end sections, and maintaining the spaced-apart relation of the opposed side members 47 of the back section 15 against the inward pull of the helicals 23 which support the fabric between the side members. This in turn assures the free action of the hinge connection 49 between the seat and back sections.

The end section 17 comprises a pair of opposed side members 55 each of which is hingedly connected at 51 to one of the side members 47 of the back section and is rigidly connected at its outer end to a cross member 57 which maintains the side members 55 in spaced-apart relation and forms an anchor for the outer end of the fabric panel 27.

When the chair 11 is extended to bed position (Fig. 4), the back section 15 is supported at one end by its hinged connection 49 to the seat section 13, and at its other end by a pair of foldable legs 59 pivotally attached at 51 to the side members 47 of the back section 15. The end section 17, in turn, is supported at its inner end by its hinged connection 51 to the back section 15 and at its outer end by a similar pair of foldable legs 61. An angle iron cross member 63, extending between the foldable legs 59 which support the back section 15, maintains the hingedly connected ends of the back section 15 and end section 17 in spaced-apart relation against the pull of the helicals 23. The cross member 63 is disposed below the plane of the fabric panel 27 to permit the fabric to be downwardly deflected a substantial distance without interference.

The operating linkage 19, includes the legs 59 and 61, a curved inner link 65 and an outer link 67, identical linkages preferably being provided at both sides of the unit. The inner link 65 is pivotally connected at 44 to the angle bracket 43 secured to the rear leg of the seat section 13 and is pivoted at its other end to the foldable leg 59 at a point 69. The outer link 67 is pivotally connected at one end to the foldable leg 59 at the point 69, and at its other end to the foldable leg 61 which supports the end section 17. The pivotal connections of the links 65 and 67 to the intermediate legs 59 may be a common connection 69, as shown, but it will become apparent from the subsequent description of the operation of the chair embodying the invention that the outer link 67 may be connected either to the intermediate folding leg 59 or to the inner link 65 at a point on either which is remote from the other.

The effective length of the inner link 65 between the pivot centers 43 and 69, and the distance between the pivot centers 51 and 69 of the intermediate foldable leg 59 are such, relative to the length of the back section 15, that the inner link 65 and the intermediate leg 59 form a toggle for rigidly supporting the back section 15 in substantially upright or chair position. From Figure 2, it may be seen that when the toggle knee 69 is disposed forwardly of a line extending between the pivot points 44 and 51, any rearward force exerted against the back section 15 tends to force the toggle knee 69 firmly against the underside of the side members 47 of the back section whereupon the back section is restrained against further rearward movement by the inner link 65. The outwardly curved, lower portion of the inner link 65 disposes its lower end 44 a substantial distance rearwardly of the hinge connection 49 between the seat and back sections for greater bracing effect, and yet permits the end section 17 to be compactly folded against the back section 15. The outer folding leg 61 is also desirably curved as illustrated so as to depend vertically when the back section 15 and end section 17 are folded (Fig. 2) thus permitting the back and end sections to be folded closely together.

To extend the sections 13, 15 and 17 into co-

planar, bed position, the operator merely grasps the end section 17, lifting it to the position indicated by the broken lines in Figure 2. If the hinged connections between all relatively movable parts are substantially frictionless, the back-section supporting toggle 44—69—51 will remain locked as shown during movement of the end section 17 to the broken line position. That is, the end section 17 and the outer link 67 will pivot freely about the pivot centers 51 and 69 without disturbing the position of the latter forwardly of the line through the pivot centers 44 and 51. However, upon further upward movement of the end section 17 from the broken-line position, the curved portion of the outer leg 61 will abut the underside of the side member 55 of the end section 17 to prevent further relative movement between the end section 17, the legs 59 and 61 and the outer link 67, and the toggle knee 69 will then move rearwardly over-center, thus breaking the lock. In the event that the outer foldable leg 61 is shaped otherwise than as illustrated, other positive stop means may be provided to limit relative movement between the end section 17, the legs 59 and 61, and the link 67, or any adjacent pair of them, in order to assure that the toggle will be broken when the end section is carried rearwardly and upwardly from its folded position. In other words, an appropriately positioned stop means between an adjoining pair of the members just referred to will cause those two members to become fixed relative to one another when the end section 17 is raised sufficiently to cause the stop means to become effective thereby, in effect, converting the quadrilateral linkage 59—55—61—67 into a trilateral one, which is incapable of relative movement. Thus the end section 17 and its appurtenances effectively become fixed to the toggle member 59, whereby further upward movement of the end section breaks the toggle. When the toggle knee passes rearwardly over a line extending between the pivot points 44 and 51, the back section 15 will recline and the end section 17 may be lowered to the floor, as shown in Figure 3. It will be apparent that further rearward motion of the end section will fully extend the legs 59 and 61, and bring all sections of the chair into co-planar alignment, as shown in Figs. 4 and 5.

If, on the other hand, the hinged connections between the relatively movable members of the unit are fairly stiff, the toggle knee 69 may be moved rearwardly past center by only slight upward movement of the end section 17 and the folded back and end sections may be moved more directly rearwardly into bed position without raising the end section to the broken line position shown in Figure 2. That is, the frictional resistance to free pivotal movement of the quadrilateral linkage 59—55—61—67, particularly of the outer leg 61 with respect to the end section 17 or the link 67, or both, will tend to cause the outer legs and the outer links 67 to prematurely move upwardly in unison with the end section 17 about the pivot 51 and, consequently, the resulting tension on link 67 will shift the toggle knee 69 over center with respect to the line through the pivot points 44 and 51 and thereby break the lock.

For the sake of economy of construction and positive operation, the intermediate folding leg 59 is preferably pivotally connected to the back section 15 on a common axis with the hinge connection 51 between the back and end sections. This conveniently permits the end section 17

to act directly upon the legs 59 to urge them over center to "make" the toggle lock, as for example, by the engagement of the downwardly-extending flanges of the side members 55 with the head of the rivet constituting the pivot 69 (Fig. 2) or suitable substitute therefor. However, the intermediate folding leg 59 may also be connected to the back section 15 at a point spaced from the hinged connection 51, without departing in principle from the operation of the illustrated embodiment. In such case, the abutment of the curved portion of the outer leg 61 with the underside of the side member 55 will still operate in the manner previously described to place the outer link 67 in tension and move the toggle knee 69 rearwardly over center to break the lock. Moreover, with the leg 59 connected to the back section 15 at a point spaced from the hinge connection 51, the folding of the end section 17 relative to the back section 15 will operate to make the toggle lock, so long as the leg 59 is positioned so that the pivot 69, during the folding action of the chair sections, will pass forwardly of the pivots 51 and 44. Normally, there will be sufficient friction in the pivot connections of the outer leg 61 with the side member 55 and the outer link 67 to cause the latter to exert a thrust on the leg 59 during folding of the back and end sections of the chair-bed. However, if such friction is insufficient for this purpose, it is obvious that a stop means may readily be provided between the outer leg 61, the end section 17, and the outer link 67, or any pair of them, so that, at a predetermined point in the folding action of the chair-bed, the outer link 67 will thrust the toggle knee 69 forwardly over center, with respect to a line through the upper pivot 51 and the pivot center 44.

It will further be apparent that since the primary function of the outer link 67 is to fold and unfold the outer leg 61, the outer link 67 is not confined, as shown, to a connection at the toggle knee 69. Satisfactory operation may be obtained by connecting the outer link 67 to the inner link 65 or to the intermediate foldable leg 59 at points on either which are spaced from the hinged connection 69 between those two members 65 and 59. And in this connection it should be noted that in a still different situation, where the outer link 67 is connected to the inner link 65 and the leg 59 is connected to the back section 15 at a point spaced from the pivot center 51, the thrust of the outer link 67 during the folding of the bed sections must be directed so that the point of action of the resultant force on the leg 59 passes forwardly of the line of the point of connection of the folding leg 59 with the back section 15 and the pivot 44.

When the sections 13, 15 and 17 are extended into bed position, as shown in Figures 4 and 5, the cushions 29, 31, and 33 may be rearranged, as indicated in Figure 4, to form a mattress for sleeping purposes. This loose cushion arrangement has the advantage of giving the unit more attractive lines when used as a chair but it will be appreciated that the invention may be applied as well to a chair or sofa wherein some or all of the cushions or upholstered portions are integral with the frame sections.

In order to reconvert the unit from a bed to a chair, the operator merely grasps the fabric panel 27 at some point adjacent the axis of the hinged connection 51 between the back section 15 and the end section 17, and lifts the fabric until the back and end sections assume a partially folded

position (Fig. 3) during which movement the outer leg 61 slides inwardly along the supporting surface toward the seat section 13. Further inward movement of the end section 17 from the partially folded attitude shown in Figure 3, will tend simultaneously to lift both sections and to rotate the outer leg 61 toward its fully folded position.

With the outer link 67 connected directly to the intermediate leg 59 and with the intermediate leg pivoted on the axis 51 as shown, the intermediate leg 59 will move in unison with the end section 17 about the pivot center 51 after relative movement between the end section 17, the intermediate leg 59, the outer link 67 and the outer leg 61, or any adjacent pair of them, becomes restrained. Thereafter, the end section 17 becomes operable to force the toggle knee 69 forwardly of a line between the pivot centers 44 and 51 to lock the unit in chair position, as illustrated in Fig. 2.

It will also be apparent that the bed may be folded into its chair-forming position by grasping and lifting the cross member 57, and walking forward to move it upwardly and forwardly until the back section 15 and end section 17 assume the position shown in dotted lines in Figure 2. Having reached the indicated position, it will be apparent that downward movement of the end section 17 about the pivot center 51 will effect a thrust on the toggle knee 69, through the outer link 67, to make the toggle lock.

It will be apparent from the foregoing description that the convertible unit of furniture embodying the invention is a greatly improved one in which the conversion of the unit from a chair or sofa to a bed may be simply and easily affected by manipulating only one of the foldable sections which comprise the unit. This improved operation results from the provision of a novel operating linkage which is inherently capable of supporting and locking the unit in chair position without the need of detents or latches, and which may be readily locked and unlocked as an incident to the manipulation of the aforementioned one section.

The features of the invention which are believed to be new and patentable are set forth in the following claims.

I claim:

1. A three-section convertible chair-bed comprising a stationary seat section, a normally upright back section pivoted to the rear of said seat section, and end section pivotally connected at its upper end to the upper end of said back section and normally depending from said back section at the rear thereof, said back section and said end section being rearwardly extensible into co-planar alignment with said seat section to form a bed, a depending foldable leg pivoted to said back section adjacent the upper end of said back section for supporting said back section in bed position, a link pivoted to said leg and to said seat section, the pivotal connection of said link to said seat section being spaced rearwardly from the pivotal connection of said back section to said seat section, said leg and said link forming a toggle for locking said back section against rearward movement from its upright position when the pivotal connection between said link and said leg is disposed forwardly of a line extending between the pivotal connection of said leg to said back section and the pivotal connection of said link to said seat section, a second foldable leg pivoted to said end section near its

lower end for supporting said end section in bed position, a second link pivoted to said second leg and to one of the members of said toggle, and means for limiting relative movement in one direction between said end section and said second leg whereby rearward movement of said end section away from its normal position is effective to break said toggle lock and to unfold said legs, thereby permitting said sections to assume said bed position.

2. A three-section convertible chair-bed comprising a stationary seat section, a normally upright back section pivoted to the rear of said seat section, an end section pivotally connected at its upper end to the upper end of said back section and normally depending from said back section at the rear thereof, said back section and said end section being rearwardly extensible into co-planar alignment with said seat section to form a bed, a depending foldable leg pivoted to said back section adjacent the upper end of said back section for supporting said back section in bed position, a link pivoted to said leg and to said seat section, the pivotal connection of said link to said seat section being spaced rearwardly from the pivotal connection of said back section to said seat section, said leg and said link forming a toggle for locking said back section against rearward movement from its upright position when the pivotal connection between said link and said leg is disposed forwardly of a line extending between the pivotal connection of said leg to said back section and the pivotal connection of said link to said seat section, a second foldable leg pivoted to said end section near its lower end for supporting said end section in bed position, a second link pivoted to said second leg and to one of the members of said toggle, and means for limiting relative movement in one direction between said second leg and said second link whereby rearward movement of said end section away from its normal position is effective to break said toggle lock and to unfold said legs, thereby permitting said sections to assume said bed position.

3. A three-section convertible chair-bed comprising a stationary seat section, a normally upright back section pivoted to the rear of said seat section, and an end section pivotally connected at its upper end to the upper end of said back section and normally depending from said back section at the rear thereof, said back section and said end section being rearwardly extensible into co-planar alignment with said seat section to form a bed, a depending foldable leg pivoted to said back section for supporting said back section in bed position, said pivotal connections of said leg and said end section to said back section having a common axis, a link pivoted to said leg and to said seat section, the pivotal connection of said link to said seat section being spaced rearwardly from the pivotal connection of said back section to said seat section, said leg and said link forming a toggle for locking said back section against rearward movement from said upright position when the pivotal connection between said link and said leg is disposed forwardly of a line extending between the pivotal connection of said leg to said back section and the pivotal connection of said link to said seat section, a second foldable leg pivoted to said end section near the lower end of said end section for supporting said end section in bed position, a second link pivoted to said second leg and to said first mentioned leg, and a first means limiting relative movement in one direction between said end section and said legs whereby unfolding movement of said end section is effective to break said toggle lock and to unfold said legs, and a second means limiting relative movement in the other direction between said end section and said legs whereby folding movement of said end section is effective to make said toggle lock and to fold said legs.

4. A three-section convertible chair-bed comprising a stationary seat section, a normally upright back section pivoted to the rear of said seat section, an end section pivotally connected at its upper end to the upper end of said back section and normally depending from said back section at the rear thereof, said back section and said end section being rearwardly extensible into coplanar alignment with said seat section to form a bed, a depending foldable leg pivoted to said back section adjacent the upper end of said back section for supporting said back section in bed position, a link pivoted to said leg and to said seat section, the pivotal connection of said link to said seat section being spaced rearwardly of the pivotal connection of said back section to said seat section, said leg and link forming a toggle for locking said back section against rearward movement from its upright position when the pivotal connection between said link and said leg is disposed forwardly of a line extending between the pivotal connection of said leg to said back section and the pivotal connection of said link to said seat section, a second foldable leg pivoted to said end section near its lower end for supporting said end section in bed position, a second link pivoted to said second leg and to one of the members of said toggle, and means for limiting relative movement in one direction between said end section and one of said legs whereby rearward movement of said end section away from its normal position is effective to break said toggle lock and to unfold said legs, thereby permitting said sections to assume said bed position.

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