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Fadler et al.

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[54] **SOFA-SLEEPER**

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[52] **U.S. Cl.** ..... **5/13,** 5/51 D, 5/203

[51] **Int. Cl.** **A47c 17/40,** A47c 17/14

[58] **Field of Search** ..... 5/12, 13, 29, 30, 51 D, 5/51 P, 56, 203, 211, 223–227, 310, 312, 316, 322

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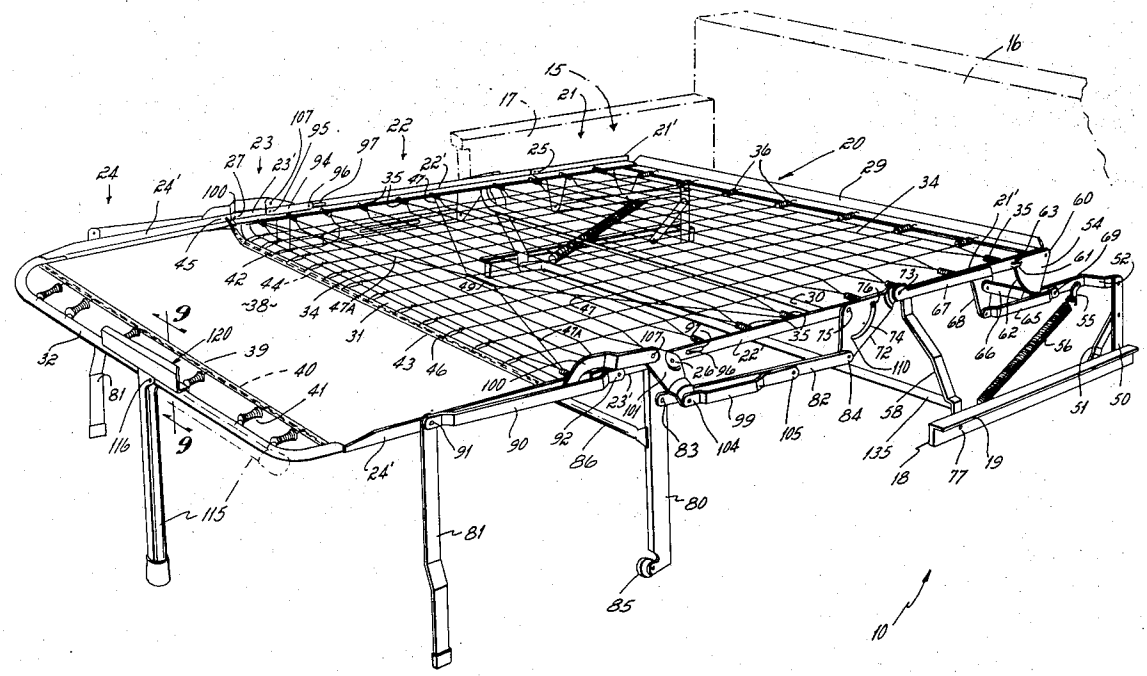
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[57] **ABSTRACT**

A sofa or davenport having a foldable bed frame adapted to provide a seat when used as a sofa and a forwardly extending unfolded bed frame when used as a bed. The foldable frame includes pivotally interconnected head, body, intermediate and foot sections and a linkage operable to automatically control extension and contraction of supporting legs and to control folding of the head section beneath the back rest cushion of the sofa. The foldable head, body, and intermediate sections of the frame are covered by a laterally and longitudinally tension wire link fabric, which fabric is reinforced by tensioned wires beneath the body section of the fabric. These wires provide a better seat cushion foundation when the unit is used as a seating surface and an improved mattress foundation when the unit is used as a bed. The unit also includes a front bed cross rail supporting leg and a detachable front mattress retainer.

11 Claims, 11 Drawing Figures



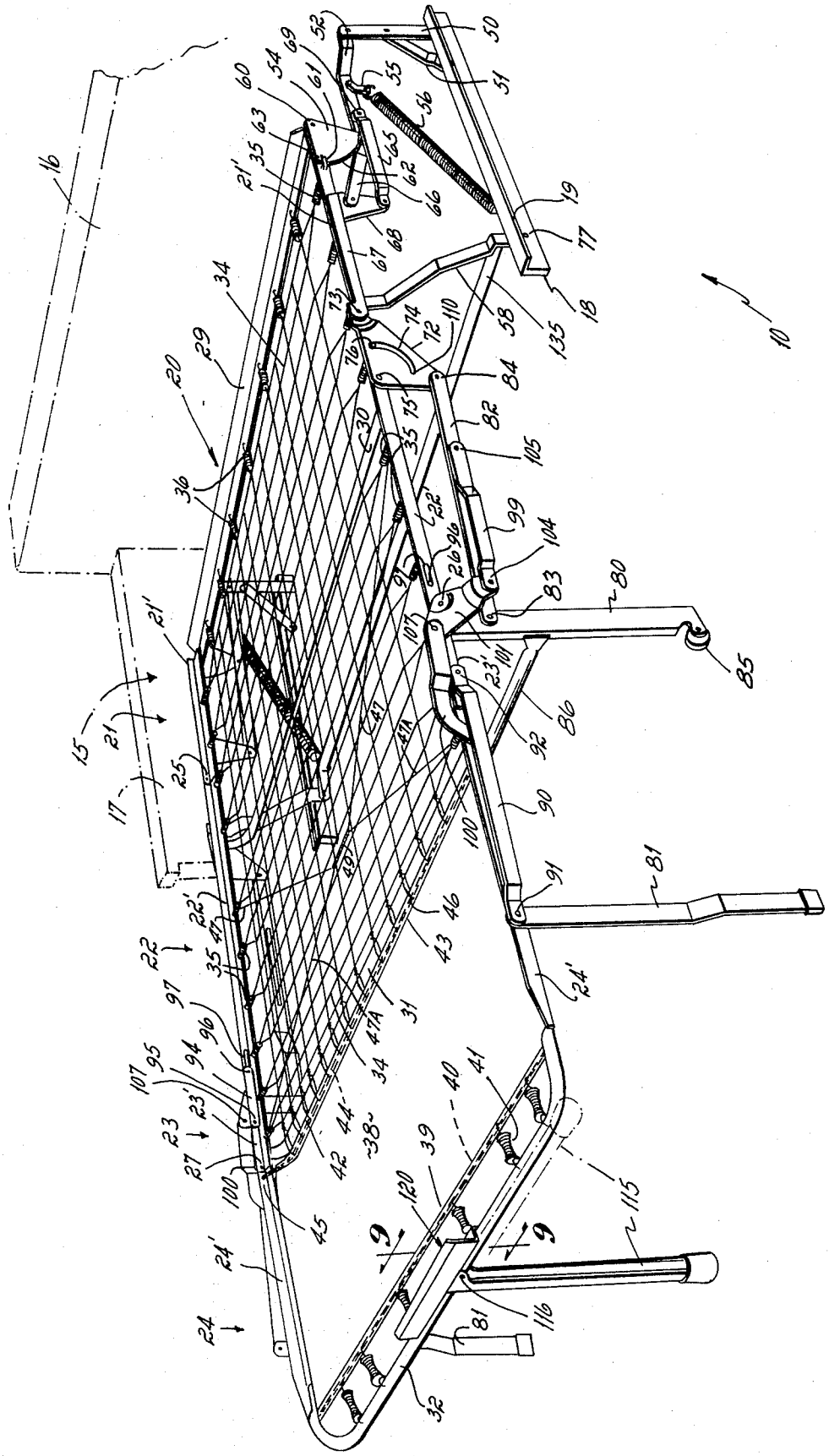


Fig. 1

Fig. 2

Fig. 10

Fig. 11

Fig. 8

Fig. 9

Fig. 6

Fig. 7

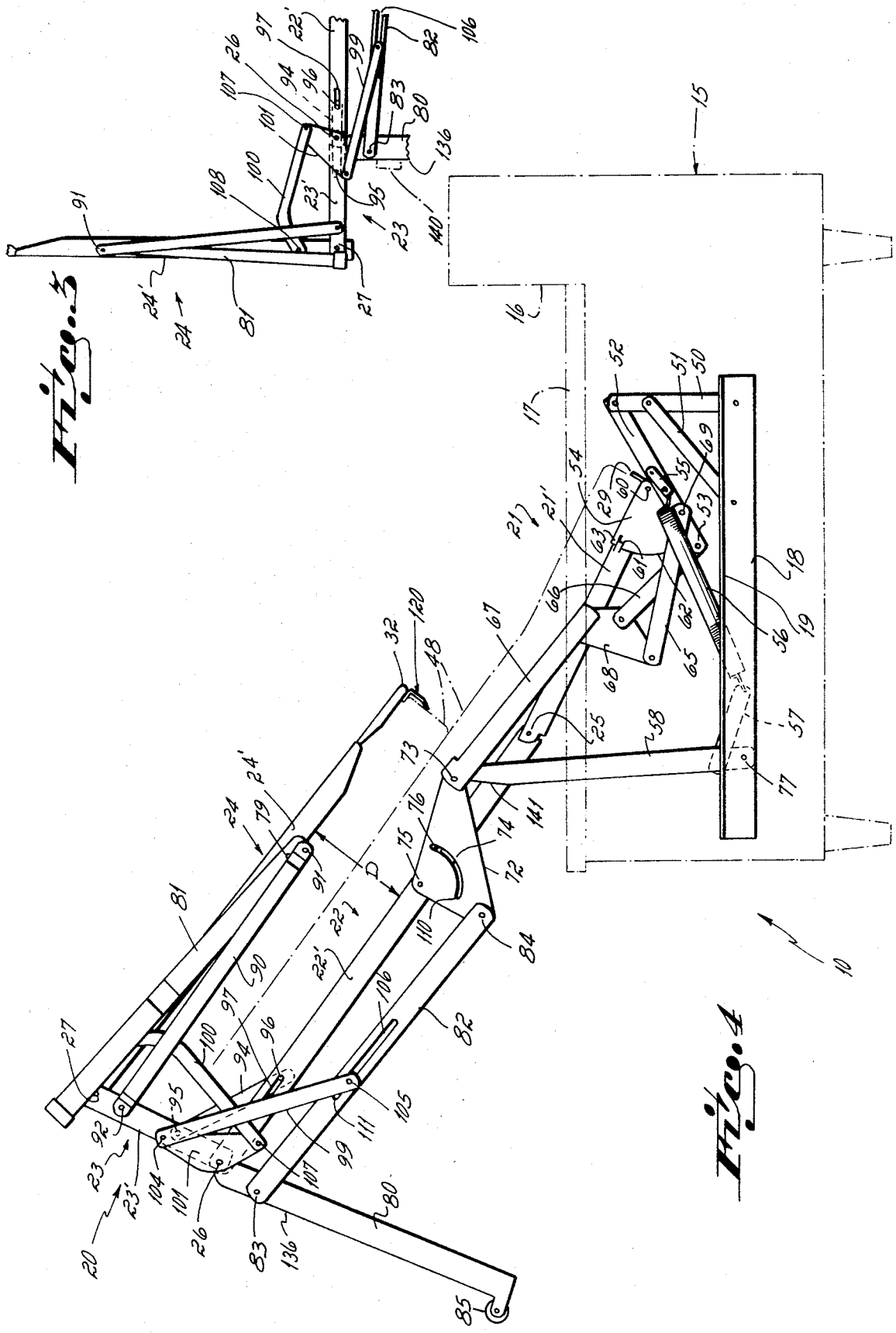


Fig. 3

Fig. 4

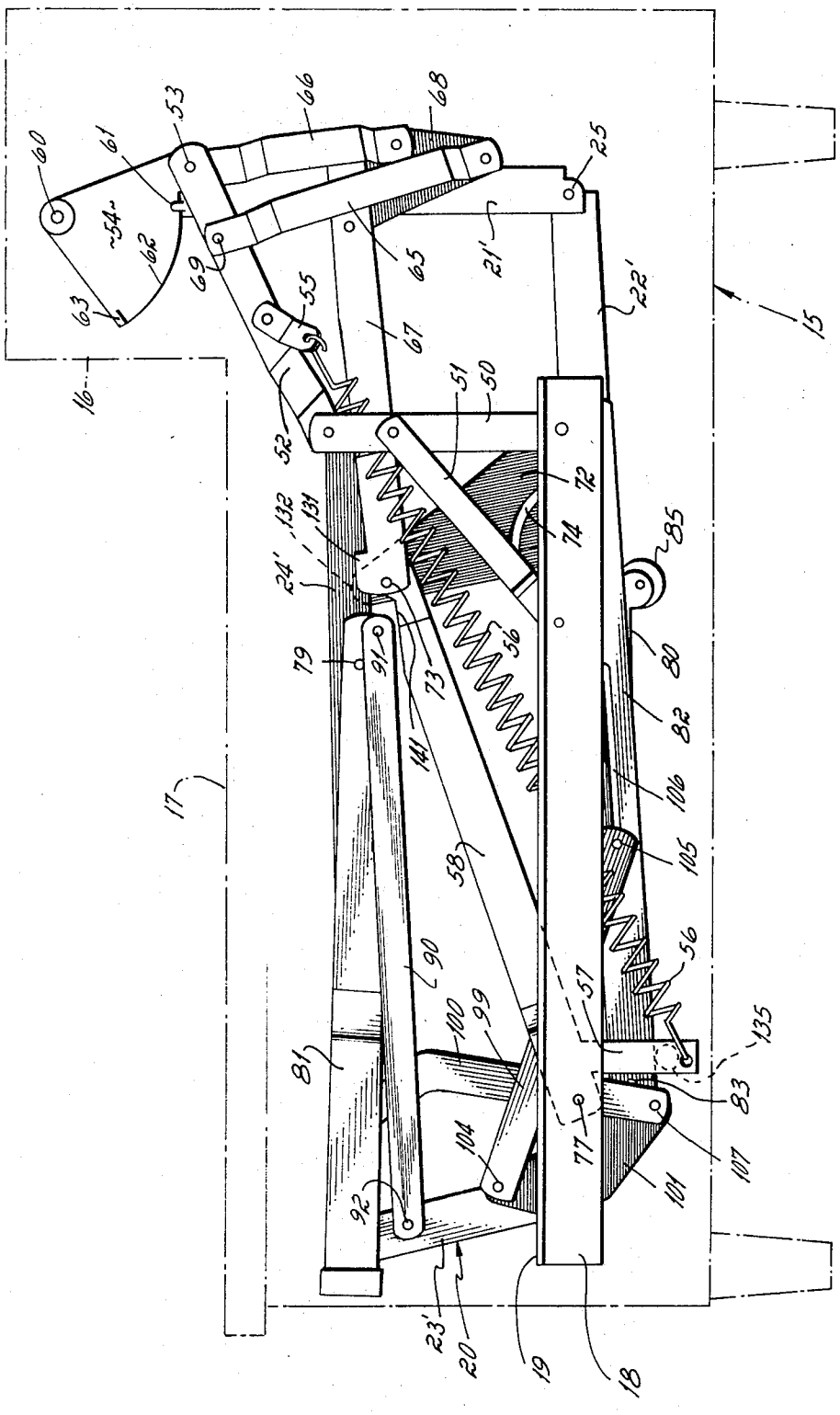

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Fig. 5

SOFA-SLEEPER

This invention relates to a combination sofa-sleeper bed and more particularly to a sofa of the type which includes a foldable bed which may be collapsed and hidden in the bottom of the sofa when the unit is used as a seating surface.

Prior foldable sofa-sleepers have long been available but have always been characterized by a relatively poor sleeping surface. In general, the prior sofa-sleepers have always represented a compromise between a good bed and a good sofa with the result that the combination sofa-sleepers, no matter how well constructed, were not as good for sleeping as most beds and were not as good for seating as most sofas. In general, the poor sleeping quality was attributable to a poor foundation beneath the mattress and the poor seating quality was attributable to the same source, the lack of a firm foundation beneath the seat cushions.

It has therefore been one objective of this invention to improve the sleeping and seating comfort of a combination sofa-sleeper. This objective has been accomplished and one aspect of this invention is predicated upon the discovery that crossed wires located beneath the tensioned wire fabric of a body-supporting section of a collapsible frame has the dual effect of improving the comfort of a unit both as a sleeping surface and as a seating surface. We have discovered that the crossed wires prevent sagging of the tensioned fabric with the result that they markedly increase the support foundation for both the mattress and the seat cushions and consequently these simple crossed wires markedly improve the comfortability of the unit for both sleeping and seating purposes.

Another disadvantage of all prior combination sofa-sleepers has been the necessity for providing numerous different styles and shapes of sleeper fixture units for each style and shape of sofa construction. If the sofa required a 17 inch high seating surface, the fixture was designed differently than if the sofa were intended to have a 16 inch seating surface. Alternatively, if the sleeper were intended to house a 5 inch thick mattress, it always required a completely different fixture design than one which was intended to house a 3½ inch thick mattress.

It has therefore been another objective of this invention to provide a standard sleeper fixture which may, with minimal adjustment or modification, provide different height seat surfaces and/or accommodate differing thickness mattresses. This objective has been accomplished by providing a standard width and length foldable frame with a unique linking system for accomplishing the folding and unfolding of the frame as well as the supporting legs.

Still another ojective of this invention has been to provide a better supported foot section for the frame when it is extended into a bed position. To this end, the sofa-sleeper of this invention incorporates a front rail supporting middle leg which in the folded condition of the unit folds up against the front cross rail but in the extended condition of the unit automatically drops to a position from which it may be manually moved to a locked condition with a minimum of effort. In the extended locked condition the center front leg adds support to the front of the bed so that a person may sit upon it without bending the front cross rail and without excessively loading the other supporting legs of the bed.

Another objective of this invention has been to provide a removable mattress retainer attached to the front cross rail of the bed. Heretofore mattress retainers have always been welded or fixedly secured to the cross rail with the result that they could not be easily removed if a customer or merchandizer preferred to utilize the unit without the mattress retainer.

Still another objective of this invention has been to provide a collapsible frame for a combination sofa-sleeper which remains squared as the unit is folded from a bed to a sofa position. To assist in squaring the unit as it is folded, the combination sofa-sleeper frame of this invention incorporates guides for guiding and supporting the top section of the frame as it is collapsed onto the lower section in a folded sofa condition.

In general the sofa-sleeper fixture of this invention which accomplishes these objectives comprises a foldable bed frame adapted to be folded into an upholstered stationary box-like sofa frame. The foldable bed frame includes pivotally interconnected head, body, intermediate and foot sections, the first three of which support a laterally and longitudinally tensioned wire link fabric and the foot section of which supports a longitudinally tensioned canvas fabric. The pivotally interconnected bed sections are supported in an extended bed position by a plurality of pivotally mounted legs and interconnected linkages operable to automatically retract the legs into a folded position when the bed frame is folded into a sofa position. This linkage is also operable to automatically lock the frame in an extended condition when the unit is unfolded as a bed surface and to automatically lock it in a compressed folded condition when the unit is folded into a sofa condition.

A primary advantage of the combination sofa-sleeper of this application is its adaptability to styles and shapes of upholstered sofa constructions which have differing seat height surfaces and/or which house differing thickness mattresses. This ability to accommodate differing heights and different mattresses enables a single fixture to fit numerous styles and variations of sofa-sleepers.

Another distinct advantage of this sofa-sleeper resides in the comfort of its seating and sleeping surfaces. This improved comfort primarily results from the better foundation provided by the tensioned crossed wires located beneath and supporting the wire link fabric in the body section of the frame.

These and other objects and advantages of this invention will be more readily apparent from the following description of the drawings in which:

FIG. 1 is a perspective view of a foldable sofa-sleeper fixture embodying the invention of this application, the sleeper being shown in the extended bed position;

FIG. 2 is a side elevational view of the sofa-sleeper of FIG. 1;

FIG. 3 is a side elevational view of the forward end of the sofa-sleeper of FIG. 1 but with the foot section partially folded;

FIG. 4 is a side elevational view of the sofa-sleeper of FIG. 1 but with the foot section folded into overlying relation with the body section and illustrating the second step in folding the frame to a sofa position;

FIG. 5 is a side elevational view of the frame in completely folded sofa position;

FIG. 6 is a perspective view of the bed lock plate portion of the linkage system in a folded sofa position;

FIG. 7 is a cross sectional view through the bed lock portion of the linkage system taken on line 7—7 of FIG. 6;

FIG. 8 is an exploded perspective view of the removable mattress retainer and of the end cross rail of the bed frame;

FIG. 9 is a cross sectional view through the mattress retainer taken on line 9—9 of FIG. 1;

FIG. 10 is a perspective view, partially in phantom, of the front center leg for supporting the front cross rail of the foot section of the bed;

FIG. 11 is a cross sectional view of the front cross rail taken along line 11—11 of FIG. 10.

Referring first to FIGS. 1 and 2, it will be noted that the combination sofa-sleeper fixture 10 is illustrated as being mounted upon a frame 15 of an upholstered sofa which has a backrest cushion 16 and sofa arms 17. The sofa does not form any part of the invention of this application and may comprise any well known standard upholstered frame construction. In fact, one aspect of this invention is predicated upon the fact that this sofa-sleeper fixture 10 easily accommodates itself to differing upholstered sofa frames which have seat sections of differing heights and mattresses of differing thicknesses.

The foldable sofa-sleeper fixture 10 comprises a pair of anchor plates 18 which have top flanges 19 extending outwardly. These top flanges 19 are intended to be mounted on top of the side mounting rail of an upholstered sofa arm. Alternatively, the flanges 19 may be mounted in a slot or lip of a side rail of a couch arm or they may be mounted on top of a mounting block if the unit is to be spaced away from the arm 17 of the upholstered couch assembly. In any event, and as may be most clearly seen in FIG. 4, the side stationary frame plate 18 is fixedly attached as by screws (not shown) to the upholstered wooden frame of the couch assembly in a position in which the frame 18 is spaced substantially above floor level.

The foldable bed frame 20 of the fixture includes pivotally interconnected and transversely arranged bed frame head section 21, body section 22, intermediate section 23, and foot section 24, the pivotal connections being indicated at 25, 26, and 27, respectively. Substantially parallel side frame rails or angles 21', 22', 23' and 24' of these bed sections 21, 22, 23, and 24 may be made of any suitable metal shape such as angle iron.

The side frame angles 21' of the head section 21 are interconnected by a transverse mattress retainer angle 29. Adjacent their opposite ends, the side frame angles 22', 23' of the body section 22 and intermediate section 23 are interconnected by downwardly offset transverse cross ties 30, 31; and the side frame angles 24' of the foot section 24 are interconnected by a front rail or cross tie 32.

Stretched between the side frame angles of the head, body, and intermediate sections 21, 22, and 23 of the frame 20 is a continuous interconnected link fabric 34 of conventional construction. The transverse wires of the link fabric 34 are resiliently connected to the side frame angles of the head, body, and intermediate sections by coil springs 35. The longitudinally extending wires of the link fabric are connected to the mattress retainer angle 29 by coil springs 36.

The foot section 24 of the frame is provided with a transversely extending strip 38 of suitable fabric material such as a relatively heavy canvas. The canvas strip 38 may be provided along its forward edge with a folded sleeve 39 to receive a flexible metal wire or rod 40 which provides a support and connection for inner ends of a plurality of transversely spaced coil springs 41 longitudinally disposed and connected at their outer ends to the front rail 32. The rod 40 is not connected to the bed frame.

The back or rearward edge of the canvas strip 38 is cut in a curved form as indicated at 42 and is similarly provided with a folded sleeve 43 which receives a pliant tensioned flexible curved wire 44. The wire is pivotally connected at its ends as at 45 to the rear ends of the angles 24' of the foot section 24. The back or rear corners of the canvas strip are connected with the foot bed section 24 at the connections of the wire element 44 to the angles 24' of the foot section.

The length of curved wire element 44 is greater than the transverse width between the parallel side frame angles 24' of the foot section 24. The tension curved wire element 44 serves to longitudinally stretch and tension the canvas strip 38 independently of the adjacent longitudinal wires of link fabric 34. These longitudinal wires of link fabric 34 are connected at their ends 46 to strip 38 through the wire element 44. The canvas strip is thus stretched longitudinally of the bed frame 20 but is not stretched transversely of the bed frame. This connection of the canvas strip 38 to the bed frame maintains the canvas strip under tension when the bed sections are folded as illustrated in FIG. 5 or extended as illustrated in FIGS. 1 and 2 and provides a soft yieldable front edge portion for the sofa seat when the bed frame is folded into the sofa position.

The top section of the bed frame including the link fabric 34 and canvas strip 38 which has been heretofore described forms no part of the invention of this application. It is completely illustrated and described in U.S. Pat. No. 2,878,490.

As illustrated in FIG. 4, the link fabric 34 and canvas strip 38 support a mattress 48 in a conventional construction and selected thickness. This mattress is capable of being folded intermediate its ends as illustrated in that figure.

In order to better support the middle section of the fabric or that section of fabric located within the body section 22 of the frame, a pair of crossed wires 47, 47A extend between diagonally opposed corners of this section of the frame. In the preferred embodiment these wires 47, 47A are twisted together at their intersection 49 so as to increase the tension in them. It has been found that the inclusion of these tensioned wires beneath the body section of the fabric 34 has the dual effect of increasing the foundation or support of the fabric in the bed or sleeping position and of increasing the support of the fabric when the fixture is in a sofa position. In either a seating or a sleeping position of the fixture, the majority of weight carried by the cushions or mattress is ultimately supported by the wire link fabric located in the body section of the frame and reinforced in that section by the crossed wires 47 and 47A.

Because of the presence of these tensioned crossed wires beneath the link fabric in the body section of the frame, the fixture 10 has been found to provide a more firm foundation for the mattress so that it does not sag in the middle when a person is sleeping upon it. And

these crossed wires also provide a firmer foundation for the sofa cushions when a person is seated over that section. It is to be noted that the crossed wires are located immediately beneath the fabric seat section **24** of the frame when the unit is fully folded as illustrated in FIG. **5.** Consequently, a person seated on a cushion located above the fabric deck **38** is supported from the body section **22** of the link fabric which is reinforced at that point by the crossed wires **47** and **47A**. The crossed wires **47, 47A** thus prevent sagging and render the unit more comfortable in both a sitting or sofa condition and in a bed or sleeping position.

The complete bed frame **20** is supported from the two anchor plates **18** upon a pair of fixed or stationary rear hanger arm posts **50** and a pair of main pilot arms **58** which are pivoted to the anchor plates **18** by rivets **77.** The posts **50** are reinforced by post braces **51** which extend between and are riveted to the post **50** and the anchor plates **18.**

At its upper end each post **50** pivotally supports one end of a pivot arm **52.** The opposite end of the pivot arm is pivotally connected as at **53** to one corner of a generally triangular shaped stabilizing plate **54.** Immediate its end the pivot arm **52** has attached a spring tag **55.** This tag supports one end of a tension spring **56,** the opposite end of which is fixedly attached to an extension arm **57** of the main pilot arm **58.** This tension spring **56** holds the frame **20** in a collapsed sofa position, assists the opening of the sofa-sleeper unit, and holds the frame **20** in a partially opened counterbalanced position.

The rear corner of the head section angle **21'** is pivotally attached to the stabilizer plate **54** by a rivet connector **60.** In order to further stabilize and prevent side sway of the rear section of the frame, a finger **61** protrudes upwardly from the head section angle **21'** and over an arcuate section **62** of the stabilizing plate **54.** This finger **61** further acts as a stop engageable with a raised abutment **63** of the stabilizing plate to limit movement of the plate relative to the head section **21** of the bed frame.

To further stabilize the head section of the frame and prevent its lateral movement, two stabilizing bars **65** and **66** interconnect the pivot arm **52** to a pilot actuating arm **67.** This arm **67** has a depending tab **68** to which the forward ends of the two arms **65** and **66** are pivotally connected. The rear ends of these same arms **65, 66** are pivotally connected to the pivot arm **52** at **69** and **53,** respectively.

The pilot actuating arm **67** is pivotally connected at its forward end to both the upper end of the main pilot arm **58** and a bed lock plate **72** by a single rivet **73.** The bed lock plate is in turn pivotally connected to the body section angle **22'** by a pivotal connector or rivet **75.** There is also a pin **76** which protrudes from the body section angle **22'** of the bed frame and through an arcuate slot **74** of the bed lock plate. This latter pin or rivet **76** limits the rotational movement of the bed lock plate **72** to an angle of approximately 105°.

When extended into a bed position, the frame **20** is supported by a pair of foldable center legs **80** and a pair of front legs **81.** The center legs **80** are pivotally attached at their upper ends (pivot **26**) to the forwardmost end of the body section angles **22'** and similarly the front legs are pivotally attached near their upper ends to the foot section angles **24'** by a rivet **79.** When unfolded, these legs support the center and forwardmost ends of the frame **20** in an unfolded or bed position.

In order to control folding of the center legs **80,** a center leg-actuating arm **82** is pivotally connected at its forward end, as by a rivet **83,** to each of the center legs **80** and at its rear end to each of the bed lock plates **72.** The connection between the bed lock plate **72** and the actuating arm **82** is preferably a rivet **84.**

As may be seen in FIGS. **3, 4,** and **5,** the actuating arms **82** cause the center legs **80,** which are preferably interconnected by a cross brace **86,** to fold up under the body section **22** of the frame when the unit is collapsed from a bed to a sofa condition, and similarly the arms **82** cause the legs to be extended to a condition normal to the body section **22** when the frame **20** is unfolded from a sofa to a bed condition. There is preferably a roller **85** on the lower end of each center leg so as to enable that leg to roll over a floor surface.

In order to collapse the front legs **81** from a vertical position to a position in which they are generally parallel to the foot section **24** of the frame **20,** an actuating arm **90** is pivotally connected at one end to the top of the leg as at **91** and is pivotally connected to the intermediate section angle **23'** as at **92.** As may best be seen in FIGS. **1** and **3,** lifting of the foot section of the frame from a horizontal to a vertical position automatically causes the front leg **81** to be collapsed into a position in which it is substantially parallel to the foot section angles **24'** and, similarly, lowering of the foot section automatically extends the legs **81** beneath the frame **20.**

In order to position the intermediate section **23** of the frame in a substantially vertical plane when the bed frame is folded into a sofa position, a link **94** is pivotally connected at one end **95** to the intermediate section angle **23'.** The other end of the link **94** is provided with a pin **96** which is slideably received within a longitudinally extending slot **97** provided in the body section angle **22'** adjacent to the pivotal connection between the center leg **80** and the body section angle **22'.** The pin **96** abuts the back end of the slot **97** when the foot, intermediate and body sections of the bed frame are in a final folded position as shown in FIG. **4.** When the bed frame is in a fully extended or bed position, the pin **96** is positioned adjacent the forward end of the slot as shown in FIGS. **1** and **2.**

In order to control articulation of the foot section **24** of the frame relative to the intermediate section **23** and to lock the foot section, intermediate section, and body section (**24, 23** and **22**) in a collapsed position, each foot section angle **24'** is connected to one of the actuating arms **82** by a bell crank **101,** a bell crank actuating arm **100** and a compression arm **99.** The bell crank **101** is pivotally connected to the body section angle **22',** the intermediate section angle **23',** and the center leg **80** by the single pivot **26.** One end of this bell crank **101** is pivotally connected as at **104** to one end of the compression arm **99.** The opposite end of the compression arm has a pin **105** which extends through and is slideable within a slot **106** of the actuating arm **82.** The opposite end of the bell crank is pivotally connected as indicated at **107** to the bell crank actuating arm **100,** the opposite end of which is pivotally connected at **108** to the foot section angle **24'.**

Referring to FIG. **3,** it will be seen that the length of the slot **106** in the actuating arm **82** is such that after the foot section **24** of the frame has been folded to a

vertical position, any further rotational movement of the foot section about the pivot **27** is precluded by the compression arm **99**, the bell crank **101** and the bell crank actuating arm **100** because of the pin **105** attached to the compression arm **99** having bottomed against the forward end **111** of the slot **106**. Thereafter, continued rotational movement of the foot section **24** causes the intermediate section **23** of the frame to pivot about the pivot point **26** until the intermediate section **23** reaches a position in which it is approximately perpendicular to both the body section **22** of the frame and the foot section **24**. At this point the pin **96** of the main brace stop arm **94** engages the rear end of the slot **97** and prevents any further rotational movement about the pivot **26** (see FIG. **4**).

This same linkage, including the bell crank actuating arm **100**, the bell crank **101** and the compression arm **99**, also serve to lock the foot section **24**, the intermediate section **23** and the body section **22** of the frame in a fully collapsed condition when the frame is completely folded into a sofa position. To this end it will be noted in FIGS. **4** and **5** that the last increment of movement as the frame moves from the position illustrated in FIG. **4** to that illustrated in FIG. **5** is for the bed lock plate **72** to rotate in a counterclockwise direction as viewed in this figure until the stop pin **76** engages the lowermost end **110** of the slot **76**. This final increment of movement of the bed lock plate **72** causes the actuating arm **82** to be moved downwardly and rearwardly until the stop pin **105** engages the end **111** of the slot **106**. Continued rotational movement of the lock plate then causes the compression arm **99** to rotate the bell crank **101** in a clockwise direction to the overcenter position illustrated in FIG. **5** in which the folded mattress (illustrated in phantom lines in FIG. **4**) is fully compressed between the body section **22** of the frame and the foot section **24**. In this locked compressed condition of the mattress between these two sections **22** and **24** of the frame **20**, the canvas fabric **38** over the foot section **24** forms a firm rearwardly sloping seat for the sofa and one which does not collapse or give when a person sits down upon it.

In the preferred embodiment of this invention, the bed frame **20** includes a third front leg **115**, which is pivotally attached as at **116** to the center of the front cross rail **32**. When viewed in cross section (as may be most clearly seen in FIG. **11**) the third leg is half-moon or crescent shaped so that when folded into the phantom position illustrated in FIGS. **1** and **10**, it fits snugly around the tubular front rail **32**. The fit of the leg around the cross rail, though, is loose enough so that the center leg automatically drops down to an open position when the frame is folded to an open or bed position. A friction lock at the top of the leg prevents the leg from dropping completely down so that it must be manually moved to an overcenter position in which it defines an included angle α of approximately 105°. The friction lock in the over center position of the leg with respect to the center rail prevents the leg from folding or collapsing when weight is applied to the end of the cross rail. This center leg **115** is preferably 1/16 inch shorter than the other two front legs **81** so that it is in use and supports weight only when there is weight on the cross rail **32**.

The advantage of this center leg is that it prevents bowing of the front rail **32** when someone sits on the end of the frame. It also reduces side sway and thus minimizes the chances of the front legs **81** collapsing under excessive loading and, of course, it relieves the front legs **81** of some weight so that they need not be reinforced.

In order to retain the mattress **48** on the frame, the preferred embodiment of the fixture **10** includes a removable mattress retainer **120**. As may be seen most clearly in FIGS. **1, 8,** and **9**, this retainer is generally Z-shaped in cross section and comprises a horizontal shelf section **122** from which there extends a rear vertical flange **123** and a front vertical section **124**. The front section **124** serves as a barrier to prevent the mattress from sliding past it over the cross rail **32**.

In order to secure the retainer on the cross rail, it includes two generally L-shaped slots **125, 126** which extend through the depending rear flange **123** and the horizontal shelf section **122**. The spacing of the slots is identical to the spacing of the two center coil springs **41** which extend between the front cross rail **32** and the canvas deck **38**. Consequently, the mattress retainer may be slipped over the springs and then shifted laterally so as to removably secure it onto the cross rail **32**.

Because the retainer **120** is removable, persons who wish to remove it may easily do so to accommodate their sitting on the end of the bed. With a normal height mattress, though, the retainer should not interfere with sitting on the bed because of its small size and low height.

OPERATION

The folding sequence in which the fixture converts from a bed as illustrated in FIG. **1** to a sofa is illustrated in FIGS. **2–5**.

Referring first to FIGS. **2** and **3**, it will be seen that the first step in the folding of the bed is to lift the front rail **32** until the foot section **24** of the frame is located in a vertical plane. As a consequence of this movement, the front legs **81** are caused by the actuating arms **90** to fold in parallel to the foot section angles **24'**. Simultaneously with or immediately after this folding of the front foot section of the frame **24**, the front center leg **115** is folded up against the front cross rail **32**.

The next step in the sequence is to continue the folding movement of the foot section **24** of the frame pushing it rearwardly from the position illustrated in FIG. **3** to that illustrated in FIG. **4**. After the foot section **24** reaches the vertical position of FIg. **2**, it is precluded from any further pivotal movement about the pivot **27** by the bell crank actuating arm **100**, the bell crank **101** and the compression arm **99**. Consequently, continued pushing against the top of the cross rail **32** causes the frame to pivot about the pivot point **26** thereby lifting the intermediate section **23** of the frame into a vertical condition. In the vertical condition of the intermediate section of the frame the forward end of the mattress **48** is completely folded over upon itself to a double thickness as shown most clearly in FIG. **4**. When the intermediate section **23** of the frame reaches a vertical position, the foot section **24** is then located in a horizontal plane over the top of the double thickness mattress. The intermediate section **23** is then precluded against continued rotational movement about the pivot **26** by the stop arm **94**.

Continued folding movement of the frame is then effected by lifting the seat rail **31** upwardly so as to lift what is now the front of the partially folded frame in-

cluding the center legs **80** upwardly to the position illustrated in FIG. **4.** This upward movement of the front of the frame causes the main pilot arm **58** to rotate about its lower pivot **77** and simultaneously cause the bedlock plate **72** to rotate in a counterclockwise direction as viewed in FIG. **4.** This counterclockwise rotation of the bed lock plate has the effect of completely collapsing the two center legs **80** beneath the body section **22** of the frame.

Simultaneously with the lifting of the front of the partially collapsed frame, the rear end, including the head section **21** and the rear mattress retainer angle **29,** are lowered while they are moved rearwardly to the position illustrated in FIG. **4.** This lowering of the head section **21** of the frame and particularly the mattress retainer angle **29** enables the mattress retainer angle to be moved beneath and clear the bottom of the back rest cushion **16** preparatory to the head section of the frame being moved up into a cavity in the back rest cushion **16.**

After the frame has reached the position illustrated in FIG. **4,** pushing against the front section of the frame causes the main pilot arm **58** to pivot about its lower pivot **77** while the complete frame moves rearwardly about that pivot **77.** In the course of this movement, the head section **21** of the frame is caused to move from a generally horizontal to a vertical position about the pivot point **25.** When the head section **21** finally reaches the vertical position, it is located completely within a cavity contained within the back rest of the sofa (see FIG. **5**).

Referring to FIGS. **5, 6,** and **7,** it will be seen that just prior to the fixture reaching a completely collapsed or folded sofa condition, the foot section angles **24'** contact and are received within a generally V-shaped recess **130** defined by an upstanding tab **131** on the forwardmost end of the pilot actuating arm **67** and an upstanding tab **132** of the bed lock plate **72.** This V-shaped recess **130** is located immediately above the top of the main pilot arm **58** and functions as a guide to position the foot section angles **24'** onto the top of the main pilot arm and to hold it there when the unit is in the collapsed sofa position. This guide **130** thus prevents the foot section angles **24'** from dropping off on either the inside of the bed lock plate **72** or on the outside of the actuating arm **67.** If the frame is slightly out of square, this guide **130** also functions to square it as it is folded and to allow it to collapse into a proper position. It also functions to prevent the seat section of the sofa (formerly the foot section of the bed) from dropping downwardly off the main pilot arm **58** when someone sits on the sofa.

Referring to FIGS. **1** and **4,** it will be seen that there is a pilot tube **135** which extends between the two spring arms **57** of the main pilot arm **58.** This pilot tube **135** is fixedly attached to the outer ends of the arms **57** so that it pivots about the pivot point **77** with the main pilot arm **58.** When the unit is completely collapsed into a sofa position, the pilot arms **58** and the attached pilot tube **135** pass over center so that the spring **56** holds the sofa fixture in a collapsed condition. In this collapsed condition, the pilot tube **135** supports the front end of the collapsed frame as a consequence of the front edge **136** of the center legs **80** resting upon and being supported by the top of the pilot tube **135.** Consequently, the pilot tube partially carries the weight and supports a person seating upon the sofa.

The sofa-sleeper heretofore described has numerous advantages over sofa-sleeper fixtures now commonly in use. One of the primary advantages of this construction is the ease with which it converts from a high profile seat sofa to a low profile seat sofa. All that is required to convert the low profile seat sofa to a high profile seat, i.e., approximately a 16½ inch to a 17½ inch height, is to add a block **140** as illustrated in phantom in FIG. **3** to the front **136** of the center legs **80.** This block may be attached to the legs by any conventional connector, as for example, a screw and nut or, if the unit is made of plastic, a conventional snap-fit connector. This block is attached to the front of the center at the point at which the legs contact the pilot tube **135** when the unit is collapsed. Consequently, if the block is 1 inch in thickness, the addition of the block to the center legs **80** has the effect of lifting the seat approximately 1 inch.

Another advantage of the sofa-sleeper heretofore described resides in its ability to accommodate either a deep 5 inch thick mattress or a shallow 3½ inch thick mattress with a minimum of replacement parts. To convert the fixture **10** from one which accommodates a 5 inch mattress to one which accommodates a 3½ inch thick mattress, all that is required is to vary the depth D of the mattress-containing cavity between foot section **24** and the body section **22** of the frame when the unit is folded. This differing depth D may be achieved by (*a*) substituting a shorter intermediate section angle **23'**; and (*b*) substituting a shorter bell crank actuating arm **100.** The notch **141** in the front of the main pilot arm **58** then receives the top of the folded front legs. With only the substitution of these two shortened parts, this fixture **10** converts from one which houses a 5 inch thick mattress to one which accommodates a 3½ inch thick mattress.

These and other advantages of this invention will be readily apparent to persons skilled in this art. Therefore, we do not intend to be limited except by the scope of the following appended claims:

We claim:

1. A foldable sofa bed fixture adapted to be mounted upon a stationary sofa frame, said fixture comprising a plurality of pivotally interconnected head, body, intermediate and foot bed frame sections, said frame sections each including a pair of opposed side rails, said frame sections being extendable to form a bed and foldable to form a sofa seat, longitudinally and laterally stretched wire fabric means carried by at least said head, body, and intermediate bed frame sections, and

the improvement which comprises crossed wires attached at their opposite ends to the side rails of said body section of said frame, said crossed wires being located beneath and partially supporting said fabric means of said body section of said frame, said crossed wires being in tension and attached to the four corners of said body section of said frame, and

said body section of said frame being rigidified by at least two laterally extending cross rails bent downwardly out of the plane of said body section of said frame.

2. The fixture of claim **1** in which said body section of said frame is rigidified by at least two laterally extending cross rails bent downwardly out of the plane of said body section of said frame.

3. A foldable sofa bed fixture adapted to be mounted upon a stationary sofa frame, said fixture comprising

a plurality of pivotally interconnected head, body, intermediate and foot bed frame sections, said frame sections being extendable to form a bed and foldable to form a sofa seat, said foot frame section terminating in a circular cross section tubular end cross rail,

longitudinally and laterally stretched fabric means carried by at least said head, body and intermediate bed frame sections,

a plurality of legs pivotally attached to said frame,

pivoted linkage means operable to automatically retract said legs into folded relation to said frame sections when the frame sections are folded into a sofa seat and operable automatically to extend said legs when the frame sections are extended into a bed position, and

a front cross rail leg pivotally attached to said end cross rail, said leg being crescent shaped in cross section and adapted to be received over said end cross rail when said frame is folded into a sofa and to be extended beneath said cross rail when said frame sections are extended into a bed position.

4. The foldable sofa-bed fixture of claim 3 which further includes a removable mattress retainer mounted upon said end cross rail, said retainer having generally L-shaped slots adapted to receive means extending from said end cross rail so as to removably secure said retainer on said end cross rail.

5. The foldable sofa-bed fixture of claim 3 in which said fabric means is attached to said end cross rail by a plurality of helical springs, and

a removable mattress retainer mounted upon said end cross rail, said retainer including generally L-shaped slots adapted to receive portions of said helical springs so as to removably secure said retainer on said end cross rail.

6. A foldable sofa bed fixture adapted to be mounted upon a stationary sofa frame, said fixture comprising a plurality of pivotally interconnected head, body, intermediate and foot bed frame sections, said frame sections being extendable to form a bed and foldable to form a sofa seat, a pair of fixed anchor plates adapted to be attached to said sofa frame and means for supporting said frame sections from said anchor plates, said supporting means comprising,

a fixed rear post attached to each of said anchor plates,

a pair of first pivoted linkage means connecting each of said posts to a rear corner of said frame,

a pair of bed lock plates and means pivotally connecting each of said plates to one side of said body section of said frame,

a pair of main pilot arms, each of said main pilot arms being pivotally attached at one end to one of said anchor plates and pivotally attached at the opposite end to one of said bed lock plates,

a pair of second pivoted linkage means including a pilot actuating arm connecting each of said first linkage means to each of said bed lock plates, and

a pair of third linkage means connecting said foot sections of said frame to said bed lock plates, each of said third linkage means including a bell crank pivotally attached to said body section of said frame, and

guide means operatively associated with the bed lock plate attached end of said main pilot arms for guiding said foot section of said bed frame into a position on top of said main pilot arm when said frame sections are folded to form a sofa seat.

7. The fixture of claim 6 in which said guide means comprises a generally V-shaped channel defined above said main pilot arm by an upwardly and inwardly extending tab on said bed lock plate and an upwardly and outwardly extending tab on said pilot actuating arm.

8. A foldable sofa bed fixture adapted to be mounted upon a stationary sofa frame, said fixture comprising a plurality of pivotally interconnected head, body, intermediate and foot bed frame sections, said frame sections being extendable to form a bed and foldable to form a sofa seat, a pair of fixed anchor plates adapted to be attached to said sofa frame and means for supporting said frame sections from said anchor plates, said supporting means comprising,

a fixed rear post attached to each of said anchor plates,

a pair of first pivoted linkage means connecting each of said posts to a rear corner of said frame,

a pair of bed lock plates and means pivotally connecting each of said plates to one side of said body section of said frame,

a pair of main pilot arms, each of said main pilot arms being pivotally attached at one end to one of said anchor plates and pivotally attached at the opposite end to one of said bed lock plates,

a pair of second pivoted linkage means including a pilot actuating arm connecting each of said first linkage means to each of said bed lock plates, and

a pair of third linkage means connecting said foot sections of said frame to said bed lock plates, each of said third linkage means including a bell crank pivotally attached to said body section of said frame, a bell crank actuating arm extending between said bell crank and said foot section of said frame and a lost motion connection between said bell crank and said bed lock plate.

9. The fixture of claim 8 which further includes a pair of center legs pivotally attached to said forward end of said body section of said frame and means including a second actuating arm connecting each of said center legs to said bed lock plate so as to cause the automatic collapse of said center legs beneath said body section of said frame when said fixture is folded into a sofa seat.

10. The fixture of claim 8 in which each of said pair of first linkage means comprises a stabilizing plate pivotally attached to said head section of said frame and extending downwardly from it when said frame is in an extended bed position and a pivot arm pivotally connected at one end to one of said rear posts and pivotally connected at the opposite end to said stabilizing plate at a point located substantially below the plane of said extended bed frame.

11. The fixture of claim 8 in which each of said second pivoted linkage means includes a pair of stabilizing bars, each of said bars being pivotally connected at one end to said pilot actuating arm and at the opposite end to said first linkage means.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,854,153 Dated December 17, 1974

Inventor(s) Leonard L. Fadler and Robert Findley

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 11, line 22 after "sofa" insert ---seat---

Signed and sealed this 4th day of March 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

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