Oct. 14, 1952 A. LORENZ ET AL 2,613,369

COMBINED SOFA SEAT AND BED

Filed Dec. 18, 1948 3 Sheets-Sheet 1

Fig. 1.

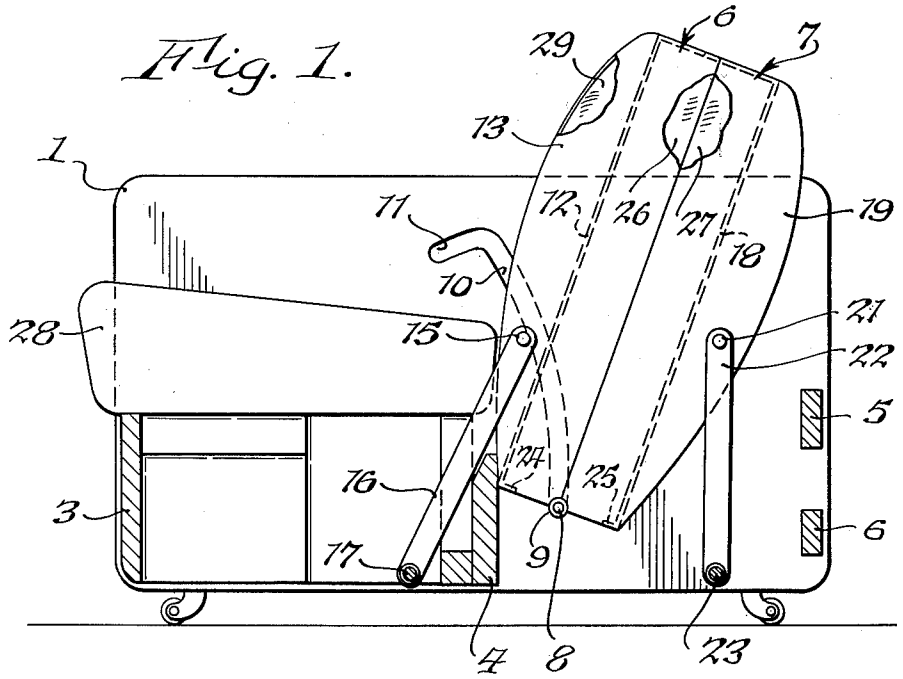
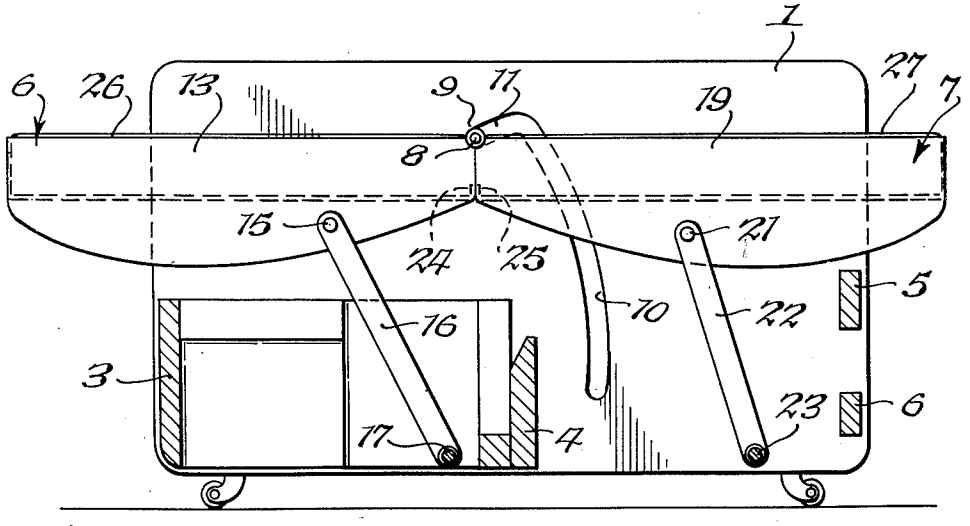


Fig. 2.



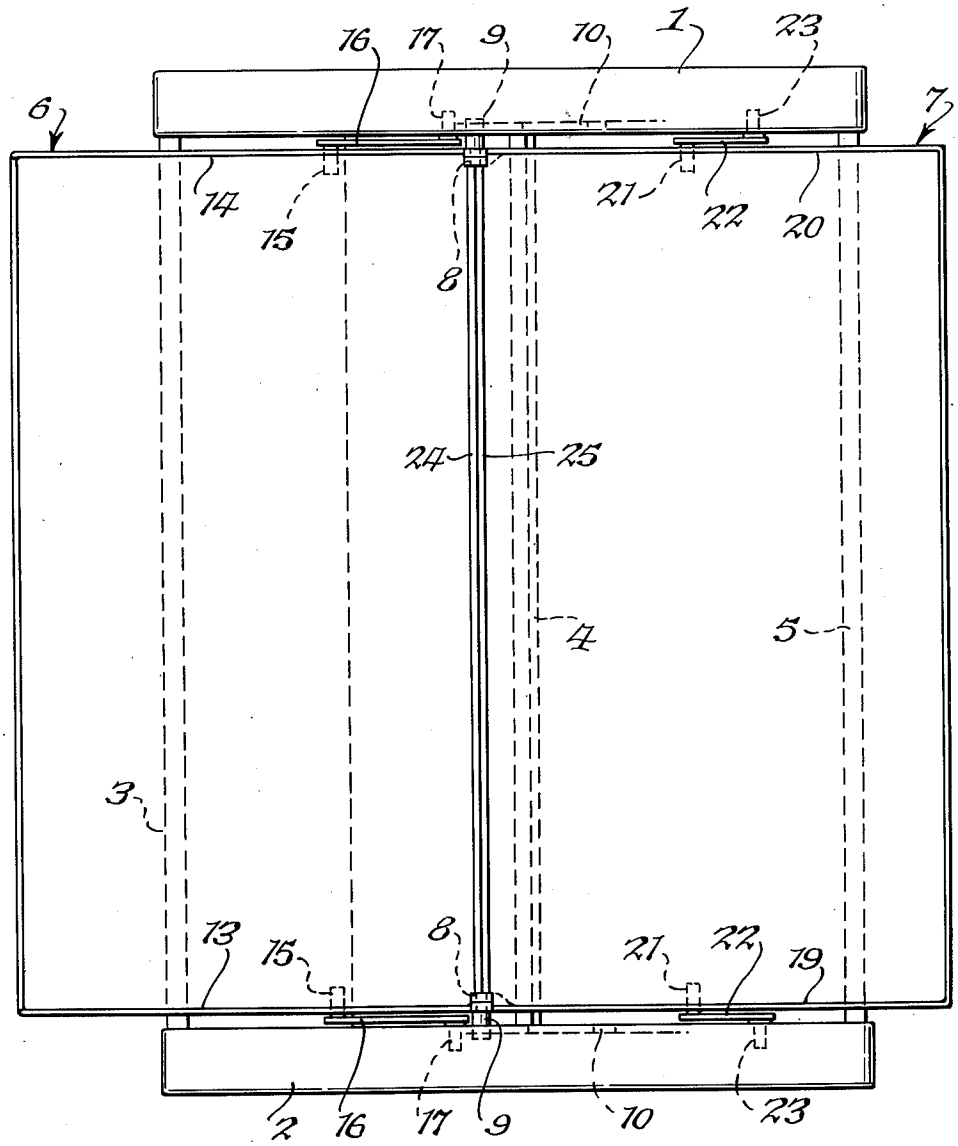
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Fig. 3.



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Fig. 4.

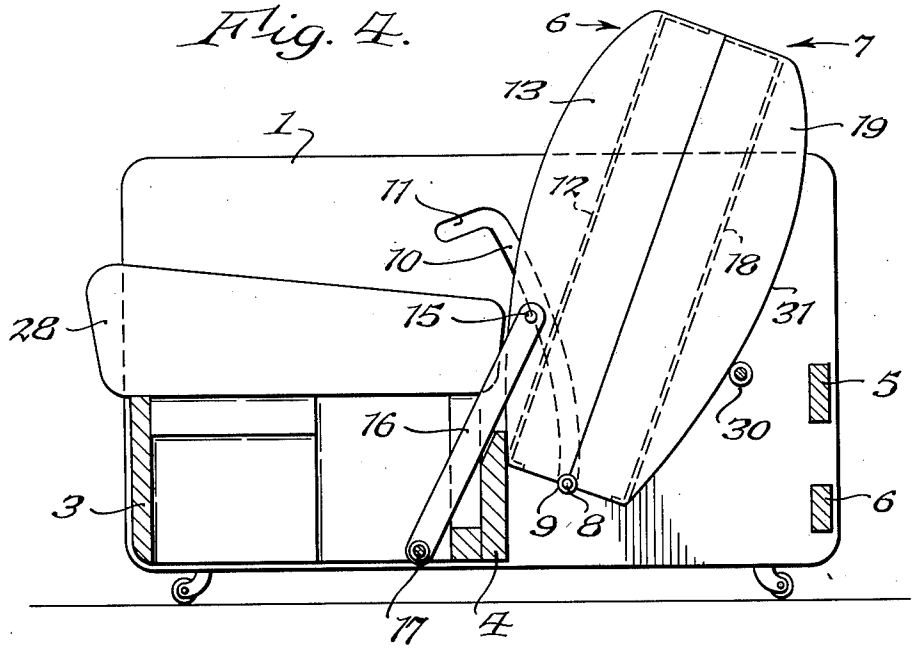
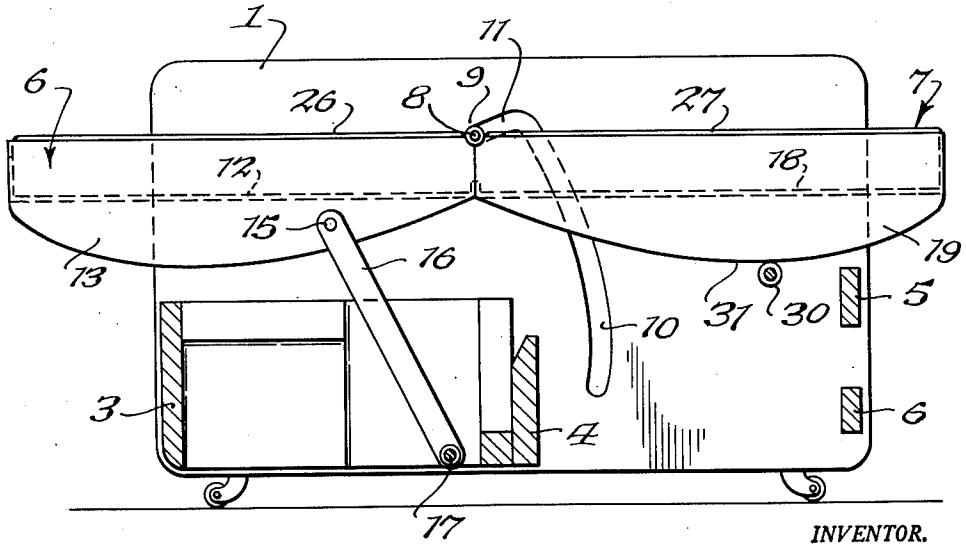


Fig. 5.



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UNITED STATES PATENT OFFICE

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COMBINED SOFA SEAT AND BED

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Application December 18, 1948, Serial No. 66,043

16 Claims. (Cl. 5—16)

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This invention relates to sofa beds which may be converted from sofa seats to beds and vice versa.

An object of the invention is to provide an improved sofa bed, which occupies approximately the same space as an ordinary sofa seat or sofa bed; which resembles in appearance an ordinary sofa seat or davenport; in which the seat level and bed level are those found most comfortable and common; which is a complete unit by itself so that it may be placed anywhere in a room and even away from a wall; which requires a minimum of effort to change or convert it from a sofa seat to a sofa bed and vice versa; in which the parts are counterbalanced somewhat to minimize the operating force required to convert it into either a sofa seat or sofa bed; which will remain in either sofa seat or bed position under normal force of use without danger of unintentional changing of its position; which will be comfortable as both a sofa seat and as a bed; which requires no mechanism to hold the parts in either sofa seat position or sofa bed position; and which will be relatively compact, simple, durable, practical 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 particulalry pointed out hereinafter in connection with the appended claims.

In the accompanying drawings:

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

Fig. 2 is a similar sectional elevation, but with the parts shown in the positions occupied when the device is used as a bed;

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

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

Fig. 5 is a sectional elevation somewhat similar to Fig. 2, but with the parts constructed as shown in Fig. 4.

In the embodiment of the invention illustrated in Figs. 1 to 3, the improved sofa bed includes a support formed of upstanding, parallel end members 1 and 2 spaced apart in face to face relation and connected by an intermediate rigid portion formed by cross members 3, 4, 5 and 6. A mattress-supporting frame shown as a shallow box within an open face is disposed between the end members 1 and 2, and is formed of a front section 6 and a rear section 7 that are hinged together at the ends of their abutting edges by hinge pins 8. One of the frame sections carries a follower or roller preferably one at each end, which is guided by a cam carried by the adjacent end member so as to control and guide the frame sections as they move in each direction between sofa bed and sofa seat positions. In this illustrated embodiment of the invention, the rollers or followers 9 are attached to the frame sections at their hinged connection. For this purpose these pins 8 extend endwise from the sections 6 and 7 and carry rollers 9 that serve as cam followers and run in arcuate, upstanding grooves 10 provided in the inside faces of the end members 1 and 2. Each cam groove 10 at its upper end is bent forwardly and downwardly at 11.

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The front section 6 is provided with a bottom wall 12, and with end walls 13 and 14 which extend in both directions beyond the bottom wall 12 to the opposite faces thereof. The extensions of the end walls 13 and 14 are hinged by pins or pivots 15 upon the upper ends of links 16, which at their outer ends are pivoted on bearing studs 17 carried by the end members 1 and 2. The pins or pivots 15 are located intermediate the front and rear edges of the end walls 13 and 14, and the links 16 are upwardly and rearwardly inclined when the front section 6 is upstanding in sofa-seat position, as shown in Fig. 1. The rear section 7 is similar to front section 6, in that it has a bottom wall 18 and end walls 19 and 20 which extend in both directions from both faces of the bottom 18, as shown in Fig. 1. Each end wall 19 and 20 is pivoted intermediate of its front and rear edges by pivots or pins 21 upon the upper ends of links 22, and the lower ends of those links are pivoted on studs 23 carried on the inner faces of the end walls 1 and 2.

When the device is in sofa seat position shown in Fig. 1, the open faces of the two sections 6 and 7 abut face, to face with the chambers of the sections combined. When the section 6 is pulled forwardly, it will rock on the pivot pins 15, and the links 16 will at the same time swing forwardly to allow the sections 6 and 7 to open like a book, the section 6 moving forwardly toward a horizontal position and the section 7 moving rearwardly toward a horizontal position. The links 22 allow the rear section 7 to move rearwardly for this purpose, and during this opening movement the rollers 9 on the hinges 8 that con-

nect the sections 6 and 7 move upwardly along the arcuate grooves 10 until they reach the upper ends of the arcuate portions of those grooves.

At this time the sections 6 and 7 will be in parallel positions, edge to edge, as shown in Fig. 2, and with the rollers 9 at the top of the grooves 10. A slight forward movement of both sections will then carry the rollers 9 down the inclined grooves 11 into the positions shown in Fig. 2. Both links 16 and 22 are then forwardly and upwardly inclined, so that any rearward push on the front section 6 will cause the sections 6 and 7 to rise on the links 16 and 22 and the rollers 9 to ride up on the cam grooves 11. Thus, ordinary forces acting against the sections 6 and 7 will not move them out of the horizontal position shown in Fig. 2, or cause the sections to fold book-like into the closed position shown in Fig. 1.

The engagement of the rollers 9 in the forward ends of the grooves 11, limits the forward movement of the sections 6 and 7. The engagement of the rollers 9 with the bottoms of the grooves 10 and the engagement of the links 16 against the cross member 4 serve to hold the folded sections 6 and 7 in their upstanding, rearwardly inclined positions shown in Fig. 1. The adjacent abutting edges of the sections 6 and 7 are open, except for short upstanding flanges 24 and 25 in sections 6 and 7 respectively that serve as stops to limit endwise movements of mattress sections 26 and 27 disposed in sections 6 and 7 respectively. Each mattress section has a small notch in the end engaging with the stop 24 or 25, so that that mattress sections will abut edge to edge when the sections are open flat as shown in Fig. 2. The mattress sections will be held against downward sliding movement by the stops 24 and 25, see Fig. 1, when the sections are together, face to face.

It will be noted that when the sections are opened out from the Fig. 1 positions to the Fig. 2 positions, the links 16 move into forwardly and upwardly inclined positions, during which the pivots 15 move through vertical dead center positions. A seat cushion 28 is removably mounted on the cross members 3 and 4 in front of the folded sections 6 and 7. Between the end walls 13 and 14 of section 6, an upholstered backing or cushion 29 is confined against the bottom wall 12, at the opposite face thereof from the mattress section 26. This cushion 29 serves as the back of the soft seat when the cushions 6 and 7 are upstanding, as in Fig. 1.

In the embodiment of the invention illustrated in Figs. 4 and 5, the construction is the same as explained in Figs. 1 to 3, except that the links 22 are eliminated, and in place thereof the inside faces of the end members 1 and 2 carry rollers 30 which engage against convex edges or rails 31 provided on the end walls 19 and 20 of the rear section 7. These rollers 30 engage beneath the widest parts of the convex edges of the end walls 19 and 20 of the section 7, so that the sections 6 and 7 cannot sag when in upstanding positions. When the section 6 is pulled forwardly, the convex edges 31 will ride upon and along the rollers 30 and fulcrum therein while moving backwardly and forwardly, until the sections assume the bed position shown in Fig. 5. The rollers 30 thus support the rear section 7 in the horizontal position as well as in the upstanding position shown in Fig. 1, and replace the links 22.

The links 22 and rollers 30 both function as fulcrums which support the rear section 7 while it rocks and moves backwardly and forwardly. Otherwise, the construction and operation of the

structure of Figs. 3 and 4 are the same as described for Figs. 1 to 3, and corresponding parts have corresponding numerals applied thereto. The upper surface of the seat cushion 28 is at the usual or any desired level for sofa seats, and the upper surfaces of the mattress sections 26 and 27 are at the desired or usual mattress level for beds. It will be noted that no mechanical locks are required to hold the parts in either the sofa seat positions or the bed positions, and the moving parts are sufficiently counterbalanced so that relatively small forces are sufficient to convert the device from a sofa seat condition to bed condition, and vice versa.

It will be observed that engagement of rollers 9 in the grooves 10 will guide the frame sections in their opening and closing movements, in the same manner whether the rollers are entirely on the section 6 or section 7, or at their junction. The cam grooves 10 will, of course, have shapes and positions depending upon where the rollers 9 are located on the frame sections.

It will be further observed that when the frame sections 6 and 7 are opened out into bed positions, shown in Figs. 2, 3 and 5, they are supported at three positions from front to rear, which are on pivots 15, 8 and 21 in Figs. 1 to 3, and on pivots 15 and 8, and fulcrums 30, Figs. 4 and 5. In all cases, one of these support points is always locked against accidental closing of the sections. The weight of the sections on links 16 and 22 will resist closing, as also the rollers 9 must ride up an inclined portion 11 of the groove 10 before the sections may close. In the embodiment of the invention shown in Figs. 4 and 5, the weight of forward section 6, when the frame is opened into a bed, is applied to link 16 in a direction to keep the sections opened, and roller 9 in the inclined groove section 11 also resists closing of the sections. In both embodiments there is always at least one locking of the sections 6 and 7 against closing, and hence no manually operated latches are necessary to keep the frame sections in their open or bed positions or which must be operated when the device is converted into a bed or back into a sofa seat. The cam grooves 10 may be curved or shaped to carry the links 16 through vertical dead center positions during any part of the opening movements, if one so desires.

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, a mattress-supporting frame formed of front and rear sections, a hinge connecting said sections to fold together and open as a book with the hinged edge lowermost when folded, a link at each end of said support hinged at one end to said front section and at its other end to said support, said links being generally vertical and rearwardly inclined, when the sections are folded together, and movable forwardly through a vertical dead center position to carry said front section from folded position forwardly and downwardly into horizontal position, a flexible mattress confined in folded condition between the abutting faces of said frame when the sections are folded, and opening out into flat condition when the sections are opened flat, a seat cushion removably mount-

ed on said support in front of said sections when folded, a cam element on said support, a follower guided by said cam element and carried by said hinge between said sections for guiding that hinge upwardly and forwardly as the sections are opened into flat, straight relation to each other, and a fulcrum member carried by said support and directly engaging with the rear section intermediate its front and rear edges and supporting it for rocking and forward and rearward movements as the sections are folded or opened.

2. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, a hinge connecting said sections to fold together and open as a book with the hinged edge lowermost when folded, a link at each end of said support hinged at one end to said front section and at its other end to said support, said links being generally vertical and rearwardly inclined, when the sections are folded together, and movable forwardly through a vertical dead center position to carry said front section from folded position forwardly and downwardly into horizontal position, a flexible mattress confined in folded condition between the abutting faces of said frame when the sections are folded, and opening out into flat condition when the sections are opened flat, a seat cushion removably mounted on said support in front of said sections when folded, a cam element on said support, a follower guided by said cam element and carried by said hinge between said sections for guiding that hinge upwardly and forwardly as the sections are opened into flat, straight relation to each other, another pair of generally vertical links, one at each end of said frame and each hinged at one end to said support and at its other end to the rear frame section intermediate its front and rear side edges for supporting the rear frame section for rocking a limited forward and rearward movement as the sections are folded and opened.

3. A sofa bed comprising a support having spaced, parallel end members connected by an intermediate portion, a mattress-supporting frame formed of front and rear sections, a hinge connecting adjacent side edges of said sections by which the sections may fold book-like in face to face relation and open into a straight line position, generally vertical links each hinged at one end to an adjacent end member and at its other end to said front section between its front and rear side edges, a follower on each end of said hinge, a cam on the inside face of each end member and having a cam groove in which said follower runs, said groove rising and terminating at its upper end in a forwardly extending generally horizontal branch, said support having a fulcrum element carried by said support and directly engaging with the rear section intermediate its front and rear edges and serving as a fulcrum for supporting said rear section for rocking and forward and rearward movement as the sections are folded or opened, said fulcrum element and links supporting said sections in folded upstanding position with the follower in the lower part of said groove and the links inclined rearwardly at their connection to said front section, but said links shifting forwardly through vertical dead center position as the sections are opened into flat horizontal position, and a seat cushion removably mounted on said support in front of said front section when said sections are folded and upstanding.

4. A sofa bed comprising a support having spaced, parallel end members connected by an intermediate portion, a mattress-supporting frame formed of front and rear sections, a hinge connecting adjacent side edges of said sections by which the sections may fold book-like in face to face relation and open into a straight line position, generally vertical links each hinged at one end to an adjacent end member and at its other end to said front section between its front and rear side edges, a follower on each end of said hinge, a cam on the inside face of each end member and having a cam groove in which said follower runs, said groove rising and terminating at its upper end in a forwardly extending generally horizontal branch, said support having a fulcrum element carried by said support and directly engaging with the rear section intermediate its front and rear edges and serving as a fulcrum for supporting said rear section for rocking and forward and rearward movement as the sections are folded or opened, said fulcrum element and links supporting said sections in folded upstanding position with the follower in the lower part of said groove and the links inclined rearwardly at their connection to said front section, but said links shifting forwardly through vertical dead center position as the sections are opened into flat horizontal positions, a seat cushion removably mounted on said support in front of said front section when said sections are folded and upstanding, and mattress sections, one confined in and filling each frame section on the faces that abut when the sections are folded, and lying edge to edge when the sections are open out flat and horizontal.

5. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, a hinge connecting said sections to fold together and open as a book with the hinged edge lowermost when folded, a link at each end of said support hinged at one end to said front section and at its other end to said support, said links being generally vertical and rearwardly inclined, when the sections are folded together, and movable forwardly through a vertical dead center position to carry said front section from folded position forwardly and downwardly into horizontal position, a seat cushion removably mounted on said support in front of said sections when folded, a cam element carried by said support at an end thereof and having a cam guide extending generally vertically, said frame at an end thereof and adjacent said hinge having a cam follower engaged with said cam guide and guided thereby as the sections move between folded position and an open, horizontal position, each end of said support having a rocking fulcrum engagement with the adjacent end of said rear section between the front and rear side edges of that section, for supporting and guiding said rear section in both rocking and forward and rearward movements as the sections are moved between folded, upright positions and opened, horizontal positions.

6. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, a hinge connecting said sections to fold together and open as a book with the hinged edge lowermost when folded, a link at each end of said support hinged at one end to said front section and at its other end to said support, said links being generally vertical and rearwardly

inclined, when the sections are folded together, and movable forwardly through a vertical dead center position to carry said front section from folded position forwardly and downwardly into horizontal position, a seat cushion removably mounted on said support in front of said sections when folded, a cam element on said support and engaging with said frame for guiding the sections as they are opened into flat, straight relation to each other or closed, another pair of generally vertical links, one at each end of said frame and each hinged at one end to said support and at its other end to the rear frame section intermediate its front and rear side edges for supporting the rear frame section for rocking and limited forward and rearward movement as the sections are folded and opened.

7. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, a hinge connecting said sections to fold together and open as a book with the hinged edge lowermost when folded, a link at each end of said support hinged at one end to said front section and at its other end to said support, said links being generally vertical and rearwardly inclined, when the sections are folded together, and movable forwardly through a vertical dead center position to carry said front section from folded position forwardly and downwardly into horizontal position, a seat cushion removably mounted on said support in front of said sections when folded, a cam element and a follower element operated by said cam element, one of said elements being carried by said support and the other by said hinge, for guiding said hinge in a selected path as the sections are opened into flat, straight relation to each other or are closed, said rear section having a rail at each end with an exposed convex edge that is opposite from the front section when the sections are folded together, and a roller on each end member on which the convex edge of the adjacent rail rides to support the intermediate part of said rear section in all of its positions between folded and straight out horizontal positions.

8. A sofa bed comprising a support having spaced, parallel end members connected by an intermediate portion, a mattress-supporting frame formed of front and rear sections, a hinge connecting adjacent side edges of said sections by which the sections may fold book-like in face to face relation and open into a straight line position, generally vertical links each hinged at one end to an adjacent member and at its other end to said front section between its front and rear side edges, a follower on each end of said frame, a cam on the inside face of each member and having a cam groove in which said follower runs, said groove terminating in a forwardly and downwardly extending generally horizontal branch, said support having a fulcrum element carried by said support and directly engaging with the rear section intermediate its front and rear edges and serving as a fulcrum for supporting said rear section for rocking and forward and rearward movement as the sections are folded or opened, said fulcrum element and links supporting said sections in folded upstanding position with the follower in the lower part of said groove and the links inclined rearwardly at their connection to said front section, but said links shifting forwardly through vertical dead center position as the sections are opened into flat, horizontal position, and a seat cushion removably mounted on said support in front of said front section when said sections are folded and upstanding.

9. A sofa bed comprising a support having spaced, parallel end members connected by an intermediate portion, a mattress-supporting frame formed of front and rear sections, a hinge connecting adjacent side edges of said sections by which the sections may fold book-like in face to face relation and open into a straight line position, generally vertical links each hinged at one end to an adjacent member and at its other end to said front section between its front and rear side edges, a follower on each end of said frame, a cam on the inside face of each member and having a cam groove in which the adjacent follower runs, said groove terminating in a downwardly inclined branch, said support having a fulcrum element engaging with the rear section intermediate its front and rear edges and serving as a fulcrum for supporting said rear section for rocking and forward and rearward movement as the sections are folded or opened, said fulcrum element and links supporting said sections in folded upstanding position with the follower in the lower part of said groove and the links inclined rearwardly at their connection to said front section, but said links shifting forwardly through vertical dead center position as the sections are opened into flat horizontal positions, a seat cushion removably mounted on said support in front of said front section when said sections are folded and upstanding, and mattress sections, one confined in and filling each frame section on the faces that abut when the sections are folded, and lying edge to edge when the sections are open out flat and horizontal.

10. A sofa bed comprising a support having spaced upright end members, a mattress-supporting frame formed of front and rear sections, hinges connecting the adjacent side edges of said sections at their ends, with the sections folding face to face like a book and opening out straight, a link at each end of the front section hinged at one end to the adjacent end member, extending generally vertically and at its other end hinged to the adjacent end of said front section intermediate its front and rear side edges, a fulcrum part on each end member and engaging with the ends of the rear section intermediate the front and rear side edges of that section and supporting said rear section for rocking and forward and rearward movements as the sections are folded or opened, said frame and end members also having additional interengaging parts to hold said sections against rocking on said fulcrum parts in a folding direction and releasably in straight out and horizontal relation, said fulcrum parts and links supporting said frame in upstanding position when the frame is folded, and a seat cushion removably mounted on said support in front of said folded sections.

11. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, hinges connecting said sections at the ends of their adjacent side edges with the sections folding face to face or opening out straight, a fulcrum part at each end of each section, carried by said support and directly engaging the section between its front and rear side edges, said fulcrum parts supporting said frame in upstanding folded position, with the hinges at the bottom, and for rocking and forward and rearward movements while the sections open into horizontal positions, cam followers with alined axes extending outwardly from opposite ends of

said frame closely adjacent the hinge axes, said support having, at each end, a generally upright cam slot in which the adjacent follower runs, by which it is guided and by which the forward and rearward movements of said frame are controlled and limited as the frame sections fold and unfold, the upper end of each cam slot turning forwardly and downwardly at an inclination into and along which the cooperating follower passes as the sections approximately reach fully open, horizontal positions, and a seat cushion mounted on said support in front of said frame when said sections are in folded positions.

12. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, hinges connecting said sections at the ends of their adjacent side edges, with the sections folding face to face or opening out straight, said support carrying a fulcrum part at each end of each section, directly engaging the section between its front and rear side edges, each said fulcrum part supporting said frame in upstanding folded position, with the hinges at the bottom, and for rocking and forward and rearward movements, while the sections open into horizontal positions, rollers carried by said frame, cams carried by said support at the ends of the frame for guiding said rollers and frame as the frame sections move into open straight positions or are closed, and a seat cushion mounted on said support in front of said frame when the sections are folded.

13. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, hinges connecting said sections at the ends of their adjacent side edges, with the sections folding face to face or opening out straight, said support having a fulcrum part at each end of each section, engaging the section between its front and rear side edges, said fulcrum part supporting said frame in upstanding folded position, with the hinges at the bottom and for rocking and forward and rearward movements, while the sections open into horizontal positions, rollers carried by said hinges, cams carried by said support at the ends of the frame for guiding said rollers and hinges first upwardly, and then forwardly and downwardly as the sections move into open straight positions, and a seat cushion mounted on said support in front of said frame when the sections are folded.

14. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, hinges connecting said sections at the ends of their adjacent side edges, with the sections folding face to face or opening out straight, said support having a fulcrum part at each end of each section, engaging the section between its front and rear side edges, said fulcrum parts supporting said frame in upstanding folded position, with the hinges at the bottom and for rocking and forward and rearward movements while the sections open into horizontal positions, said support also having an element interengaging with the hinges to hold said sections releasably against folding of the sections while the sections are in open, horizontal positions, mattress sections confined against the faces of the sections that abut when the frame is folded into closed position, and a seat cushion mounted on said support in front of said frame when the sections are folded.

15. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, hinges connecting said sections at the ends of their adjacent side edges, with the sections folding face to face or opening out straight, said support having a fulcrum part at each end of each section, engaging the section between its front and rear side edges, each said fulcrum parts supporting said frame in upstanding folded position directly from said support, with the hinges at the bottom, and for rocking and forward and rearward movements, while the sections open into horizontal positions, rollers also carried by said frame at a substantial distance from all of said fulcrum parts, cams carried by said support at the ends of the frame for guiding said rollers first upwardly and then forwardly and downwardly as the sections move into open straight positions at the end of the opening movement, mattress sections confined against the faces of the sections that abut when the frame is folded into closed position, and a seat cushion mounted on said support in front of said frame when the sections are folded.

16. A sofa bed comprising a support, a mattress-supporting frame formed of front and rear sections, hinges connecting said sections at the ends of their adjacent side edges, with the sections folding face to face or opening out straight, said support having a fulcrum part at each end of each section, engaging the section between its front and rear side edges, said fulcrum parts supporting said frame in upstanding folded position, with the hinges at the bottom and for rocking and forward and rearward movements, while the sections open into horizontal positions, rollers carried by said hinges, cams carried by said support at the ends of the frame for guiding said rollers and hinges first upwardly, and then forwardly in a general horizontal direction as the sections move into open straight positions, mattress sections confined against the faces of the sections that abut when the frame is folded into closed position, and a seat cushion mounted on said support in front of said frame when the sections are folded.

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HARRY NOCK.

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