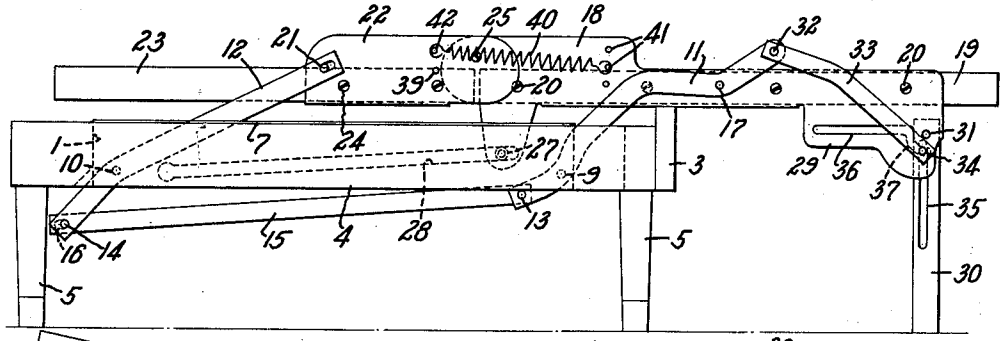
Oct. 22, 1963 C. P. SIMMONS 3,107,363

SOFA-BED HINGE MECHANISM

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Fig. 1.



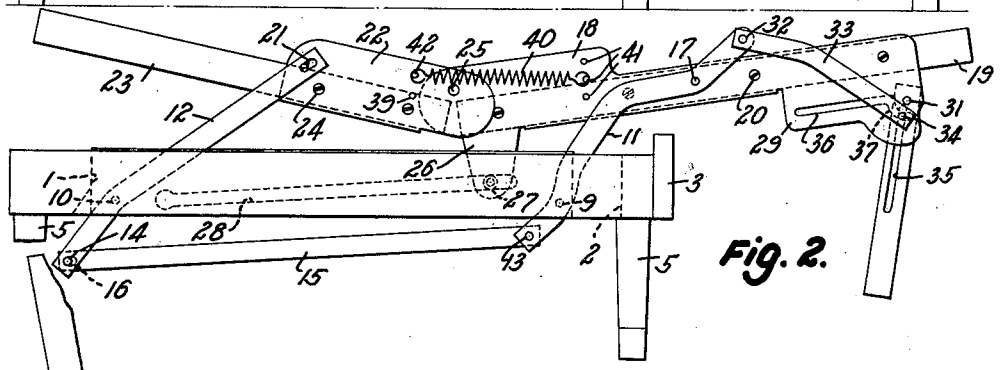


Fig. 2.

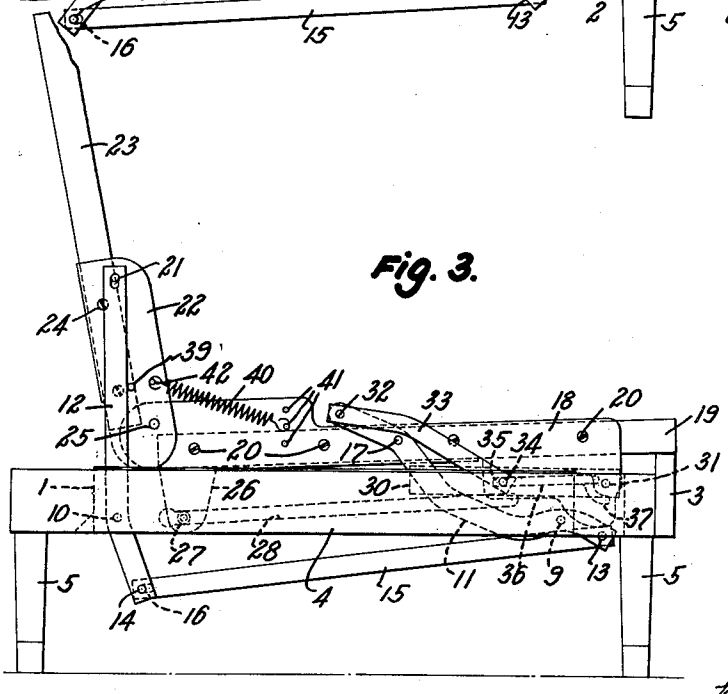


Fig. 3.

INVENTOR.

Charles P. Simmons

BY

N. N. Finckel Jr.

Atty.

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SOFA-BED HINGE MECHANISM

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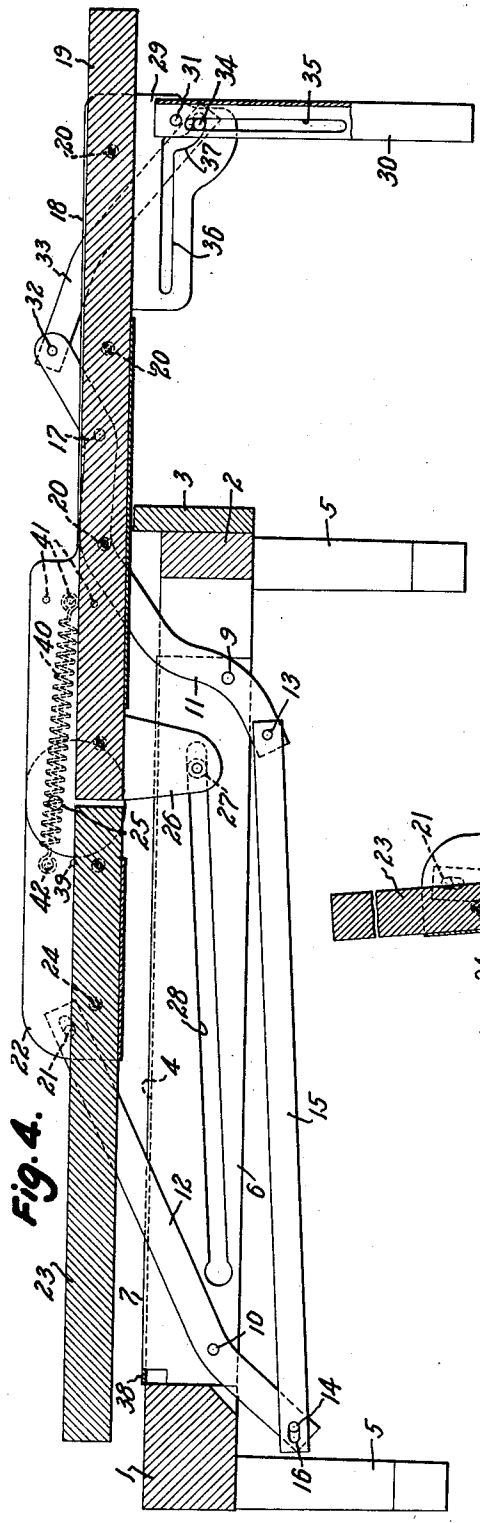


Fig. 4.

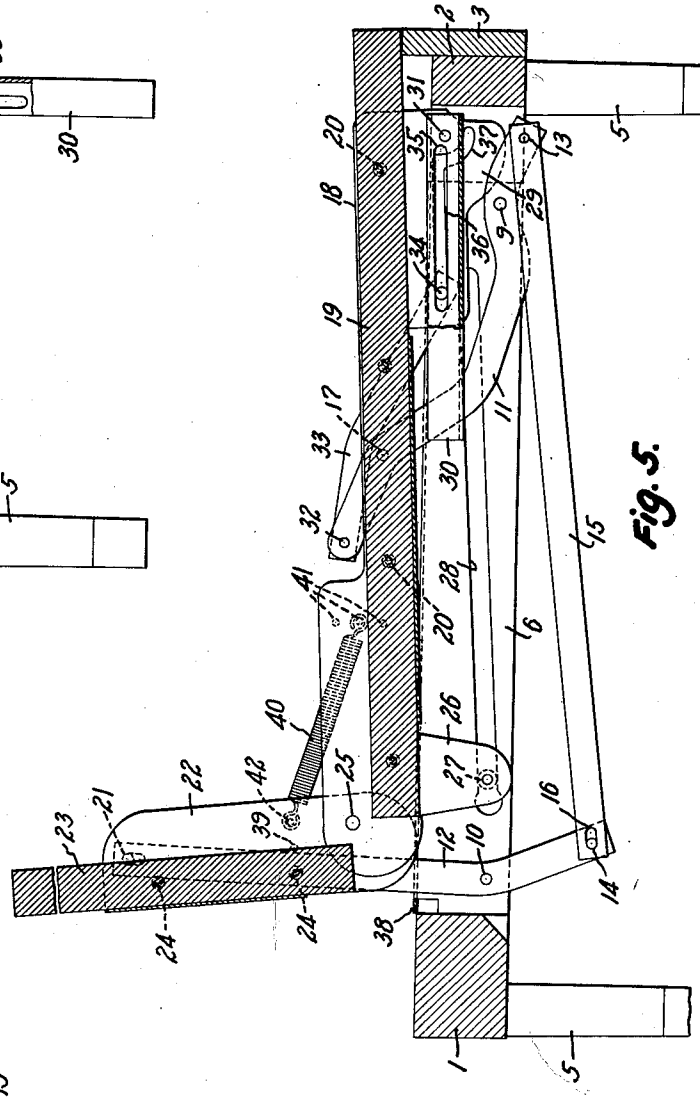


Fig. 5.

INVENTOR.

Charles P. Simmons

BY R. F. Finckel Jr.

Atty.

Oct. 22, 1963 C. P. SIMMONS 3,107,363

SOFA-BED HINGE MECHANISM

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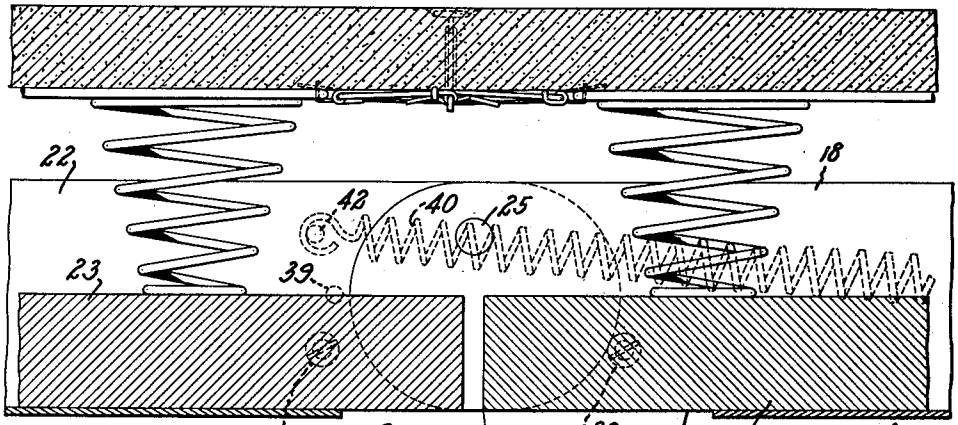
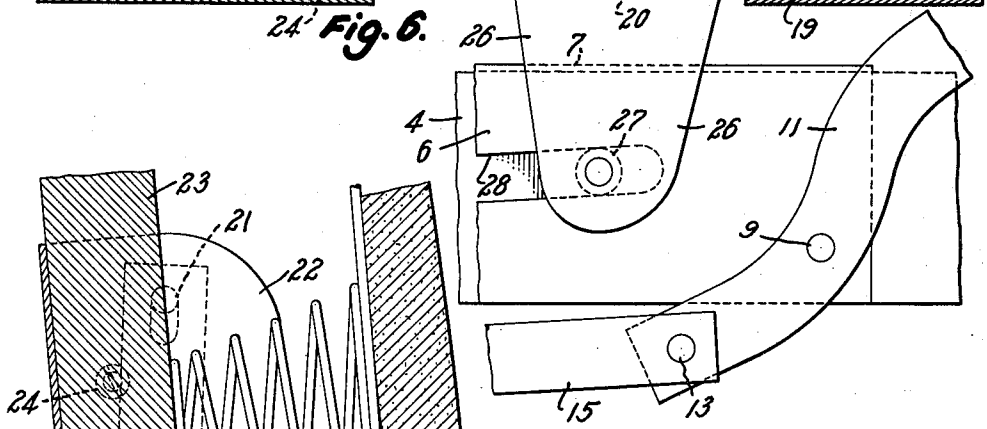


Fig. 6.



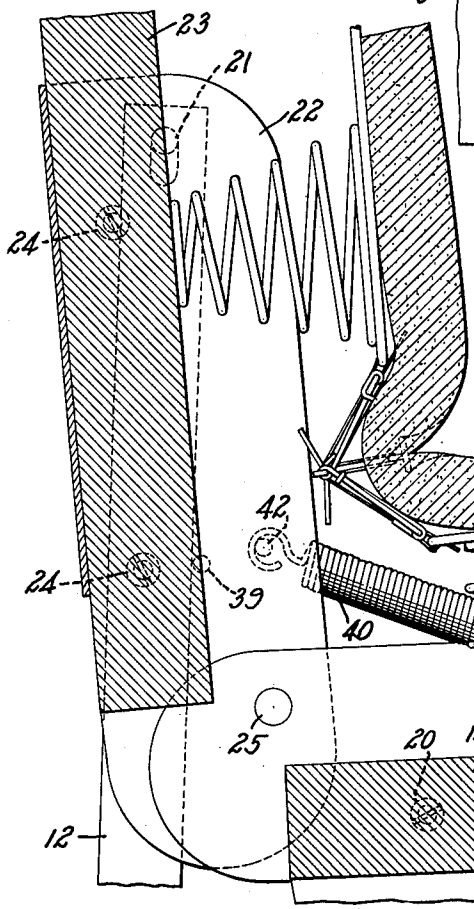


Fig. 7.

INVENTOR.
Charles P. Simmons
BY
W. H. Finckel Jr.
Atty.

Oct. 22, 1963 C. P. SIMMONS 3,107,363

SOFA-BED HINGE MECHANISM

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Fig. 8.

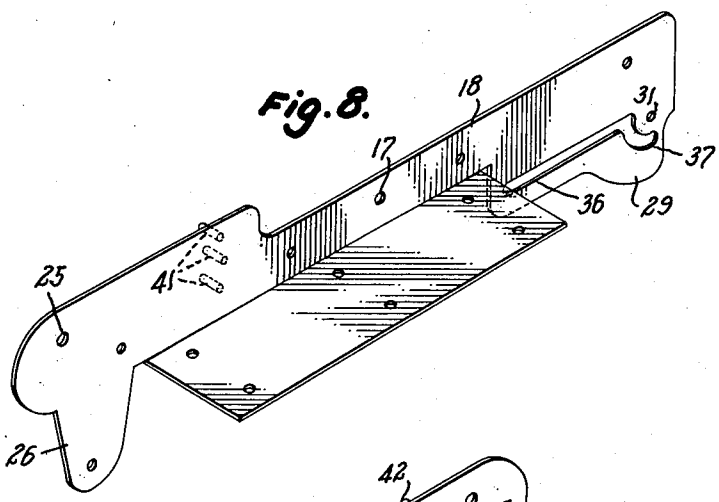


Fig. 9.

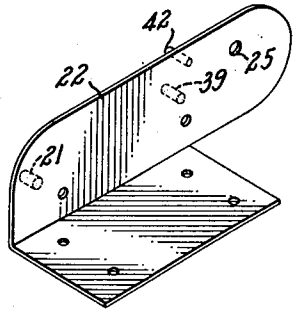


Fig. 9a.

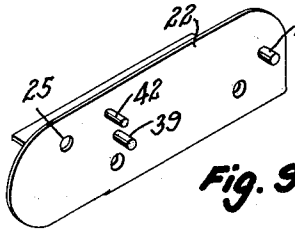
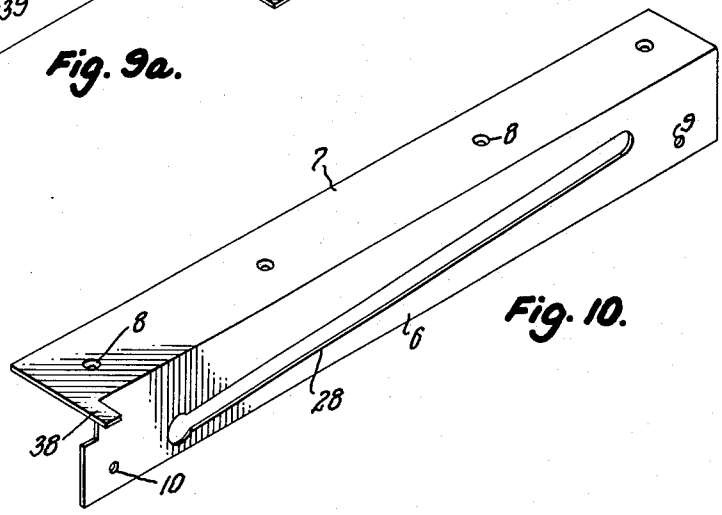


Fig. 10.



INVENTOR.

Charles P. Simmons

BY M. H. Finckel Jr.

Atty.

United States Patent Office 3,107,363 Patented Oct. 22, 1963

3,107,363

SOFA-BED HINGE MECHANISM

Charles P. Simmons, Box 914, Americus, Ga.

Filed July 25, 1960, Ser. No. 45,172
2 Claims. (Cl. 5—41)

This invention relates, broadly, to convertible furniture such, primarily, as sofa-beds, and it has special reference to the hinge mechanism joining the seat and back members of a sofa-bed or the like, and to the apparatus by means of which the seat and back members may be automatically adjusted from bed position to seating position, and vice versa, upon proper manipulation of the seat member.

The invention relates, further, to leg means pivotally attached to the seat member adjacent to the front edge thereof, and means cooperating with such leg means to project them into ground contacting arrangement to support the front portion of the seat member in bed position, and to retract them beneath the seat member when in seating position, such cooperating means being automatically actuated by the adjusting means for the seat and back members when such members are changed from bed position to seating position, and vice versa.

All conventional sofa-bed or so-called dual purpose hinges now available are so constructed that their pivot points have to be located at least four inches above the top surfaces of the so-called spring box frames on which the upholstery springs are mounted and to which the halves of the hinges are attached. This is due to the fact that the conventional jack-knife or pull-over levers employed for controlling the hinge motion must be below the pivot points of the hinges in order to function properly.

This causes the back member to ride higher than is disered for some accepted types of sofa-beds for which the mechanism of the present invention is particularly designed.

One object of the present invention is, therefore, to provide a hinge mechanism and actuating means for sofa-beds and the like in which the pivot point of such hinge mechanism need be no more than seven-eighths of an inch, and may indeed be less, above the spring box frames referred to.

Thus, for example, when a 24½ inch seat member and a 20½ inch back member are used they will, when in bed position provide a bed width, or spring supported sleeping surface, of 45 inches with a length, say 72 inches, more or less, depending upon the length of the sofa-bed between the arms thereof. However, when these parts are in the seating position the usable spring cushion portion of the seat member will be reduced to 21 inches and that of the back member to 17 inches, thus providing a more sightly and comfortable sofa than has heretofore been possible.

Furthermore, the arrangement of the seat and back members with their hinge and adjusting mechanisms according to the present invention makes possible the provision of a sofa-bed which does not have to be moved away from a wall in order to adjust its parts from seating position to bed position, and vice versa.

Also, the small height required for operating area of the machinasm of the invention makes it especially well adapted for use in "Modern," "Early American," "Victorian," and "Swedish" designs when a thin-line or low front base rail, say not to exceed four inches, is required for sofas and sectional pieces.

Another object of the invention is to provide for rigidly locking the back member in seating position without the necessity of separately operated or adjusted locking elements.

A further object is to provide the leg means hereinbefore referred to which are made to function automatically in response to adjustment of the seat and back

members from seating position to bed position, and vice versa.

Still another object is to provide resilient or spring means connecting the halves of the hinges in such a manner as to normally bias the seat and back members to seating position, but so related to the hinge pivot as preferably to be inactive when these members are in bed position, the effectiveness of the resilient or spring means in these respects being adjustable for dead-centering or over dead-centering of their axis of expansion and contraction with respect to the hinge pivot.

Another object is to provide hinge and adjusting mechanisms which will function with a floating action or effect, without dead moments or binding when the positions of the seat and back members are altered, thus making for free and relatively effortless manual operation.

Another object is to so simplify the design of the hinge and actuating mechanism that it may be of considerably less weight than known apparatus for a similar purpose, thus tending to lighten the furniture and reduce the cost of the mechanism. Furthermore, the simplification of design serves to practically eliminate the chance of malfunction of the mechanism.

With the foregoing and other objects and advantages in view, the novel features of the invention whereby they are accomplished will be apparent from the accompanying drawings, the following description and the appended claims.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated,

FIG. 1 is a side elevation of the operative mechanism of the invention, as viewed from the left-hand side of a sofa-bed, with the associated elements in bed position,

FIG. 2 is a view similar to FIG. 1 but showing the elements in the positions assumed in their initial stage of adjustment from bed position to seating position,

FIG. 3 is a view similar to FIG. 1 but showing the elements fully adjusted to seating position,

FIG. 4 is an enlarged sectional elevation of the mechanism giving an inner view of the elements at the right-hand side of the sofa-bed with such elements in bed position,

FIG. 5 is a view similar to FIG. 4 but showing the elements in seating position,

FIG. 6 is a further enlarged fragmentary view of the mechanism in the region of the hinge means with the elements shown in bed position as in FIG. 4, and including an assembly therewith of springs and other upholstery parts following the teaching of applicant's patent for Spring Construction for Furniture, granted October 30, 1956, No. 2,768,390,

FIG. 7 is a view similar to FIG. 6, but showing the elements in seating position,

FIG. 8 is a perspective view of the right-hand combined hinge and mounting plate for the seat member,

FIG. 9 is a perspective view of the inner side of the right-hand hinge and mounting plate for the back member,

FIG. 9*a* is a perspective view of the outer side of the plate shown in FIG. 9, and

FIG. 10 is a perspective view of the inner side of the right-hand mechanism mounting and guide plate carried by the supporting frame of the sofa-bed.

Having reference particularly to FIGS. 1 to 3 and 4 to 7, it will be understood that the operative elements of the mechanism of the invention are arranged in right-hand and left-hand complements at the opposite sides of the sofa-bed or the like and function similarly and simultaneously during adjustment of the seat and back members from bed position to seating position, and vice versa, and that they serve, also, to hold these members in either

of their adjusted positions, as will appear from the following description.

The supporting frame for the sofa-bed or the like may be of substantially conventional form, including a rear rail 1, a front rail 2 having a trim piece 3, and side rails 4 rigidly joined to the ends of the rear and front rails 1 and 2 to thus provide an open rectangle within the confines of which all of the operative mechanism is confined.

Appropriate fixed legs 5, in any number and location desired, will be provided for ground support of the supporting frame, and arm structures, not shown, will usually be provided at the sides of the frame exteriorly of the operative mechanism and serving to conceal it.

Each of the side rails 4 carries a mechanism mounting and guide plate 6 (FIGS. 4, 5 and 10) having a flange 7 overlying its respective rail 4 and affixed thereto as by screws, not shown, which the flange is adapted to receive through screw-holes 8 (FIG. 10).

Carried by the plate 6 adjacent to the ends thereof at fixed fulcral pivots 9 and 10, respectively, are first and second levers of the first order 11 and 12, respectively, the lower ends of which are pivotally connected at 13 and 14, respectively, with a longitudinally rigid link 15, this link being provided at its pivot 14 with a lost motion slot connection 16. Adjacent to its other, or upper, end the lever 11 is connected at a relatively fixed pivot point 17 to a combined hinge and mounting plate 18 (FIG. 8) attached to the side of the seat member 19 as by screws 20. The opposite, or upper, end of the lever 12 has a lost motion pivotal connection 21 with a combined hinge and mounting plate 22 (FIGS. 9 and 9*a*) attached to the side of the back member 23 as by screws 24. The combined hinge and mounting plates 18 and 22 are overlapped and joined in a hinge pivot connection at 25.

The plates 18 at opposite sides of the sofa-bed are provided adjacent to their rear ends with downwardly extending ears 26 carrying guide follower rollers 27 engaged in guideways or slots 28 formed in the complemental mounting and guide plates 6 and extending from the front to the rear thereof in downwardly inclined position.

The front ends of these plates 18, which extend adjacent to the front edge of the seat member 19, are provided with downward extensions 29 to which legs 30 are pivoted at 31.

The upper ends of the levers 11, outwardly of their pivot points 17 and arcuately movable thereabout, are pivotally connected at 32 with the rear ends of links 33 which are provided at their opposite ends with pins 34 engaged in guideway slots 35 in the legs and in guideways 36 in the extensions 29, the forward end portions of said guideways 36 being in the form of arcs 37 concentric with the pivots 31 of the legs 30.

For stop cooperation with the opposite edges of the levers 12 when the back member is in seating position (FIG. 5), the plates 6 are provided with stop lugs 38, and the hinge plates 22 are provided with stop pins 39.

Springs 40 spanning the hinge pivots 25 and adjustably attached to a selected one of a plurality of anchor pins 41 on the hinge plates 18 of the seat member and attached to an anchor pin 42 on the hinge plates 22 of the back member 23 serve normally to bias the seat and back members to seating position, but it will be noted that when these members are in the bed position these springs will preferably assume such a past dead-center position as to make this biasing ineffective until initial movement of the members toward seating position (see FIG. 2). Obviously, the effect of the springs 40 can be varied somewhat in accommodation to the weight and other operative characteristics of the assembly by the selection of those anchor pins 41 to which their forward ends are connected to thus facilitate the bed-to-seat position shifting of the parts, and springs of various force can be provided to this end when necessary or desired.

It will be noted, having reference especially to FIGS. 6 and 7, that the hinge mechanism of the invention is particularly well adapted to accommodate spring and upholstery assemblies in accordance with applicant's Patent No. 2,768,390 hereinbefore referred to, inasmuch as there is no crowding of the seat and back cushions when the parts are in seating position due to the pivot point 25 of the hinge being much closer to the spring-mounting seat and back members 19 and 23 than is customary in furniture of this type.

The operation of the mechanism of the invention will, it is thought, be apparent from the foregoing description, but it may, nevertheless, be described briefly as follows:

Referring to FIGS. 1 to 5, and assuming that the seat and back members are to be shifted from the bed position (FIGS. 1 and 4) to the seat position (FIGS. 3 and 5), first the forward edge of the seat member is lifted about six inches and, at the same time, pushed rearwardly (FIG. 2). This initial movement will be transmitted through the lever and link connections to impart relative pivotal movement to the seat and back members upon their hinge pivots 25 thus bringing into play the biasing action of the springs 40 and, at the same time, through the cooperation of the pins 34 of the links 33 with the arcuate portions 37 of the guideways 36 and the slots 35 of the legs 30, causing the legs to begin their pivotal upward folding movement.

As rearward pressure upon the seat member is continued the guide followers 27 will follow the guideways 28, thus slightly lowering the rear portion of the seat member to conventional seating position, the back member 23 being simultaneously raised by the levers 12, through their connection with the levers 11 by the links 15, until, upon full erection of the back member the levers 12 will be abutted on their opposite edges, and locked in position, by the lugs 38 and pins 39 of the frame and back members, respectively.

When the parts are in this final adjustment to seating position the rear and front of the seat member will be supported by the ear means 26, guide followers 27 and guideways 28, and by the trim piece 3, respectively, and the legs 30 will have been folded upwardly and thus retained by travel of the pins 34 of the links 33 in the complemental portions of the guideways 36 and leg slots 35.

In order to shift from the seating position to the bed position the front edge of the seat member is raised and pulled forward thus causing the lever and link connections to be reversely actuated.

It will be apparent that in response to the lifting of the front edge of the seat member and pushing or pulling it for shifting of the parts, as above described, the operation of the lever and link adjusting mechanisms will function automatically, easily and smoothly, and without binding. This shifting action may properly be defined as a floating movement, inasmuch as the hinge-joined seat and back members substantially float upon a six-point support furnished by the two guide follower rollers 27 in the guideways 28 and the four fulcral pivots 9, 9 and 10, 10 of the levers 11 and 12 respectively.

It will be noted, moreover, that while the levers 12 are turning clockwise the levers 11 are also turning clockwise, and vice versa, thus making possible full travel of these levers to effect change in adjustment of the seat and back members while they travel from front to rear of the supporting frame through the relatively short distance defined by the length of the guideways 28.

Also, the shifting movement of the back member 23 from seating position to bed position, and vice versa, is such that the back member does not project rearwardly of the rear rail 1 of the supporting frame, and hence when the sofa-bed is backed against a wall it need not be moved away from the wall to make the change from seating position to bed position, and vice versa.

Various changes and modifications are considered to be within the principle of the invention and the scope of the following claims.

What I claim is:

1. In a sofa-bed and the like article of furniture having a supporting frame and a seat member and a back member supported by said frame and movable relatively thereto and to each other from relative angular seating position to relative horizontally aligned bed position and vice versa, hinge means joining said seat member and back member at their contiguous edges at opposite ends thereof, and means for adjusting said seat member and back member from seating position to bed position and vice versa during their relative hinging movement and for ultimately optionally supporting said members in their seating or bed position, said adjusting means comprising guideway means carried by said supporting frame and extending between points adjacent to the front and rear thereof, guide follower means carried by said seat member and cooperating with said guideway means, a first lever of the first order having the fulcral point intermediate its ends provided with a fixed pivot on and adjacent to one end of said supporting frame and pivotally connected adjacent to one of its ends with said seat member, a second lever of the first order having the fulcral point intermediate its ends provided with a fixed pivot on and adjacent to the opposite end of said supporting frame and pivotally connected adjacent to one of its ends with said back member, and a link pivotally connecting the respective opposite ends of said levers, whereby when said seat member is shifted longitudinally of and guided by said guideway means said levers and link will cause said back member to respond to such movement and be automatically adjusted from its seating position to its bed position and vice versa, leg means pivotally attached to said seat member adjacent to its edge remote from said hinge means, and means for positioning said leg means substantially normal to said seat member and in ground-contacting arrangement when said seat member is in bed position, and in substantial parallelism with said seat member when it is in seating position, said positioning means being connected with the lever mechanism of the adjusting means for said seat and back members and being

operative automatically upon adjustment of said members from seating position to bed position and vice versa, said positioning means including an extension of said first lever outwardly of and for arcuate movement about the pivotal connection of said first lever with said seat member, a link having connections with said extension and leg means respectively, means providing for movement of the connection of said link with said leg means longitudinally of said leg means, and a guideway carried by said seat means in fixed relation to the pivotal connection of said leg means therewith, said guideway serving to guide the connection of said link means with said leg means during arcuate movement of said extension.

2. In sofa-bed apparatus as defined in claim 1, the connection between said link and leg means comprising a pin fixed to said link, and the connection for longitudinal movement of said link with respect to said leg means including a guideway carried by said leg means, the travel of said pin in the guideways of said seat member and leg means serving to impart pivotal movement to said leg means.

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