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SOFA-BED HINGE MECHANISM

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2 Sheets-Sheet 1

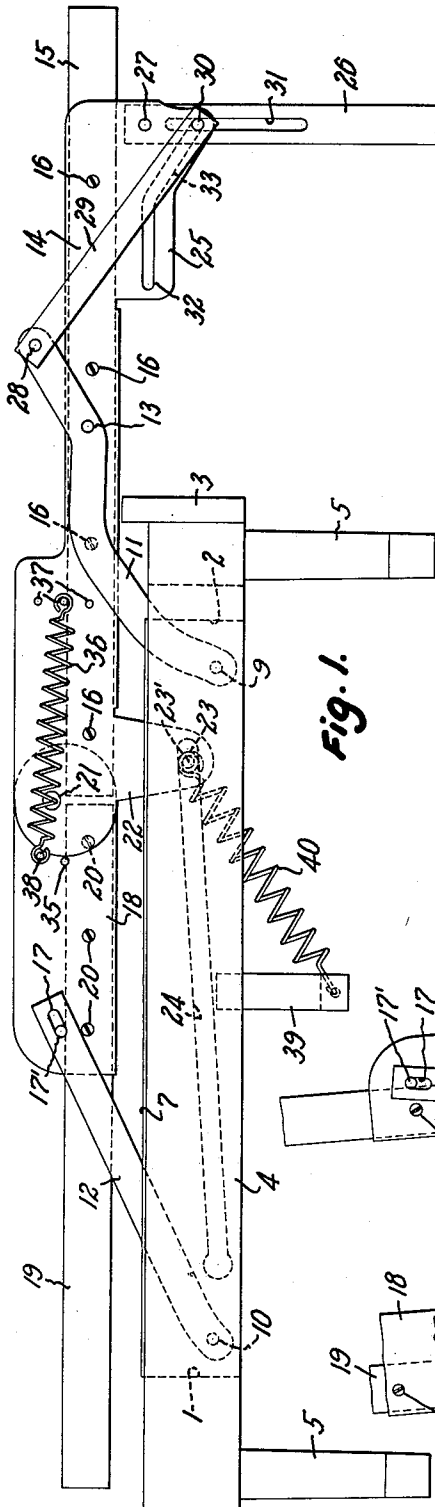


Fig. 1.

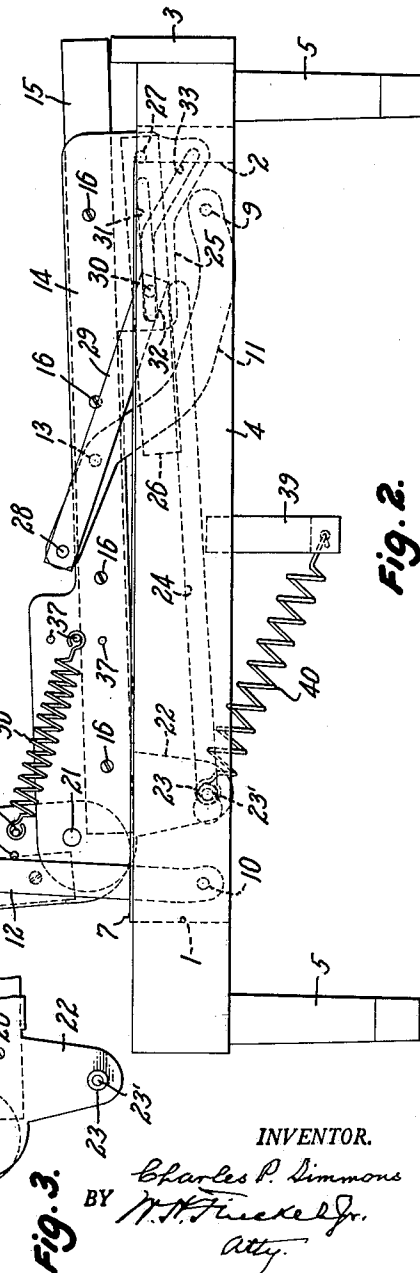


Fig. 2.

Fig. 3.

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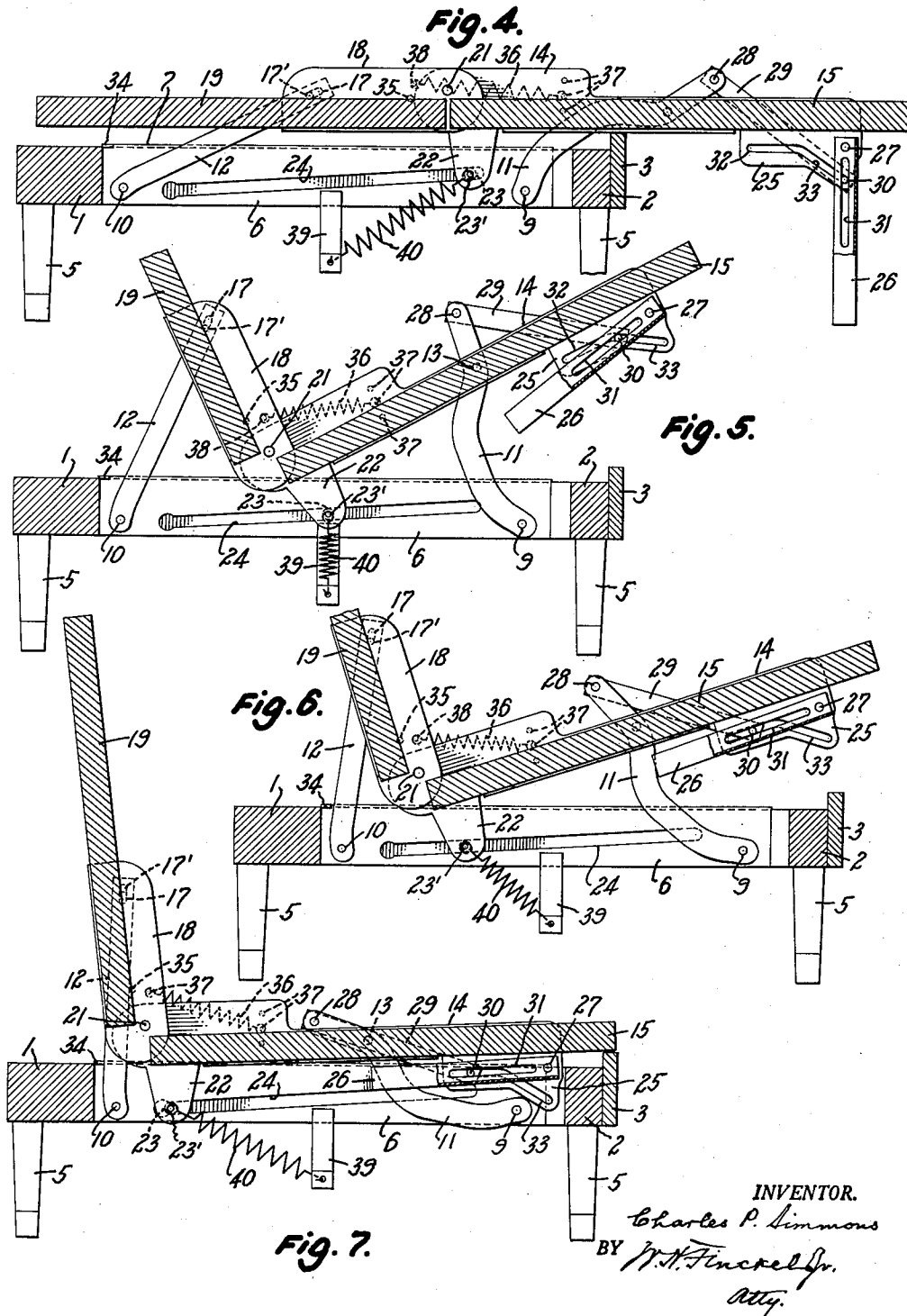
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2 Sheets-Sheet 2



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3,107,364
SOFA-BED HINGE MECHANISM
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 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 mechanism of the present invention embodies modifications of that disclosed in applicant's copending application for patent for Sofa-Bed Hinge Mechanism, filed July 25, 1960, Serial No. 45,172.

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 jackknife 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 desired for some accepted types of sofa-beds for which the mechanism of the present invention is particularly designed.

The hinge mechanism of the invention is particularly well adapted to accommodate spring and upholstery constructions embodying the features and elements disclosed in applicant's patent for Spring Construction for Furniture, No. 2,768,390, granted October 30, 1956.

One object of the present invention is to provide a hinge mechanism and actuating means therefor 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 slightly 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 mechanism 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 and in bed 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 relatively 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 provide resilient or spring means connected with the seat member and the main supporting frame, at opposite ends, respectively, such resilient or spring means serving to assist the operator in making the shift of the hinge-connected parts from bed position to seating position, and vice versa, and also functioning to cooperate in retaining these parts in either of such positions of final adjustment.

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 designed,

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 seating position,

FIG. 3 is a fragmentary view of the hinge parts as shown in FIG. 2 and showing one of the roller elements which travel in the guideways or slots of appropriate mounting plates of the supporting frame,

FIG. 4 is a reduced scale 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 element in the mid position of the shift from bed position to seating position, and vice versa,

FIG. 6 is a view similar to FIG. 5 but showing the parts of the mechanism in their relative disposition on approach to the seating position, and

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

Having reference particularly to the drawings, 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 boundaries 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 to 7) having a flange 7 (FIGS. 1 and 2) overlying its respective rail 4 and affixed thereto as by screws, not shown.

Carried by the plate 6 adjacent to the ends thereof at fixed fulcral pivots 9 and 10, respectively, are levers 11 and 12, respectively. Adjacent to its upper end the lever 11 is connected at a relatively fixed pivot point 13 to a combined hinge and mounting plate 14 (FIGS. 1 and 2) attached to the side of the seat member 15 as by screws 16. The upper end of the lever 12 has a lost motion pivotal connection comprising a slot 17 in the lever and a pin 17' offsetting from a combined hinge and mounting plate 18 attached to the side of the back member 19 as by screws 20. The combined hinge and mounting plates 14 and 18 are overlapped and joined in a hinge pivot connection at 21.

The plates 14 at opposite sides of the sofa-bed are provided adjacent to their rear ends with downwardly extending ears 22 carrying guide follower rollers 23 having pintles 23' (FIG. 3) and engaged in guideways or slots 24 formed in the complementary mounting and guide plates 6 and extending from the front to the rear thereof in downwardly inclined position.

The front ends of these plates 14, which extend adjacent to the front edge of the seat member 15, are provided with downward extensions 25 to which legs 26 are pivoted at 27.

The upper ends of the levers 11, outwardly of their pivot points 13 and arcuately movable thereabout, are pivotally connected at 28 with the rear ends of links 29 which are provided at their opposite ends with pins 30 engaged in guideway slots 31 in the legs and in guideways 32 in the extensions 25, the forward end portions 33 of said guideways 32 being angularly disposed downwardly of the pivots 27 of the legs 26.

For stop cooperation with the opposite edges of the levers 12 when the back member is in seating position (FIG. 7), the plates 6 are provided with stop lugs 34 (FIGS. 4 to 7), and the hinge plates 18 are provided with stop pins 35 (see particularly FIGS. 1 and 2).

Springs 36 spanning the hinge pivots 21 and adjustably attached to a selected one of a plurality of anchor pins 37 on the hinge plates 14 of the seat member 15 and attached to anchor pins 38 on the respective hinge plates 18 of the back member 19, 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 near or past dead-center position as to make this biasing ineffective until initial movement of the members toward seating position (see FIGS. 5 and 6).

Connected at one of their ends to the inwardly project-

ing pintles 23' of the rollers 23 of the ears 22, and at their other ends to brackets 39 projecting downwardly from the mounting plates 6 substantially midway of the guideways or slots 24, and hence substantially midway of the fore and aft travel of the hinge pivot connection 21 as determined by the levers 11 and 12 and travel of the roller 23, are tension springs 40 which serve to assist an operator in shifting the seat and back members 15 and 19 from bed position to seating position, and vice versa, and also to insure retention of these members in either position selected, as will be more particularly referred to hereinafter.

Obviously, the effect of the springs 36 and 40 can be varied somewhat in accommodation to the weight and other operative characteristics of the assembly, the former by the selection of those anchor pins 37 to which their forward ends are connected, and the latter by their contractive force, to thus facilitate the bed-to-seat position shifting of the parts, and also, as to the former, springs 36 of various force can be provided to this end when necessary or desired.

It will be noted, having reference especially to FIGS. 5 to 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 will be no crowding of the seat and back cushions when the parts are in seating position due to the pivot point 21 of the hinge being much closer to the spring-mounting seat and back members 15 and 19 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 particularly to FIGS. 1, 2 and 4 to 7, 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. 2 and 7), first the forward edge of the seat member is lifted about six inches and, at the same time, pushed rearwardly. This initial movement will be transmitted through the lever connections to impart relative pivotal movement to the seat and back members upon their hinge pivots 21 thus bringing into play the biasing action of the springs 36 and 40 and, at the same time, through the cooperation of the pins 30 of the links 29 with the angular portions 33 of the guideways 32 and the slots 31 of the legs 26, causing the legs to begin their pivotal upward folding movement.

As rearward pressure upon the seat member, aided by the springs 40, is continued, the guide follower rollers 23 will follow the guideways 24, thus slightly lowering the rear portion of the seat member to conventional seating position, the back member 19 being simultaneously raised by the levers 12, 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 34 and pins 35 of the frame and back members, respectively. Also, with the levers 12 thus blocked against movement, and the pins 17' being in the upper ends of the slots 17 of their lost motion connections, the back member is locked against movement until the seat member is again shifted forwardly. The reversely extending position of the levers 11 with respect to their pivots 9 and 13 is also effective in this locking function.

It will be noted moreover, that the inertia in the seat member created by the operators push upon it in shifting from bed position to seat position, augmented by the pull of the springs 36 and 40, is sufficient, when the springs 40 pass dead center (FIG. 5), to cause the springs to again be put under tension (FIGS. 2 and 7) while the seat and back members assume the seating position (FIG. 7). This function of the springs 40 is present also when the shift from seating to bed position is made.

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 22, 23 and guideways 24, and by the trim piece 3, respectively, and the legs 26 will have been folded upwardly and thus retained by travel of the pins 30 of the links 29 in the complementary portions of the guideways 32 and leg slots 31.

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 connections to be reversely actuated. Here again, when the seat and back members are in bed position, the lost motion connections 17, 17' come into play to lock the parts until the front edge of the seat member is again raised, for it will be noted that the pins 17' are then in the lower ends of the slots 17 and are thus retained by the tension of the springs 40, the reverse arrangement of the levers 11 with respect to their pivots 9 and 13 meanwhile serving to prevent any rearward movement of the seat member.

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 11, 12, 29, 30, 31, 32 and 33 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 23 in the guideways 24 and the four fulcral pivots 9, 9 and 10, 10 of the levers 11 and 12 respectively. Also, the action of the springs 36 and 40 in performance of the shift from bed to seating position so aids the operator that practically no effort on his part is required, and in shifting from seating to bed position the springs 40 will similarly aid and tend, moreover, to counteract the tension of the springs 36.

It will be noted, moreover, that while the levers 12 are turning clockwise the upper ends of the levers 11 are turning counter-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 24.

Also, the shifting movement of the back member 19 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, 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 lever provided with a fixed fulcral pivot on said supporting frame and pivotally connected adjacent to one of its ends with said seat member, a lever having a fixed fulcral pivot on said supporting frame and pivotally connected adjacent to one of its ends with said back member, resilient means in normally tensed condition having its opposite ends connected respectively with said seat member adjacent to said guide follower means and with said supporting frame substantially midway of the length of said guideway means, whereby said resilient means is tensed and relatively relaxed as said seat member is shifted longitudinally of and guided by said guideway means relative to the connection of said resilient means with said frame and will thus bias said levers to aid in continuing such shifting movement and cause said seat and back members to respond to such movement and be automatically adjusted from seating position to 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 in ground-contacting arrangement when said seat member is in bed position, and in substantial parallelism with said seat member when the seat member is in seating position, said positioning means including an extension on the lever connected with said seat member and extending outwardly of the pivotal connection of said lever with said seat member for arcuate movement about said connection, a link having connections with said extension and leg means respectively, means providing for movement of the connection of said link means with said leg means longitudinally of the leg means, and a guideway carried by said seat means in fixed relation to the pivotal connection of said leg means therewith for guiding the connection of said link means with said leg means during arcuate movement of said extension, whereby said leg positioning means will be operative automatically upon adjustment of said member from seating position to bed position and vice versa.

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 slot means in said leg means, said pin being engaged in said slot means and the travel of said pin in the guideway of said seat member and in the slot means of said leg means serving to impart pivotal movement to said leg means.

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