June 30, 1959 J. J. BARABAS 2,892,484

RECLINING CHAIR STRUCTURE

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Fig. 1.

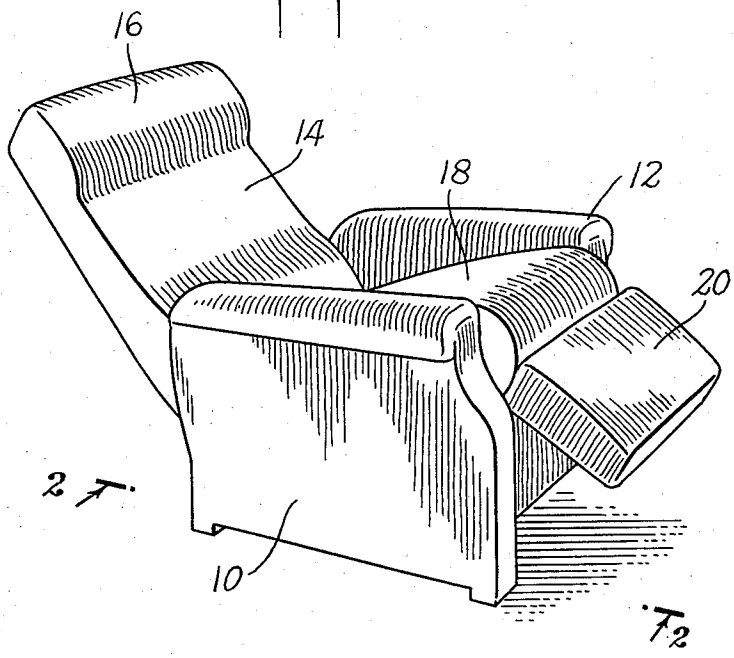
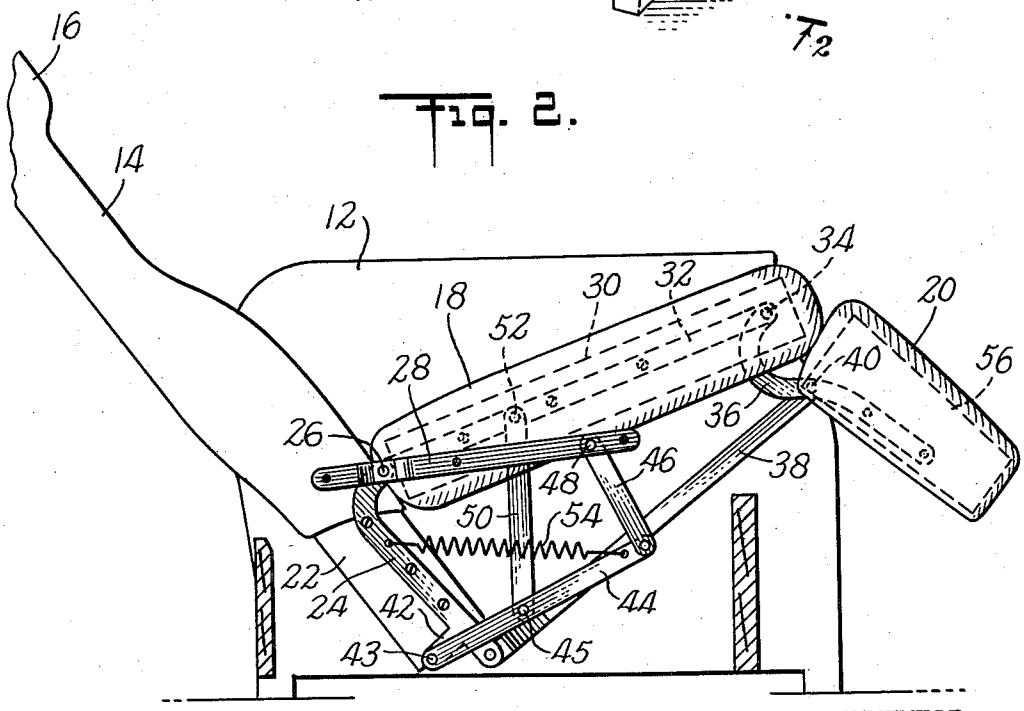


Fig. 2.



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Fig. 3.

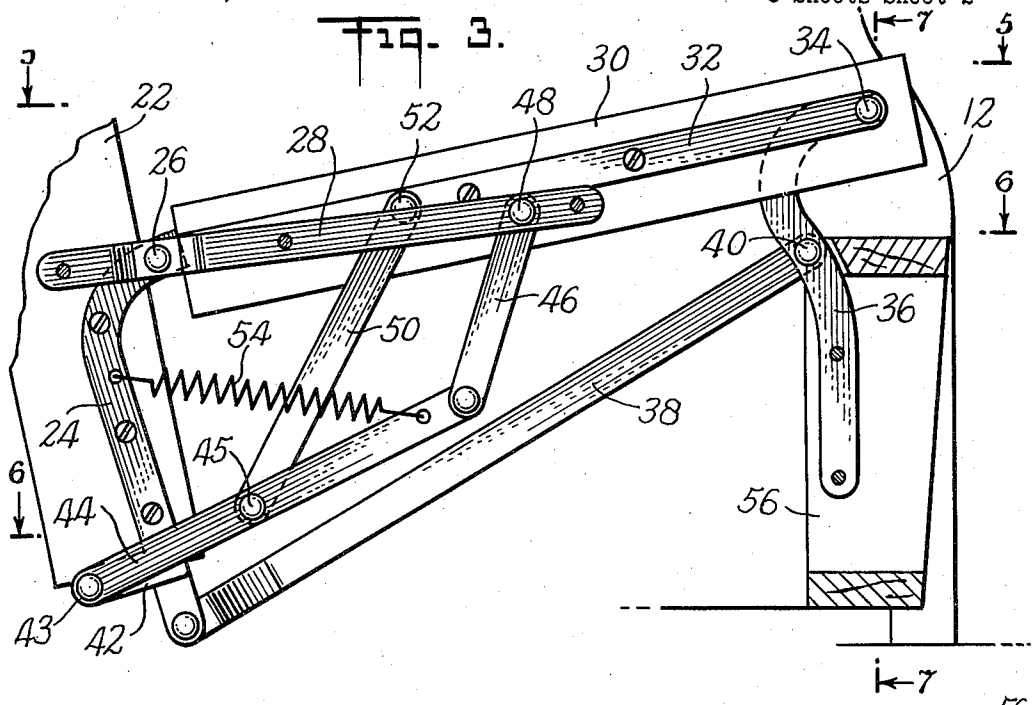
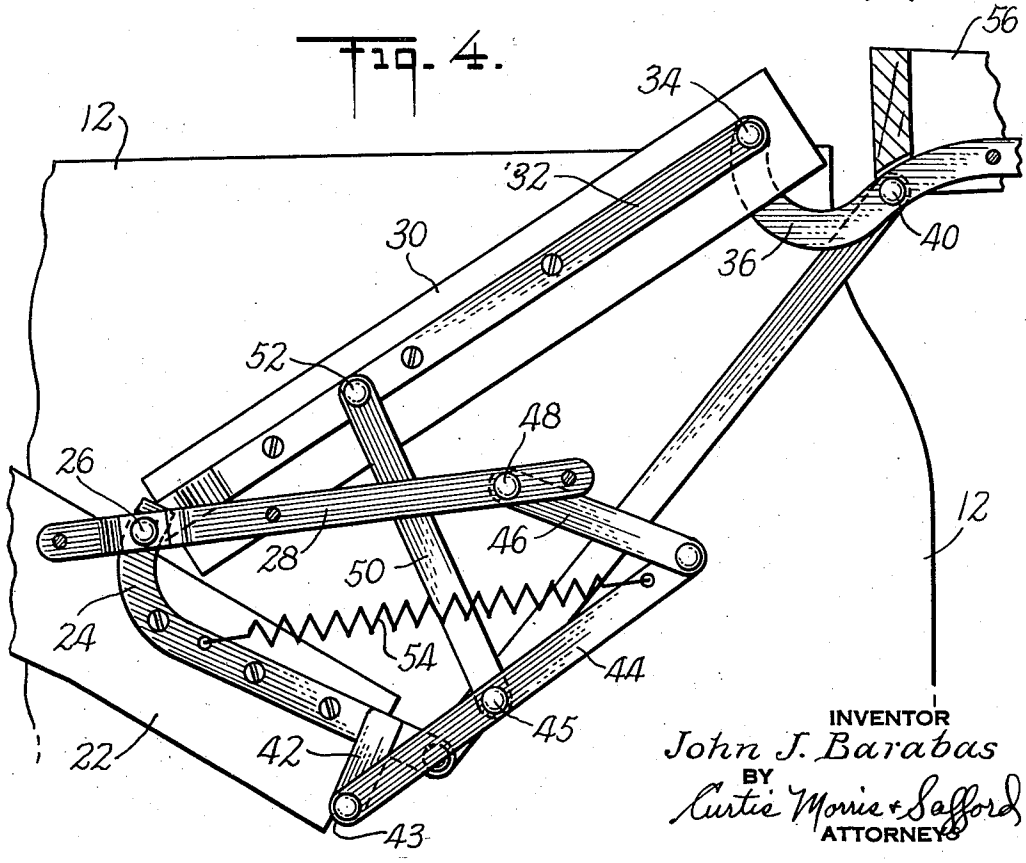


Fig. 4.



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Fig. 5.

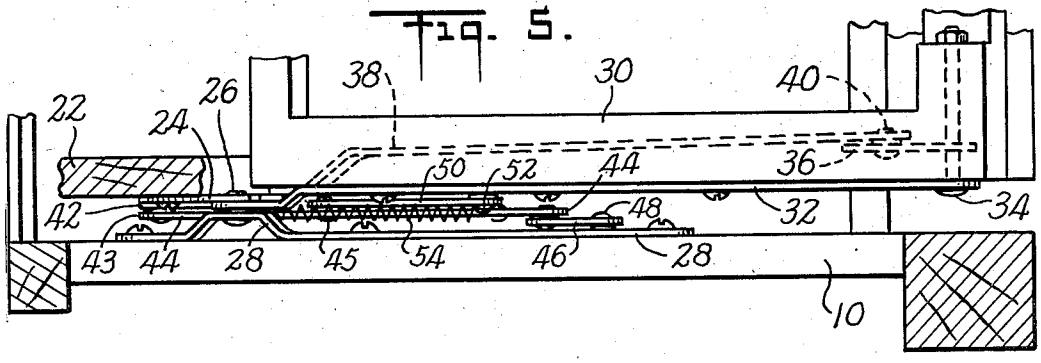


Fig. 6.

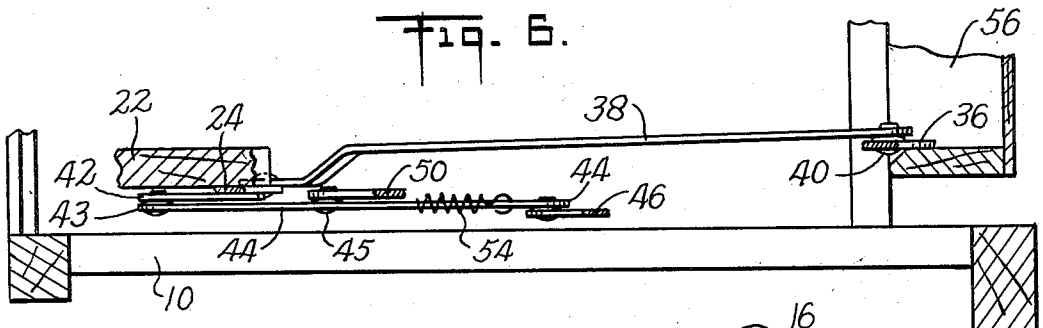


Fig. 7.

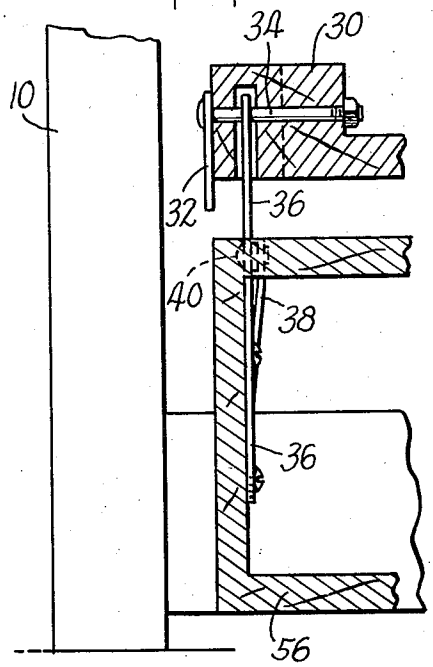


Fig. 8A.

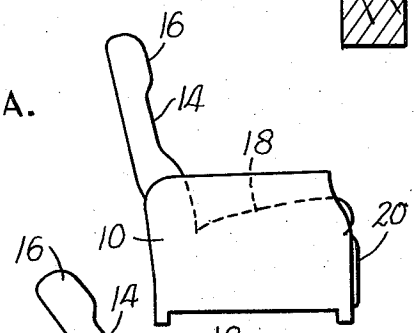


Fig. 8B.

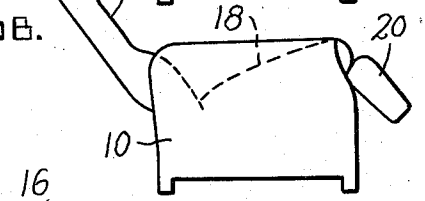
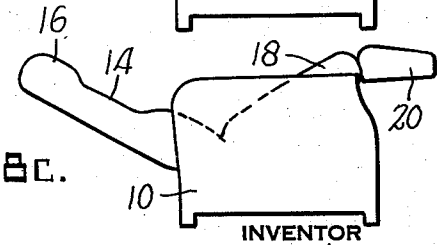


Fig. 8C.



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RECLINING CHAIR STRUCTURE

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Application January 24, 1956, Serial No. 560,965

2 Claims. (Cl. 155—106)

This invention relates to reclining chairs. More particularly, this invention relates to such chairs having a movable back-rest, seat and leg-rest all of which are interconnected in such a manner that their movements are properly coordinated during adjustment of the chair to provide optimum comfort for the user at all positions thereof.

Although a considerable variety of adjustable-type chairs have been proposed heretofore, the prior arrangements have had a number of important defects. For example, the reclining mechanisms in such arrangements have generally not been capable of providing the correct relationship between the movements of the back-rest, seat and leg-rest to assure proper comfort for the user in all positions of the chair. Furthermore, in attempting to achieve this relationship, many of the prior proposals have included mechanical structures that are relatively complex and expensive to manufacture, and hence have not been suitable for commercial development. In this respect, a number of the old arrangements have used mechanisms employing sliding contact devices, roller elements, etc., which have given considerable difficulty in use. Additionally, the reclining chair mechanisms proposed heretofore have not been fully satisfactory when used with upholstered lounge-chair furniture.

Accordingly, it is an object of the present invention to provide a reclining chair that is superior to those available heretofore. It is a further object of the present invention to provide a commercially practicable chair having a linkage mechanism adapted to establish the correct relationship between the movements of the back-rest, the seat and the leg-rest thereof so as to assure proper comfort for the user in all possible chair positions. It is a still further object of the present invention to provide such a chair that lends itself to inexpensive manufacturing processes, and which is particularly well adapted for use with upholstered type furniture.

In a preferred embodiment of the invention, to be described hereinbelow in more detail, a lounge chair is provided comprising a pair of spaced-apart side frame members to which is pivotally connected a back-rest having a portion which extends down below the back-rest pivot point. The chair seat is pivotally connected to the back-rest at this same pivot point, and a leg-rest is in turn pivoted to the front portion of the seat. An easy-operating mechanism is provided for interconnecting the back-rest, the seat and the leg-rest in such a manner that they all move together in predetermined relation to one another as the user shifts his weight backwards or forwards in the chair. This mechanism includes a number of pivotally-connected linkages so arranged as to permit this predetermined relationship to be correct for providing substantially optimum comfort for the user at all chair positions; and yet the linkage arrangement also is such as to assure adequate mechanical clearances between the various moving parts, between these parts and adjacent portions of the chair proper, and between these parts and the flooring on which the chair rests.

Other objects, advantages and aspects of the present invention will be in part pointed out in, and in part apparent from, the following description considered together with the accompanying drawings, in which:

Figure 1 is a perspective view of a reclining chair in accordance with the present invention;

Figure 2 is a vertical section taken along line 2—2 of Figure 1;

Figure 3 is a detail view showing the reclining mechanism of Figure 2 in its normal non-reclining position;

Figure 4 is a detail view showing the reclining mechanism of Figure 2 in its fully-reclining position;

Figure 5 is a horizontal section taken along line 5—5 of Figure 3;

Figure 6 is a horizontal section taken along line 6—6 of Figure 3;

Figure 7 is a vertical section taken along line 7—7 of Figure 3 and particularly showing the interconnection between the seat and the leg-rest; and

Figure 8 shows in reduced scale the reclining chair in three different positions.

Referring now to Figure 1, there is shown an upholstered reclining chair in its intermediate reclining position, i.e. as shown in Figure 8(*b*) intermediate the upright and fully-reclined positions shown respectively in Figures 8(*a*) and 8(*c*). This chair includes a pair of side frame members **10** and **12** with their upper edges arranged as arm rests. Supported between these frame members is a tiltable back-rest **14** having its upper portion padded to form a head rest **16**. The chair also includes a seat **18** and a leg-rest **20** which are interconnected with the back-rest in a manner to be explained and movable therewith to establish the desired reclining support for their chair user.

The back-rest **14**, seat **18** and leg-rest **20** are connected together for coordinated movement by a pair of linkage mechanisms each of which is located adjacent a corresponding one of the side frame members **10** and **12**. These mechanisms are identical, and accordingly the description hereinbelow will be directed to only one of the two mechanisms.

Referring now to Figure 2, the back-rest **14** includes a frame member **22**, e.g. formed of wood. Fastened as by means of bolts to the side of this back-rest frame, at the lower portion thereof, is a rigid iron strap **24** which extends upwardly and at its top is curved forwardly of the back-rest to a pivotal connection with a pin **26** which is supported by an iron strap **28** fastened in a generally horizontal position to an inner surface of the side frame member **10**. The pivot pin **26**, in conjunction with the corresponding pivot pin (not shown) on the opposite side of the chair, supports the back-rest and accommodates reclining movement thereof as the chair user shifts his weight forwards or backwards.

The chair seat **18** includes a seatboard **30**, shown in dotted outline in Figure 2, to the side of which is fastened an iron strap **32**. The rearward end (to the left in the drawings) of this seat strap is pivotally supported by the pin **26** to which the back-rest frame **22** also is secured. The forward end of this strap **32** is pinned at **34** to an iron strap **36** which curves downwardly and rearwardly in semi-circular fashion and is fastened to an inner side surface of the framework **56** (shown in dotted outline) within the leg-rest **20**.

The lowermost end of the back-rest strap **24** is pivotally connected to a thrust linkage **38** which extends upwardly and forwardly to a pivotal connection at **40** with the leg-rest strap **36**. It will be apparent that as the back-rest **14** is moved counter-clockwise about the pivot pin **26** to a more reclining position, the resultant

forward motion of the thrust linkage **38** will rotate the leg-rest strap **36**, and with it the leg-rest **20**, counterclockwise around the seat pin **34** and thereby advance the leg-rest to a more nearly horizontal position.

The back-rest strap **24** is formed, adjacent its lowermost end, with a rearwardly-offset tab **42** to the end **43** of which is pivotally connected one end of an intermediate linkage **44** extending upwardly and forwardly generally adjacent the thrust linkage **38**. The forward end of the intermediate linkage **44** is pivotally connected to the lower end of a control linkage **46**, the upper end of this latter linkage being pivoted about a pin **48** supported by the side frame strap **28**. The intermediate linkage also is pivotally connected, at a point **45** approximately midway between its ends, to the lower end of a connecting link **50**. The upper end of this connecting link is in turn pivotally connected to a pin **52** secured to the seat board strap **32**.

Connected between the forward end of the intermediate linkage **44** and the back-rest strap **24** is a coiled balance spring **54**. This spring applies a force to the linkage mechanism tending to urge the back-rest **14** towards its upright position. The amount of force applied by the spring is generally proportional to the extent to which the back-rest has been reclined.

As the back-rest is tilted rearwardly about the pivot pin **26**, the movement of the thrust linkage **38** as explained above tends to rotate the leg-rest **20** upwardly towards a horizontal position, and at the same time the intermediate linkage **44** moves forwardly and slightly upwards due to the restraint imposed by the control linkage **46**. This upward movement of the intermediate linkage is transmitted through the connecting linkage **50** to the seat board **30** and accordingly elevates the seat **18** about the pivot pin **26**. The leg-rest **20** is moved upwardly not only by the thrust linkage **38** but also by the motion imparted to the leg-rest strap **36** by the seat board, thereby to assure a substantially unbroken line of support for the body of the chair user at all positions of the linkage mechanism.

Figure 3 shows in enlarged detail the linkage mechanism described above, the chair upholstery being omitted in this view to clarify the presentation. The mechanism is shown conditioned for the normal non-reclined chair position, with the back-rest frame **22** disposed in a nearly vertical position and the leg-rest frame **56** extending downwardly from the seat board **30** substantially in a vertical position. The balance spring **54** is arranged to provide only a slight tension in this position to permit easy movement of the chair to its reclining positions. This moderate tension is important because the user, in shifting his weight backwards to recline the chair, does not apply great force against the back-rest since the major portion of his weight is borne by the seat in the upright position of the chair.

It also may be noted that the thrust linkage **38** and the leg-rest strap **36** are interconnected in such a manner as to provide considerable motion of the leg-rest **20** during the initial phases of movement of the back-rest **14**. The corresponding motion of the seat **18**, however, desirably is relatively small, and for this reason the intermediate linkage **44**, functioning in combination with the control linkage **46** and the connecting linkage **50**, is arranged to provide only a moderate initial uplift of the seatboard **30** during the initial phases of movement of the back-rest. This small initial amount of movement is partly due to the fact that the connecting and control linkages are inclined somewhat forwardly with respect to the intermediate linkage when the chair is in its non-reclining position.

The linkage mechanism of Figure 3 is shown in its fully-reclining position in Figure 4. Here it may be seen that the seat-board **30** now is tipped upwardly about the pivot pin **26** a substantial amount, while the leg-rest frame **56** extends outwardly in a nearly horizontal position to provide desirable comfort for the chair user. The control linkage **46** in this position of the mechanism is tipped rearwardly with respect to the intermediate linkage **44**, and hence reclining motion of the back-rest produces a substantial upward movement of the intermediate linkage. Also, this movement is transmitted directly to the seat-board **30** because the connecting linkage now is very nearly perpendicular to the intermediate linkage. The resulting motion of the seat-board, although substantial, is maintained at a proper relationship to the motion of the back-rest and the leg-rest, partly because the intermediate linkage is pivoted to the back-rest by means of the off-set tab **42**. Further in this regard, it has been found desirable to form the mechanism in such a way that the length of the connecting linkage **50** (between the pivot points **45** and **52**) is equal to the distance between the back-rest pivot points **26** and **43**.

It will be apparent that the linkage mechanism is arranged in such a manner as to simultaneously produce the required different relative degrees of movement of the seat **18** and the leg-rest **20**, and yet is extremely simple in construction and free from any possible mechanical interferences between the various parts and linkages thereof. Also, in the fully-reclining position, the balance spring **54** provides a substantial amount of tension tending to return the mechanism to its normal non-reclining position. This increased tension helps to maintain the linkage mechanism stable in the face of the increased force produced by the weight of the user when the back-rest is in its more nearly horizontal position, and further assists the user in returning the chair to its normal non-reclining position when desired.

Figure 5 shows the manner in which the various elements of the linkage mechanism are arranged relative to one another to permit full freedom of movement in the small space available between the side frame **10** and the interior of the chair. It may be noted that the side-frame strap **28** and the seat-board strap **32** are formed toward each other in the region where they are joined together with the back-rest strap **24** by the pivot pin **26**, and thereby present a compact multiple pivot connection that is especially rugged and assures relative freedom from undesired twisting movement of the back-rest and the seat. In like manner, and as particularly shown in Figure 6, the thrust linkage **38** is fastened to the lower end of the back-rest strap **24**, abuting the inner surface thereof, and curves inwardly away from the other elements of the linkage mechanism to its pivotal connection with the leg-rest strap **26**, abuting the inner surface of this latter strap. With this compact but properly coordinated mechanism, there is ample space for providing the conventional upholstering without producing any interference either between the moving parts of the mechanism, or between these parts and the main elements of the chair proper.

These features also are brought out in Figure 7 which shows in more detail the manner in which the leg-rest frame **56** is pivoted to the seat-board **30**. In this figure, it can be seen that the leg-rest strap **36** is fastened directly to the inner side surface of the leg-rest frame, and the curved upper portion of this strap extends vertically upwards into a narrow slotted recess formed in the underside surface of the seat-board. This latter arrangement is particularly advantageous in that it accommodates in a simple manner the full extent of movement of the leg-rest between its vertical and horizontal positions. The seat-board pivot pin **34** extends entirely through the side wall of the seat-board and engages both the seat-board strap **32** and the leg-rest strap **36** in a pivotal connection that provides full freedom of movement and desirable spacing between the various elements.

Although a specific preferred embodiment of the invention has been set forth in detail, it is desired to emphasize that this is not intended to be exhaustive or necessarily limitative; on the contrary, the showing herein is for the

purpose of illustrating one form of the invention and thus to enable others skilled in the art to adapt the invention in such ways as meet the requirements of particular applications, it being understood that various modifications may be made without departing from the scope of the invention as limited by the prior art.

I claim:

1. A reclining chair comprising in combination a pair of spaced apart side frame members, a back rest and a seat pivoted together between said frame members and supported thereby, said back rest including a portion extending below said seat, and a pair of link mechanisms for coordinating the movements of said back rest and seat, each of said mechanisms being suspended from a side of a respective one of said frame members and including an intermediate link pivoted at its rear end near the bottom end of said back rest portion and extending forward and upward, a control link pivoted at its lower end to the front end of said intermediate link and extending upward and slightly forward to a fixed pivot point on a respective one of said side frame members, and a connecting link pivoted near the middle of said intermediate link and extending forward and upward to a pivot point on a respective side of said seat, said control and connecting links being approximately parallel when said chair is in upright position and being substantially non-parallel when said chair is in full reclining position, said connecting link lying at approximately right angles to said intermediate link when said chair is in full reclining position and lying at an angle of approximately 45° relative to said intermediate link when said chair is in upright position, and a tension spring connected between a point adjacent the pivot of said intermediate link and said control link and a point on said backrest below the pivot between it and said seat, whereby the tension of said spring tends to return said chair to upright position.

2. A self-uprighting reclining chair comprising a frame, a chair back having an upper portion and having a lower portion extending down into said frame, a seat positioned forward of said back, and a reclining mechanism for pivotally supporting said seat and back from said frame, said mechanism including an elongated link attached along a side of said seat and having a front and a rear end, a short link attached to the lower portion of said back and pivoted at its upper end to the rear end of said elongated link, a first pivot supported from said frame, a downwardly extending support link pivoted at its upper end at a second pivot supported by said frame, a forwardly extending lower link pivoted at a third point to the lower end of said short link, and pivoted at a fourth point to the lower end of said support link, linkage means pivoted to said elongated link forward of its rear end and to said lower link so that as said back is swung to reclining position said seat swings upward, a footrest pivoted to the forward end of said elongated link and coupled to the lower portion of said back for outward and upward swinging when said back reclines, and a tension spring connected at its forward end adjacent the pivot junction between said lower link and said support link and connected at its rear end to said short link slightly below said first pivot, whereby said spring acts to return said chair to upright position but when said chair is in reclining position said spring is not excessively tensioned so that said chair will remain in reclining position even with a lightweight person sitting in it.

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