

July 5, 1960

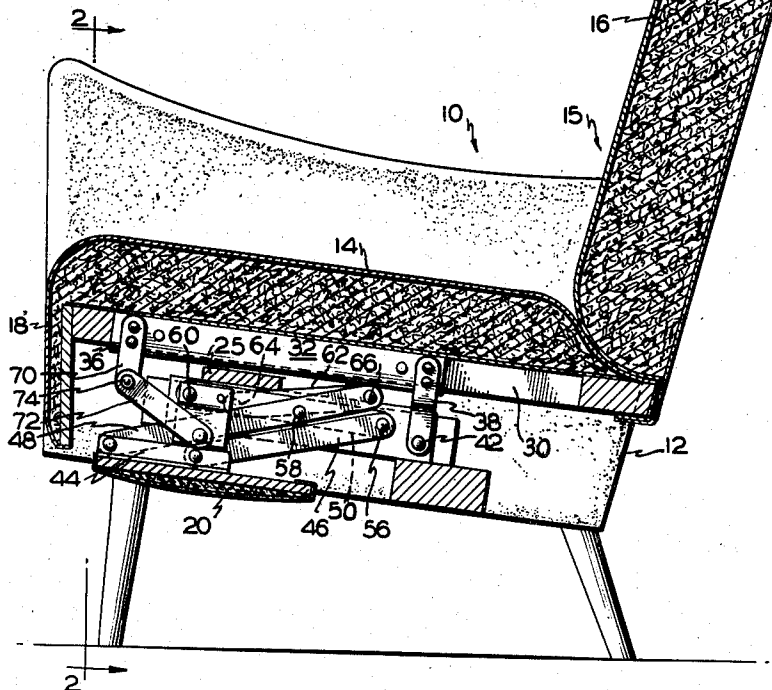
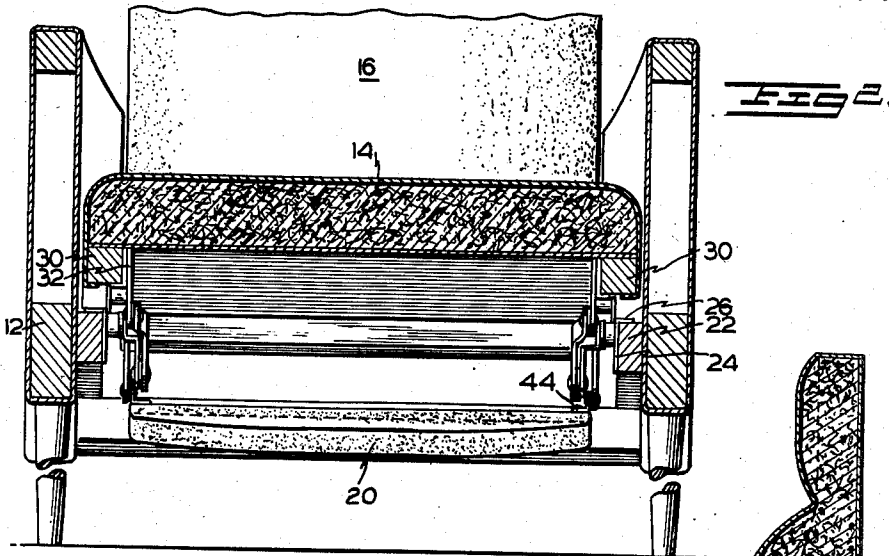
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2,943,670

RECLINING CHAIR

Filed June 25, 1954

3 Sheets-Sheet 1



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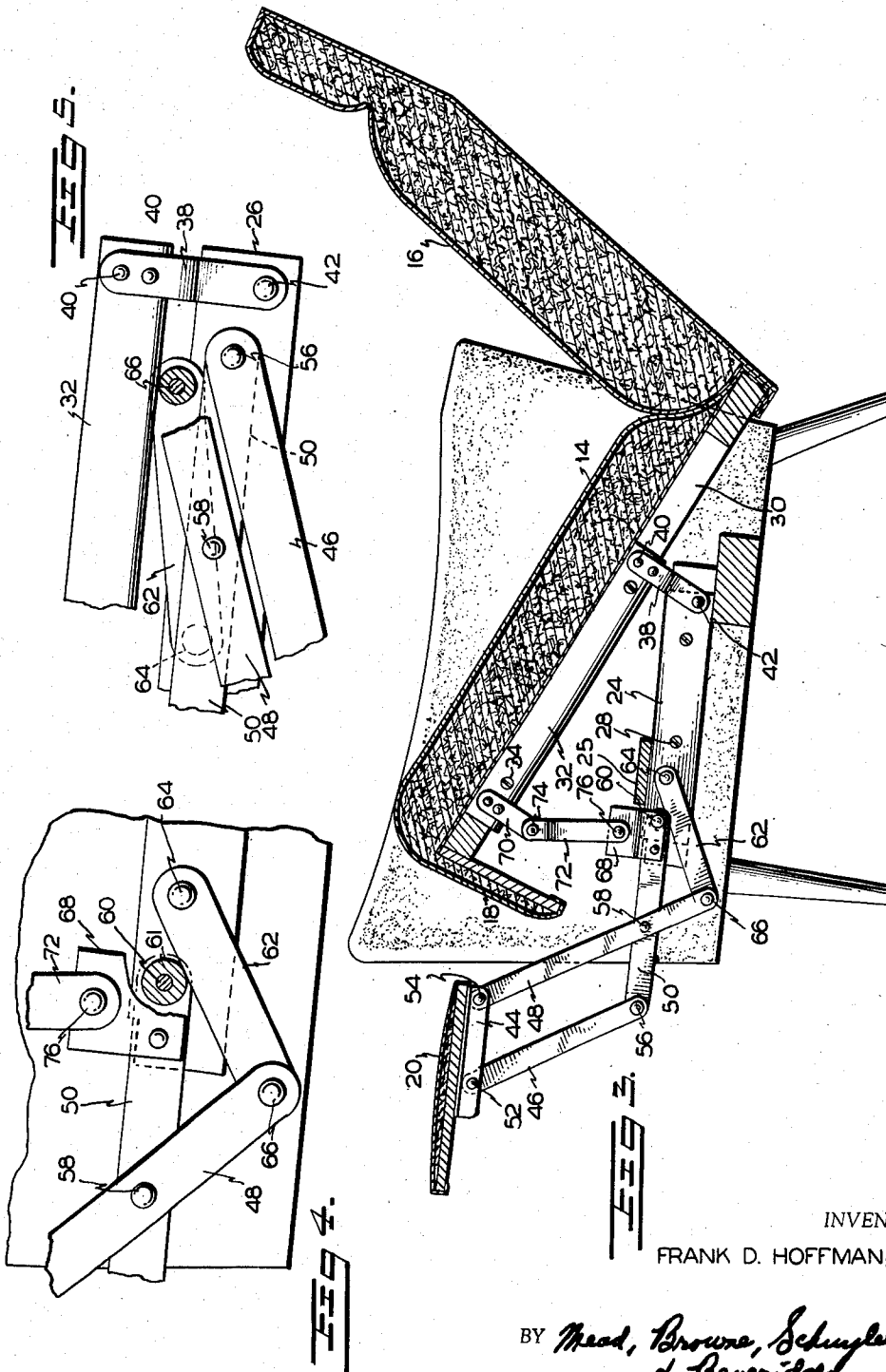
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3 Sheets-Sheet 2



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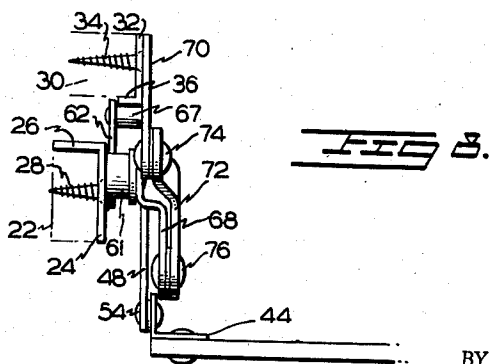
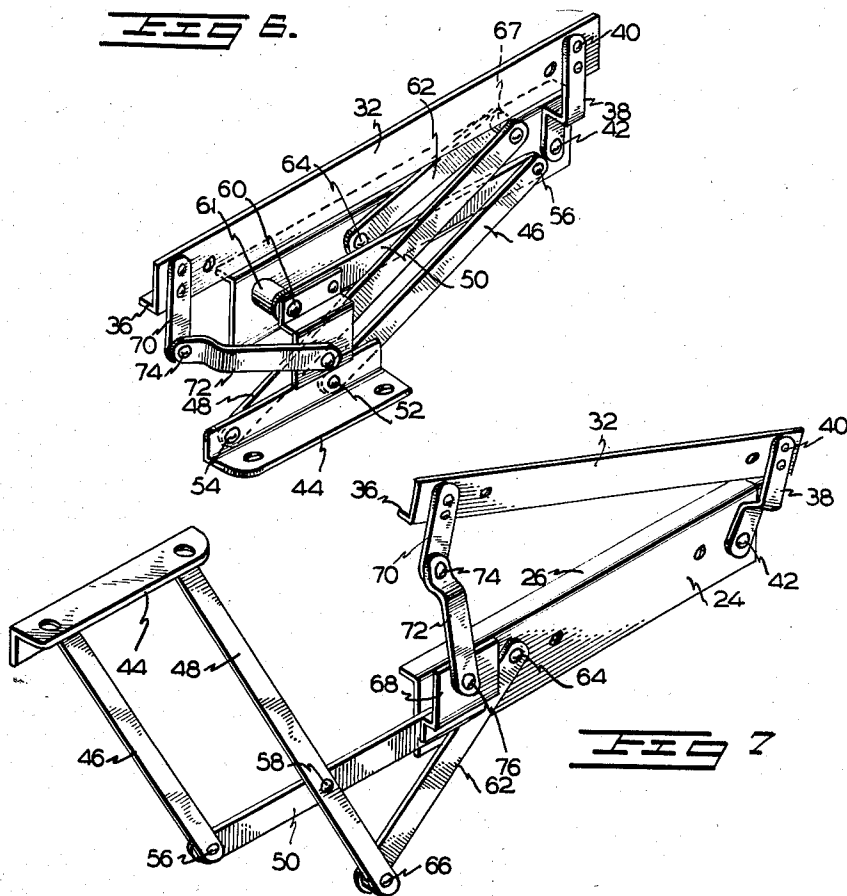
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3 Sheets-Sheet 3



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2,943,670

RECLINING CHAIR

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Filed June 25, 1954, Ser. No. 439,425

1 Claim. (Cl. 155—106)

The invention relates to reclining chairs and more particularly to a reclining chair having a leg rest whose movement is coordinated with the movement of the chair into reclining position.

Many types of reclining chairs have been developed in which a leg rest member is moved upwardly as the reclining chair is moved into reclining position. Most of these chairs have the leg rest member pivotally connected to the forward portion of the chair seat and a linkage means is provided for moving the leg rest member upwardly about its pivot point when the chair is moved into reclining position. One limitation of chairs operating on the principle just mentioned is the fact that the leg rest member, being pivotally connected at one of its ends to the seat member, does not project as far forwardly of the chair as might be desired for the comfort of the occupant of the chair.

A further feature typical of most reclining chairs is the fact that the leg rest is disposed at the forward portion of the chair in a vertical position when the chair is not in reclining position. In other words, the leg rest which usually serves no useful function when the chair is not in reclining position is conventionally positioned in full view at the forward portion of the chair even when the leg rest is not serving its intended function.

Accordingly, it is an object of this invention to provide a reclining chair having a leg rest which is supported by an operating linkage, rather than being pivotally connected to the front of the chair seat as is common in many types of reclining chairs.

It is another object of this invention to provide a reclining chair structure in which a leg rest member is projected upwardly and forwardly of the seat by the motion of the chair seat or seat-back structure into reclining position.

It is still another object of this invention to provide a reclining chair structure in which the leg rest member is normally hidden from view when not in use.

It is a further object of this invention to provide a reclining chair structure in which the leg rest moves through an arc of 180 degrees in passing from an in-use to a not-in-use position.

In achievement of these objectives, this invention provides a reclining chair in which a leg rest is connected to a constrained quadric linkage system which is moved upwardly and forwardly of the chair when the chair is moved into reclining position. Motion is imparted to the quadric linkage through an operating member in such manner that the leg rest is moved from a concealed position beneath the seat when not in use to a position projected forwardly of the chair seat when the seat member is in reclining position. The leg rest moves through an arc of 180 degrees in moving from its elevated or in-use position to its retracted or not-in-use position.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a view in longitudinal section of a reclining

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chair in accordance with the invention with the chair not in reclining position;

Fig. 2 is a view in transverse vertical section along the line 2—2 in Fig. 1;

Fig. 3 is a view in longitudinal section with the chair in reclining position;

Fig. 4 is an enlarged fragmentary view of a portion of the operating linkage to illustrate the stop action which occurs when the leg rest reaches its maximum elevated position;

Fig. 5 is an enlarged fragmentary view of a portion of the operating linkage illustrating the stop action which occurs when the leg rest reaches its maximum retracted position;

Fig. 6 is a perspective view of the operating linkage with the leg rest in fully retracted position;

Fig. 7 is a perspective view of the operating linkage with the leg rest in fully elevated position; and

Fig. 8 is a front elevation view of the operating linkage in retracted position.

Referring now to the drawings, there is shown a reclining chair generally indicated at 10 having a stationary supporting framework 12 and a unitary seat-back structure 15 which includes a seat 14 and a back 16. In the embodiment shown, the seat and back are rigidly connected together and move as a unit. Both the seat and the stationary framework may be upholstered in any desired manner. The seat portion 15 also includes a downwardly depending front portion 18 which extends downwardly substantially perpendicularly or at an angle slightly less than perpendicularly to the seat portion 14. The front portion 18 is upholstered in the same manner as the rest of the unitary seat-back structure.

A leg rest member 20 is connected to the stationary framework and to the reclining seat-back unit 15 by an operating linkage which will be described hereinafter. The leg rest 20 when not in use is disposed beneath the chair in a plane substantially parallel to the plane of the seat portion 14. The leg rest member 20 is movable upwardly and forwardly of the chair when the seat-back unit moves to reclining position and assumes the position shown in Fig. 3 when the seat-back unit is in its ultimate reclining position. In moving from the position of Fig. 1 to the position of Fig. 3 the leg rest 20 is also turned through an angle of substantially 180 degrees.

The stationary supporting structure 12 includes a pair of oppositely disposed longitudinally extending stringer members 22 which extend in the front-rear dimension of the supporting framework on each side of the chair. A metal bracket member 24 having an outwardly turned flange portion 26 is rigidly attached to each of the stringer members 22, as by means of the screws 28. A frame member 25 extends transversely between the upper edges of stringer members 22. The chair seat portion 14 includes a pair of oppositely disposed longitudinally extending stringer members 30 which extend in the front-rear dimension of the seat 14 on each side thereof. A metal bracket member 32 is rigidly attached to each of the stringers 30 by screws 34. Each of the bracket members 32 is provided with an outwardly turned flange 36 which is adapted to lie adjacent the underneath surface of each of the stringer members 30 adjacent the inner edge thereof.

The seat-back structure 15 is pivotally connected to the stationary supporting framework 12 by means of link member 38 which is rigidly connected at 40 to the rear end of the bracket 32 attached to the seat portion 14. The opposite end of link 38 is pivotally connected at point 42 to the rear end of the bracket 24 attached to the stationary framework 12. A similar link member 38 is provided on each of the opposite sides of the chair.

In order to effect a forward and upward movement of

the leg rest member 20 from the retracted position shown in Fig. 1 to the extended position shown in Fig. 3, an operating linkage is provided which communicates the movement of the reclining seat-back structure 15 to the leg rest member. This operating linkage will now be described. A similar linkage is provided on each side of the chair. It will be understood that the description of one linkage is equally applicable to both linkages. As can most clearly be seen in the view of Fig. 3, the leg rest 20 is supported by what may be termed a constrained quadric linkage which includes the links 44, 46, 48 and 50. The link 44 is a bracket member rigidly attached to the underneath surface of the leg support member. The links 46 and 48 are pivotally connected at the points 52 and 54 to the front and rear ends, respectively, of the bracket 44 with respect to the view shown in Fig. 3. The links 46 and 48 form one pair of opposite sides of the quadric linkage while the links 44 and 50 form the second pair of opposite sides of the quadric linkage. The link 50 is pivotally connected to the end of link 46 at the point 56 and is pivotally connected to the link 48 at the point 58. Links 46 and 48 directly overlie link 50, the links 46 and 48 lying in the same plane as each other. Link 50 extends beyond the quadric linkage and is connected at point 60 to the forward end of the bracket 24 which is attached to the stationary framework 12. Link 50 is spaced from the plane of bracket 24 by a short distance, say one inch, by the interposition of a bushing member 61 between link 50 and the surface of bracket 24 at pivot point 60. A link 62 is pivotally connected at point 64, a short distance to the rear of the pivotal connection 60 of link 50. The link 48 projects beyond its pivotal connection 58 to the link 50 and is connected at its outer end at pivotal connection 66 to the outer end of the link 62. Link 48 lies in a plane which is spaced a short distance from the plane of link 62, so that the pin which establishes the pivotal connection between these two links passes through a spacing bushing 67. As will be explained later, the link 62 may be termed a "tertiary" operating link or guide link which serves to swing the links 46 and 48 upwardly about their pivot points 56 and 58. The link 50 which is pivotally connected at point 60 to the bracket 24 is provided adjacent its pivotal connection 60 with a lever arm or bracket 68. Link 50 may be considered a "secondary" operating link.

In order to communicate the motion of the reclining seat-back structure 15 to the leg rest 20 and its linkage system just described, an operating linkage including the projection 70 and link 72 is provided. The projection 70 is rigidly connected to the forward end of the bracket 32 which is attached to the seat portion 14 and extends substantially perpendicularly to the longitudinal axis of the bracket 32. At its outer end, the member 70 is pivotally connected at point 74 to the outer end of the link 72. The opposite end of link 72 is pivotally connected at point 76 to the lever arm or bracket 68. The lengths of members 70 and 72 determine the arc of movement of reclining member 15 about its pivot point 42 from a non-reclining to a reclining position, which in turn controls the angular movement imparted to the link 50 and to the leg rest in moving from non-reclining to reclining position. The lengths of members 70 and 72, and hence the arc of movement of reclining member 15, are so adjusted as to cause a 180-degree movement of the link 50 and of the leg rest member in moving from non-reclining to reclining position.

When the chair is not in reclining position, the linkage assumes the position shown in Figs. 1 and 6. The leg rest member 20 is disposed entirely beneath the stationary supporting framework 12 of the chair and lies in a plane substantially parallel to the plane of the seat portion 14. In this position, the leg rest is turned 180 degrees from the position shown in Fig. 3, so that the pivot point 54 which is disposed at the rear of the leg rest in the elevated position of Fig. 3 is disposed at the front

of the leg rest in the retracted position of Figs. 1 and 6; and the pivot point 52 of the leg rest member which is disposed at the forward portion of the leg rest when the leg rest is in its elevated position is disposed to the rear of the pivot point 54 in the retracted position. In the retracted position, the secondary and tertiary operating links 50 and 62 have also moved substantially 180 degrees about their respective pivot points 60 and 64 from the elevated position shown in Fig. 3 to the retracted position shown in Figs. 1 and 6. The links 46, 48, 50 and 62 are all nested together beneath the seat member 14, and the ends of the links 48 and 62 at their pivotal connection 66 are in abutting relation to the underneath surface of the bracket member 32 as can best be seen in the views of Figs. 1, 5 and 6. An additional stop action is provided by the contact which occurs between the upper edge of link 62 and the underneath surface of the transversely extending frame member 25.

When the chair is moved into reclining position from the position shown in Fig. 1 to the position shown in Fig. 3, the pivotal movement of the seat-back structure 15 about its pivotal connection 42 to the stationary bracket 24 causes the secondary operating link 50 to be swung in a clockwise direction about its pivot point 60 due to the connection of the members 70 and 72 between the forward portion of the bracket 32 and the lever arm 68 of the secondary operating lever 50. The link 50 is rotated substantially 180 degrees in a clockwise direction from its position in Fig. 1 to the position of Fig. 3, finally assuming a substantially horizontal position with the pivot point 56 directed forwardly of the chair.

The clockwise movement of the secondary operating link 50 also causes a clockwise rotation of the other links of the quadric linkage; namely, links 44, 46 and 48. The clockwise movement of the quadric linkage and particularly of link 48 causes a clockwise movement of the tertiary operating link 62 about its pivot point 64. As will best be seen in the view of Fig. 5, a stop action is provided by the engagement of the upper edge of link 62 with the bushing 61 which spaces the link 50 from the surface of bracket 24. Because of the connection of the tertiary operating link 62 to the link 48 at pivot point 66, the links 46 and 48 are swung in a clockwise direction about their pivot points 56 and 58 in a movement which is independent from the clockwise rotation imparted by the motion of link 50. The movement of links 46 and 48 about the pivot points 56 and 58 because of the influence of link 62 causes the leg rest member to be shifted upwardly to an elevated position as shown in Fig. 3.

When the chair is moved from the reclining position of Fig. 3 back to the position of Fig. 1, the seat-back unit 15 is moved in a counterclockwise direction with respect to the view shown in Fig. 3 about its pivotal support 42. As the seat-back structure moves in a counterclockwise direction about its pivot point 42 in returning to non-reclining position, the secondary operating link 50 is pivotally moved in a counterclockwise direction about its pivot point 60 because of the connection of link 50 and its attached lever arm 68 to the members 70, 72.

During substantially the first half of the angular movement of the reclining seat member 14 from its maximum reclining position of Fig. 3 to its ultimate non-reclining position of Fig. 1, the operating link 50 is rotated from its horizontal position shown in Fig. 3 to a substantially vertical position. During the last half of the angular movement of the reclining seat member 14, the secondary operating link 50 continues to move in a counterclockwise direction past the vertical position until it finally assumes a substantially horizontal position in the opposite direction to the orientation shown in Fig. 3. Thus, link 50 has moved through a total arc of 180 degrees in moving from its elevated position of Fig. 3 to its retracted position of Fig. 1.

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The leg support member 20 moves to its retracted or concealed position of Fig. 1 with a snap action which occurs when the pivot point 66 between links 48 and 62 moves over center of the straight line connecting the pivot points 60 and 64. When this occurs, the links 48 and 62 and the links 46 and 50 are moved upward with a snap action. The leg support member is locked in its concealed or retracted position because of the overcenter relation of the pivot point 66 with respect to pivot points 60 and 64.

It can be seen from the foregoing that there is provided in accordance with this invention an operating mechanism for a reclining chair in which a leg rest is moved through a 180-degree angle from a position upwardly and forwardly of the chair seat to a retracted and locked position beneath the chair seat. Thus, the leg rest is concealed out of sight beneath the chair seat when not in use, thereby improving the appearance of the chair and increasing its utility.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as my invention is:

A reclining chair comprising a stationary member, a reclining member pivotally supported on said stationary member for movement between a normal position and a reclining position, a footrest, linkage means interconnected between said members and said footrest to extend said linkage means to locate said footrest in an upwardly facing position spaced outwardly from the front of said chair when said reclining member is in said reclining position and to contract said linkage means to locate said footrest in a downwardly facing position beneath said chair when said reclining member is in said

normal position, said linkage means comprising a first closed quadric linkage having one side defined by a portion of one of said members, a pair of spaced pivots on said one member respectively located at opposite ends of said one side, a pair of links each pivotally connected at one end to one of said pair of pivots to define opposite sides of said first quadric linkage, a third pivot at the other end of one of said pair of links, a cross link pivotally connected at one end to said third pivot and pivotally connected by a fourth pivot to the other of said pair of links, the portion of said cross link between the third and fourth pivots defining the fourth side of said first quadric linkage, said cross link and said other of said pair of links being extended beyond said fourth pivot to define adjacent sides of a second closed quadric linkage with said fourth pivot being common to said first and said second quadric linkages, the side of said second quadric linkage pivotally connected at the other end of said cross link being rigidly connected to said footrest, actuating link means connected between the other of said members and said first quadric linkage to drive said one of said pair of links about its pivot on said one of said members through an arc of substantially 180° when said reclining member is moved from said reclining position to said normal position and to swing said third pivot across a line passing through said pair of pivots as said reclining member approaches said normal position whereby said linkage means may be locked in an overcenter relationship beneath said chair when said reclining member is in said normal position.

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