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3,142,510

LEG-REST ACTUATING MEANS FOR MULTIPLE POSITION RECLINING CHAIR

Filed June 13, 1960

3 Sheets-Sheet 1

FIG. 1.

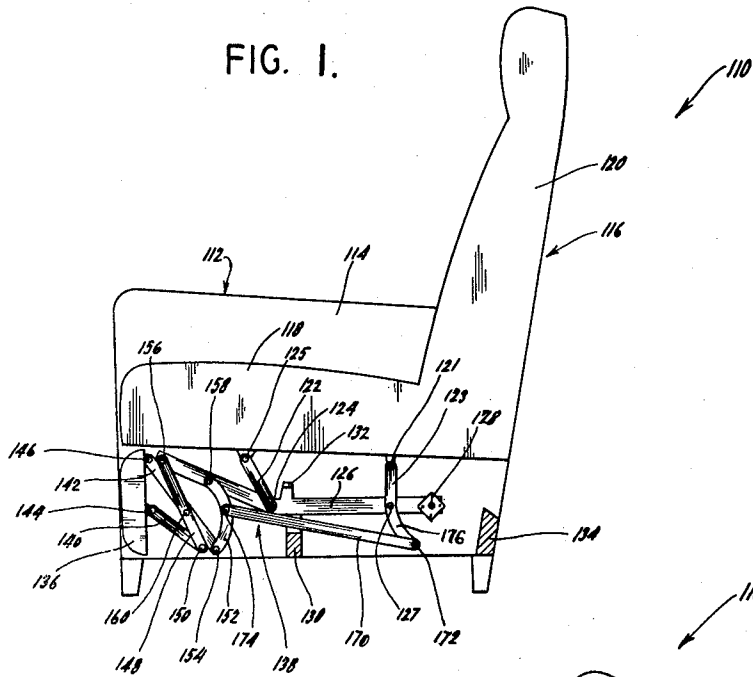
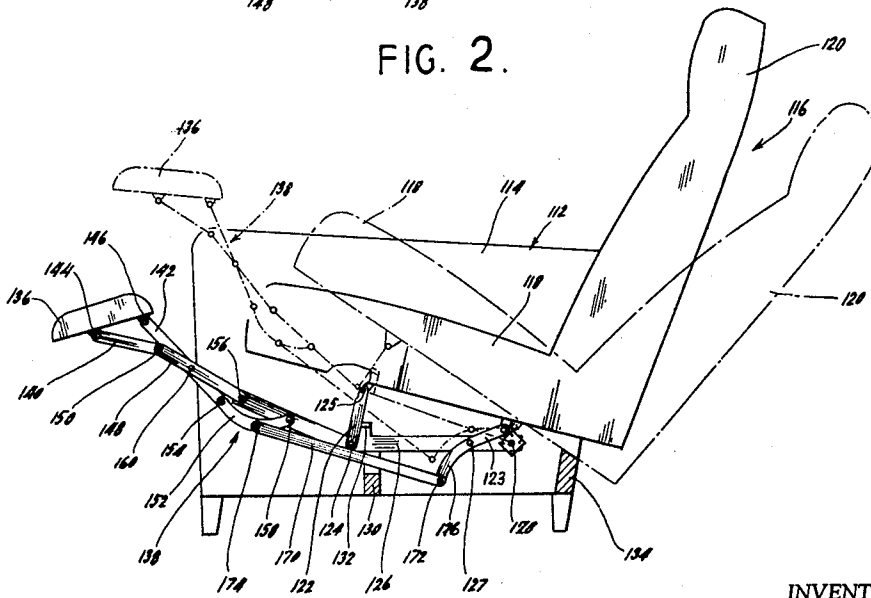


FIG. 2.



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FIG. 3.

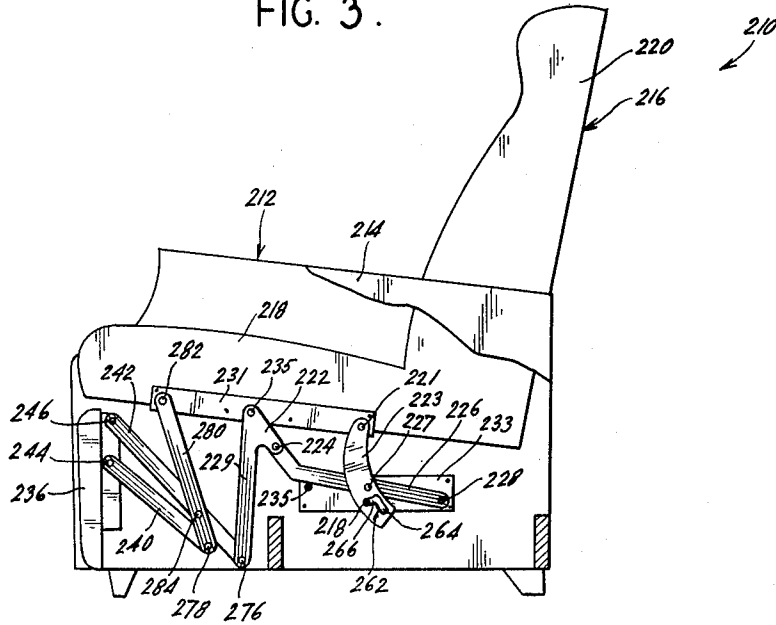
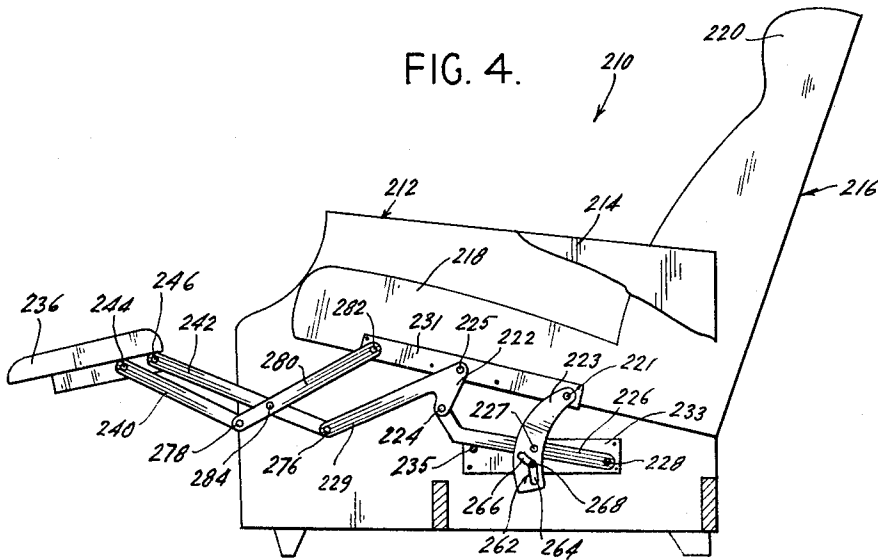


FIG. 4.



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LEG-REST ACTUATING MEANS FOR MULTIPLE POSITION RECLINING CHAIR

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 6 Claims. (Cl. 297-89)

This invention relates to improvements in multiple position reclining chairs, and in particular to a novel and improved leg-rest control arrangement for chairs of this type.

This application contains subject matter disclosed in my co-pending United States patent application Serial No. 747,748, filed July 10, 1958 (now issued as U.S. Patent No. 2,940,509) and entitled "Multiple Position Reclining Chair" and constitutes a continuation-in-part thereof. In said application I have disclosed a multiple position chair in which a body-supporting unit is mounted on a support frame for movement through a first motion phase about a first instantaneous center of rotation to an intermediate, tilted sitting position, and then through a second motion phase about a second instantaneous center of rotation to a fully-tilted position. This is accomplished in several embodiments of the aforementioned co-pending application by mounting the body-supporting units on a pair of guide links, which guide links are in turn mounted on a support bar or carrier member. The support bar is pivotally mounted at one end on the support frame and normally rests in a stationary position. During the first motion phase, the body-supporting unit is guided rearwardly by the turning movement of both guide links on the stationary support bar. During the second motion phase, the guide links are blocked and are thus rigidly coupled to the support bar and the latter turns about its pivotal mount on the support frame, carrying with it the blocked guide links and the body-supporting unit.

Multiple position chairs of this type include a leg-rest, and control means must be provided for moving the leg-rest from a retracted position beneath the seat to an extended position forwardly of the seat and substantially at the level thereof during the first motion phase. Thus, in the intermediate position, the occupant's body is still in a substantially erect sitting position suitable for reading, viewing television or the like, but the occupant's legs are supported in an outstretched condition by the extended leg-rest. The control means must also be adapted to maintain the leg-rest in its extended position with little or no movement relative to the seat when the body-supporting unit is moved through the second motion phase to the fully-tilted position.

The present invention is concerned with such leg-rest control means. In accordance with the invention, the leg-rest control means takes advantage of the fact that the guide links turn during the first motion phase about a pivot which is temporarily stationary relative to the support and then rises with its pivot relative to the support during the second motion phase, following the seat in such movement. The leg-rest control means is therefore in the nature of a linkage connecting one of the guide links to the leg-rest and being moved by said guide link during the first motion phase to actuate the leg-rest and elevate it to its extended position. During the second motion phase, the linkage is inactive, merely rising with the seat and maintaining the leg-rest at substantially the same level relative to the forward end of the seat.

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It is the object of the present invention to provide leg-rest control means of the character described which is of simple construction and economical in manufacture.

Additional objects and advantages of the invention will become apparent during the course of the following specification when taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a reclining chair made in accordance with the present invention, with portions broken away and shown in section to reveal inner construction, the chair being shown in its upright sitting position;

FIG. 2 is a view similar to FIG. 1 showing in full line the chair in its intermediate or "active" tilted sitting position with the leg-rest in its extended position, and showing in broken line the chair in its fully-tilted position, the leg-rest linkage in this latter position being illustrated schematically;

FIG. 3 is an elevational view, with portions broken away and shown in section, of a second embodiment of reclining chair made in accordance with the present invention, the chair being shown in its upright sitting position;

FIG. 4 is an elevational view, of the chair shown in FIG. 3, but with the chair shown in its intermediate tilted sitting position; and

FIG. 5 is an elevational view showing the chair of FIGS. 3 and 4 in its fully-tilted position.

Referring in detail to the drawings and particularly to FIGS. 1 and 2, there is shown an illustrative example of a reclining chair incorporating the invention herein and designated generally by the reference numeral 110. This reclining chair 110 may be designated as a "multiple-position" reclining chair in that it is capable of being brought from an upright sitting position, illustrated in FIG. 1, to an "active" intermediate tilted position shown in full line in FIG. 2, and thence may be brought to an "inactive" fully-tilted position, shown in broken line in FIG. 2.

The reclining chair 110 includes a base or support frame 112 having spaced side walls 114 interconnected by suitable cross rods or braces 130 and 134. The chair also includes a body-supporting unit designated generally by the reference numeral 116 which comprises a seat 118 and a back-rest 120 formed integrally with each other or rigidly connected to each other to form an integral rigid body-supporting unit. This body-supporting unit 116 is movably mounted on the support 112 for movement relative thereto to the two inclined positions previously described.

The body-supporting unit 116 is movably mounted on the support frame 112 by a pair of spaced guiding links 122 and 123 mounted on a support bar 126 which in turn is pivotally mounted at its rear end on the support frame 112 by a pivot 128. The rear guiding link 123 is mounted on the bottom of the seat 118 by a pivot 121 and is connected intermediate its ends to the support bar 126 by a pivot 127. The front guiding link 122 is mounted on the bottom of the seat by a pivot 125 located forwardly of the pivot 121. The lower end of the link 122 is connected to the support bar 126 by a pivot 124.

The chair also includes a leg-rest 136 supported by a leg-rest linkage 138 which is carried by the forward end points to the leg-rest 136 by respective pivots 144 and 146. At its opposite end the link 140 is connected to the end of

of the support bar 126. The leg-rest linkage 138 includes a pair of links 140 and 142 which are connected at spaced a link 148 by a pivot 150, and at its opposite end the link 142 is connected to a link 152 by a pivot 154. The support bar 126 extends forwardly from the pivot 124, and to this forwardly extending portion the links 148 and 152 are connected at spaced points by respective pivots 156 and 158.

For purposes of actuating the leg-rest linkage 138, the rear guiding link 123 is made in the form of a lever, having an arm 176 projecting below its pivotal mount 127 on the support bar 126. The lever arm 176 is connected to one end of a controlling link 170 by a pivot 172. The opposite end of the controlling link 170 is connected to an intermediate portion of the link 152 by a pivot 174. The links 142 and 148 cross each other and are connected at their crossing-over point by a pivot 160.

As is clearly shown in FIG. 1, the support bar 126 is normally maintained in a horizontal position and rests upon a cross brace 130 at a point to the rear of the pivot 124. To bring the body-supporting unit 116 from its upright sitting position of FIG. 1 to its intermediate tilted position shown in FIG. 2, the user shifts his weight rearwardly and applies rearward pressure to the back-rest 120. This causes the body-supporting unit 116 to move rearwardly, the links 122 and 123 pivoting rearwardly for this purpose. It will be observed in FIG. 1 that the rear guiding link 123 is in a substantially vertical position while the front guiding link 122 is in a forwardly inclined position so that the body-supporting unit 116 is provided with a compound rearward movement, the forward end of the seat 118 being guided in a substantially horizontal rearward path by the front guiding link 122 and the rear end of the seat being guided in a rearward and downward path by the rear guiding link 123. In the intermediate tilted position, the front guiding link 122 engages a stop member 132 which is rigidly fixed to the support bar 126, the stop member 132 preventing further pivoting movement of the front guiding link 122 and defining the limit of the intermediate tilted position.

As the upper portion of the rear guiding link or lever 123 pivots rearwardly about pivot 127 in moving toward the intermediate tilted position, the lower portion of said link 123 constituting lever arm 176 pivots forwardly, moving the controlling link 170 forwardly and causing said controlling link to raise the leg-rest linkage until the leg-rest 136 has reached its extended position shown in full line in FIG. 2. In this position, leg-rest 136 is spaced forwardly of the front edge of the seat and substantially at the level thereof.

During the second motion phase, the front guiding link 122 and the rear guiding link or lever 123 are carried upwardly with the support bar 126 which turns on the fixed pivot 128, but remain rigid and immovable relative to said support bar 126 and the seat 118. Since the rear guiding link 123 does not turn about its pivot 127 during this second motion phase, it is therefore inactive insofar as actuation of the leg-rest linkage 138 is concerned. The controlling link 170, and the leg-rest linkage 138 also are carried upwardly with the seat and maintain a fixed position relative to the latter, so that the leg-rest is maintained in the same extended position forwardly of the front end of the seat and substantially at the level thereof, as shown in broken line in FIG. 2.

Referring now to FIGS. 3 and 4, there is illustrated therein a reclining chair 210 having a somewhat modified structure but which is also made in accordance with the invention herein. The chair 210 includes a support frame 212 having spaced side walls 214, and a body-supporting unit 216 comprising a seat 218 formed rigidly with a back-rest 220.

The body-supporting unit 216 is again mounted upon front and rear guiding links 222 and 223 for movement through a first motion phase from the upright sitting position of FIG. 3 to the intermediate, tilted sitting posi-

tion of FIG. 4, and then through a second motion phase to the fully-tilted position of FIG. 5.

In this instance, the front guiding link 222 is made in the form of an angular lever having an elongated depending arm 229, this arm being utilized for actuation of the leg-rest linkage, as will be presently described. The front guiding link or lever 222 is mounted at the junction of its two arms by pivot 225 on an angle plate or bracket 231 affixed to the seat 218. The rear guiding link 223 is connected at its upper end to the plate 231 by pivot 221 and is mounted by pivot 227 to the support bar or carrier member 226.

The support bar 226 is mounted at its rear end by a fixed pivot 228 to a plate 233 affixed to one of the side walls 214 of the support frame 212. As shown in FIG. 3, the support bar 226 normally rests upon a stop member 235 affixed to the plate 233 and is supported thereby in a substantially horizontal position. The front guiding link or lever 222 is mounted on the front end of the support bar 226 by pivot 224 which is stationary during the first motion phase and displaceable during the second motion phase.

The rear guiding link 223 extends downwardly below its pivotal mount 227 and contains a slot 262 having sections 264 and 266 arranged angularly to each other and meeting at a junction. A pin 268, fixed to the plate 233, extends slidably through the slot 262. The pin 268 and slot 262 provide sequencing means for the chair movement, as will be presently explained.

The chair 210 also includes a leg-rest 236 which is mounted on links 240 and 242 by respective spaced pivots 244 and 246. The end of link 242 is connected to the end of arm 229 of front guide link or lever 222 by pivot 276. The end of link 240 is connected by pivot 278 to one end of a link 280, the other end of which is mounted on the seat plate 231 by pivot 282. The links 280 and 242 cross each other and are connected at their crossing-over point by pivot 284.

When the person seated in the chair 210 applies his weight rearwardly upon the back-rest 220, the body-supporting unit is moved rearwardly from the position of FIG. 3 by the simultaneous turning movement of both guide links 222 and 223. This first motion phase continues until the body-supporting unit reaches the intermediate, tilted sitting position of FIG. 4 in which the occupant's body is still in a substantially upright, active position.

In the upright sitting position, the pin 268 is located at the forward portion of the upper section 266 of slot 262. During the first motion phase, as the rear guiding link 223 turns about its pivotal mount 227, the slot 262 moves relative to the fixed pin 228, so that at the intermediate position of FIG. 4, the pin 268 is located at the rear of slot section 266 and is at the junction of the two slot sections 266 and 264. The pin 268 engages the rear wall of slot section 264, halting movement of the rear guiding link 223 and limiting further movement through the first motion phase. The body-supporting unit 216 can now be moved only by the upward pivoting of the support bar 226 about the fixed pivot 228 in the second motion phase, and the slot section 264 is so arranged to permit this movement.

During the first motion phase, as the front guiding link or lever 222 turns about its pivotal mount 224 on the support bar 226, the lever arm 229 swings upwardly and forwardly, elevating the leg-rest 236 to its extended position of FIG. 4 through the connecting link 242. The links 240 and 280 bring the leg-rest 236 to its horizontal attitude.

When the occupant in the intermediate, tilted sitting position of FIG. 4 applies further rearward pressure against the back-rest 220, the body-supporting unit 216 moves through the second motion phase to the fully-tilted position of FIG. 5. The position of the pin 268 in the slot 262 maintains the guide links 222 and 223 in a rigid

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position relative to the support bar 226, so that the only rearward motion possible is the upward and rearward pivoting movement of said support bar 226 about its pivotal mount 228 on the support frame 212. The section 264 of the slot 262 is arcuately shaped as a segment of a circle whose center is the pivot 228, so that during this second motion phase, the pin 268 slides freely through the slot section 264 and permits the support bar 226 to pivot upwardly relative to the fixed plate 233.

As the support bar 226 turns upwardly about its fixed pivot 228 during the second motion phase, it carries with it the relatively fixed guiding links 222 and 223 and the body-supporting unit 216. The seat 218 in turn carries with it the leg-rest link 230. During this movement, the front guiding link or lever 229 does not turn about its pivotal mount 225 and maintains its same angular relationship with the seat 218. The leg-rest 236 is therefore maintained in the same position relative to the seat 218 as it held in the intermediate position of FIG. 4, that is, in the extended position forwardly of the seat and substantially at the level of the forward end thereof, as shown in FIG. 5.

The limit of movement through the second motion phase is effected by engagement of the pin 268 with the bottom end of the slot section 264 in the fully-tilted position of FIG. 5. An additional function of slot 262 in sequencing the movements of the body-supporting unit will also be appreciated by reference to FIG. 3. When the pin 268 is located in the upper slot section 266, the rear guiding link 223 cannot rise relative to the plate 233, and therefore the support bar 226 is also prevented from pivoting upwardly relative to the plate 233. This prevents the body-supporting unit 216 from moving directly through the second motion phase from the upright sitting position of FIG. 3 and insures that the unit first moves through the first motion phase by the pivoting movement of the guiding links 222 and 223 on the stationary guiding bar 226.

While preferred embodiments of the invention have been shown and described herein, it is obvious that numerous omissions, changes and additions may be made in such embodiments without departing from the spirit and scope of the invention.

What I claim is:

1. In a multiple position reclining chair which includes a support frame, a body-supporting unit including a seat and back-rest rigid with each other, control means mounting the body-supporting unit on the support frame for movement through a first motion phase to an intermediate, tilted sitting position, and through a second motion phase to a fully-tilted position, said control means including a link pivotally connected to the seat and means on the support frame supporting said link at a pivotal mount, said pivotal mount remaining stationary during the first motion phase and said supporting means providing displacement of said pivotal mount during the second motion phase; a leg-rest, and leg-rest actuating means for moving the leg-rest from a retracted position beneath the seat to an extended position forwardly of the seat, said actuating means including an extension of said link projecting beyond the pivotal mount thereof, and link means operatively connecting said extension to the leg-rest, said extension turning about said stationary pivotal mount during the first motion phase and raising the leg-rest to its extended position through said link means, said displacement of said pivotal mount by said supporting means relative to the support frame during the second motion phase raising said extension with the seat without further turning movement of said extension to maintain the leg-rest in its extended position relative to the seat.

2. In a multiple position reclining chair which includes a support frame, a body-supporting unit including a seat and back-rest rigid with each other, control means mounting said body-supporting unit on said support frame for movement through a first motion phase from an upright

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sitting position to an intermediate, tilted sitting position and through a second motion phase from said intermediate, tilted sitting position to a fully-tilted position, said control means including a support member pivotally mounted on said support frame, means supporting said support member in a stationary position during the first motion phase, said control means further including front and rear guiding links operatively connected to said support frame and mounting said body-supporting means for movement relative to said support frame during said first motion phase, one of said guiding links having a pivotal connection to said seat and a pivotal connection to said support member for turning movement relative to said support member in said first motion phase, and means for blocking movement of the front and rear guiding links relative to said seat at said intermediate, tilted sitting position; a leg-rest, a leg-rest control linkage carrying the leg-rest and guiding the same for movement from a retracted position beneath the seat to an extended position forwardly of the seat, and means for actuating said leg-rest control linkage, said actuating means including an extension of said one guide link projecting beyond one of the pivotal connections thereof, link means operatively connecting the leg-rest to said extension at a point spaced from said pivotal connections, said extension being moved by the seat to turn relative to the support member during the first motion phase to actuate said leg-rest control linkage and elevate said leg-rest, said support member turning about its pivotal mount on said support frame whereby said extension moves in unison with the seat during the second motion phase without further turning movement of the extension relative to the seat to maintain the leg-rest in extended position.

3. A multiple position reclining chair according to claim 2 in which said extension is integral with the rear guiding link and a connecting link is pivotally connected at one end to the free end of said extension and at the other end to the leg-rest control linkage.

4. A multiple position reclining chair according to claim 3 in which said leg-rest control linkage includes a first pair of links connected at spaced points to said leg-rest, and a second pair of links mounted at spaced points on the forward end of the support member, one of the links of the first pair being pivotally connected to both links of the second pair, the other link of the first pair being pivotally connected to one link of the second pair.

5. In a multiple position reclining chair which includes a support frame, a body-supporting unit including a seat and back-rest rigid with each other, control means mounting said body-supporting unit on said support frame for movement through a first motion phase from an upright sitting position to an intermediate, tilted sitting position and through a second motion phase from said intermediate, tilted sitting position to a fully-tilted position, said control means including a support member pivotally mounted on said support frame, means supporting said supporting member in a stationary position during the first motion phase, said control means further including front and rear guiding links operatively connected to said support frame and mounting said body-supporting means for movement relative to said support frame during said first motion phase, the front guiding link having a pivotal connection to the forward end of said seat and a pivotal connection to said support member for turning movement relative to said support member in said first motion phase; a leg-rest, a leg-rest control linkage carrying the leg-rest and guiding the same for movement from a retracted position beneath the seat to an extended position forwardly of the seat, and means for actuating said leg-rest control linkage, said actuating means including an extension of said front guide link forming a lever therewith, the free end of said extension being located below said pivotal connections of said front guide link to the seat and support member in said upright sitting position, and means operatively connecting the free end of said

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extension to said leg-rest, said extension being moved by the seat to turn relative to the support member during the first motion phase to actuate said leg-rest control linkage and elevate said leg-rest, said support member turning about its pivotal mount on said support frame whereby said extension moves in unison with the seat during the second motion phase without substantial turning movement of the extension relative to the seat to maintain the leg-rest in extended position.

6. A multiple position reclining chair according to claim 5 in which said leg-rest control linkage includes a first and second link connected at spaced points to said leg-rest and a third link pivotally mounted on the front

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end portion of the seat, said third link being pivotally connected at an intermediate point to an intermediate point on the first link and at its end to the end of the second link, the free end of the first link being pivotally connected to the free end of said extension.

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