

June 14, 1960

P. S. FLETCHER
MULTIPLE-POSITION CHAIR

2,940,509

Filed July 10, 1958

4 Sheets-Sheet 1

FIG. 1.

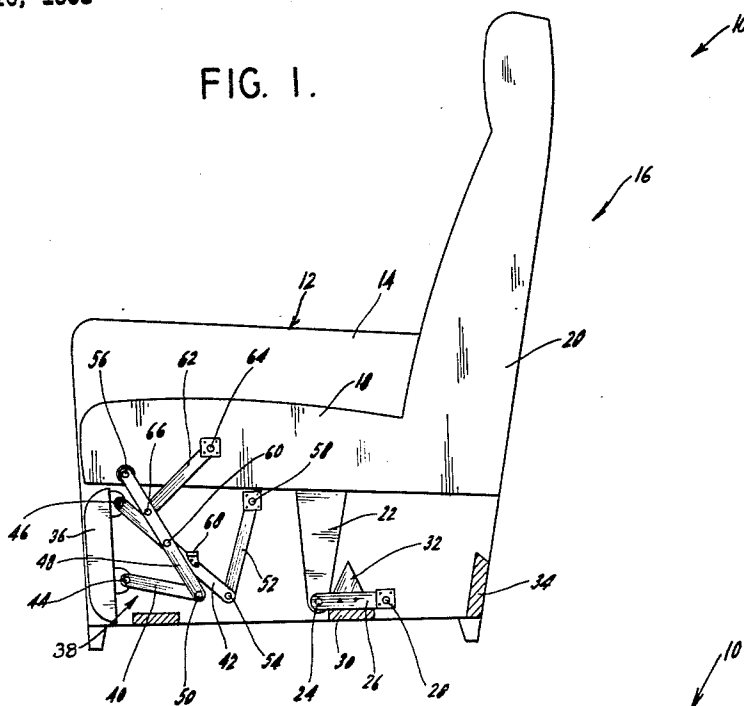
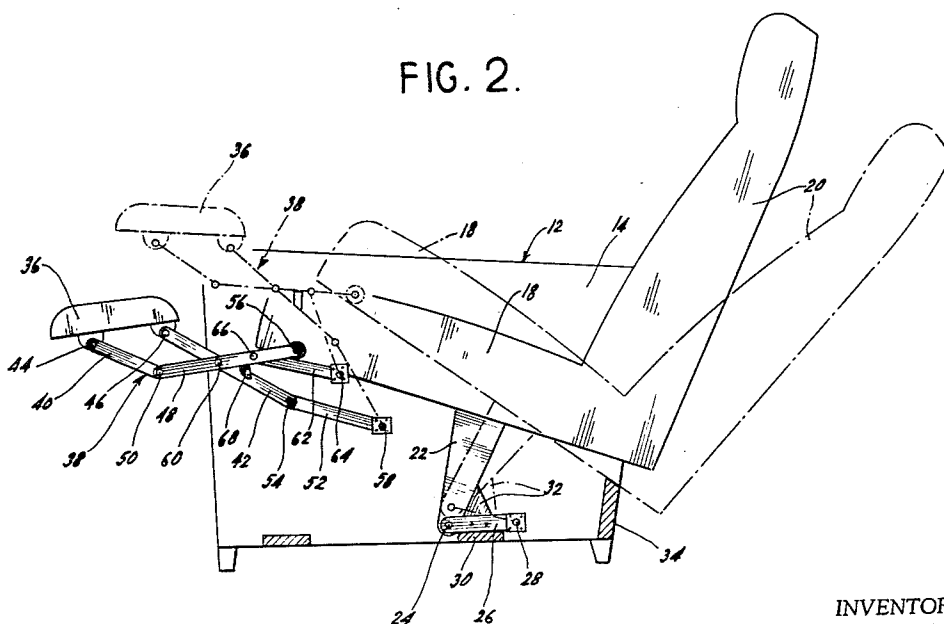


FIG. 2.



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FIG. 5.

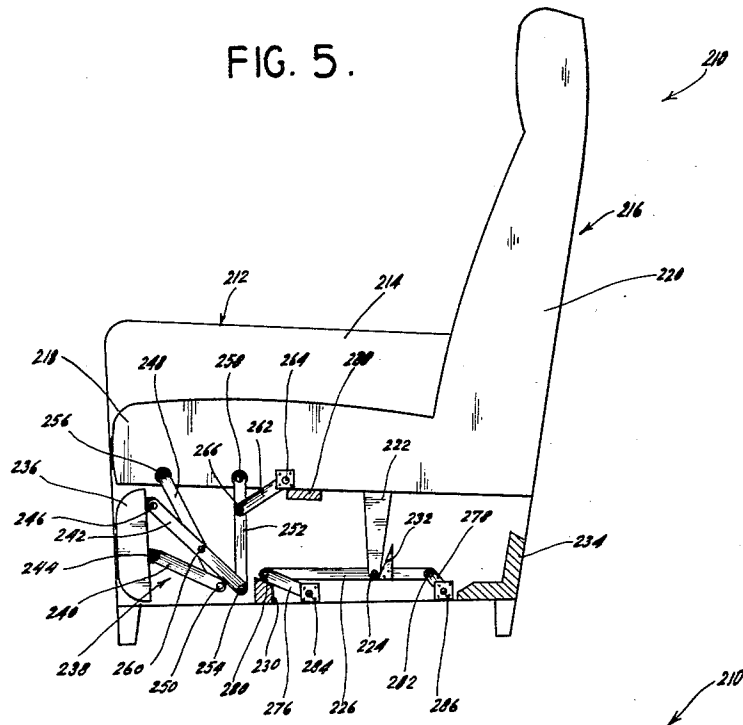
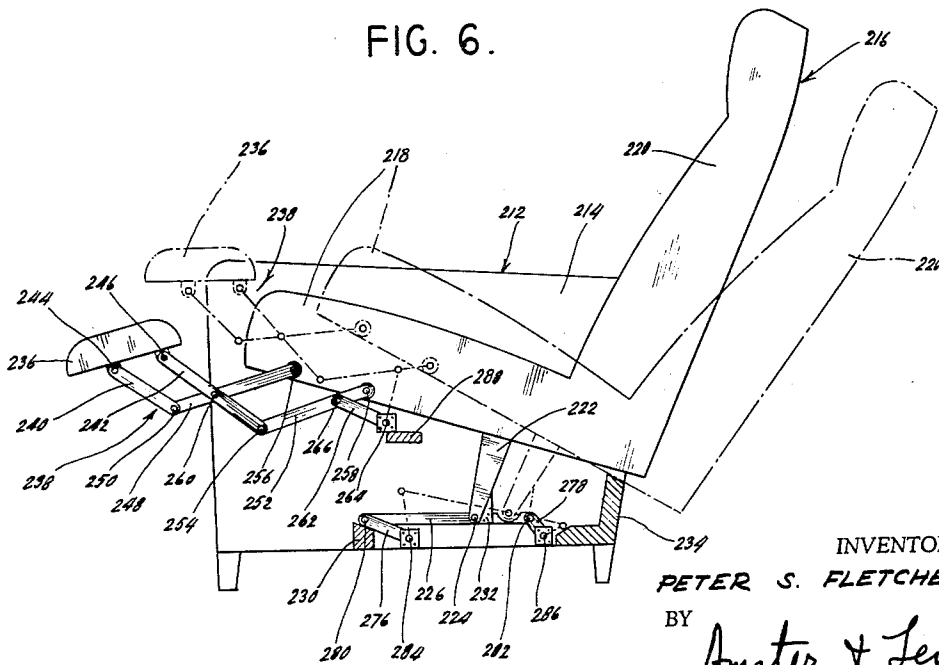


FIG. 6.



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FIG. 7.

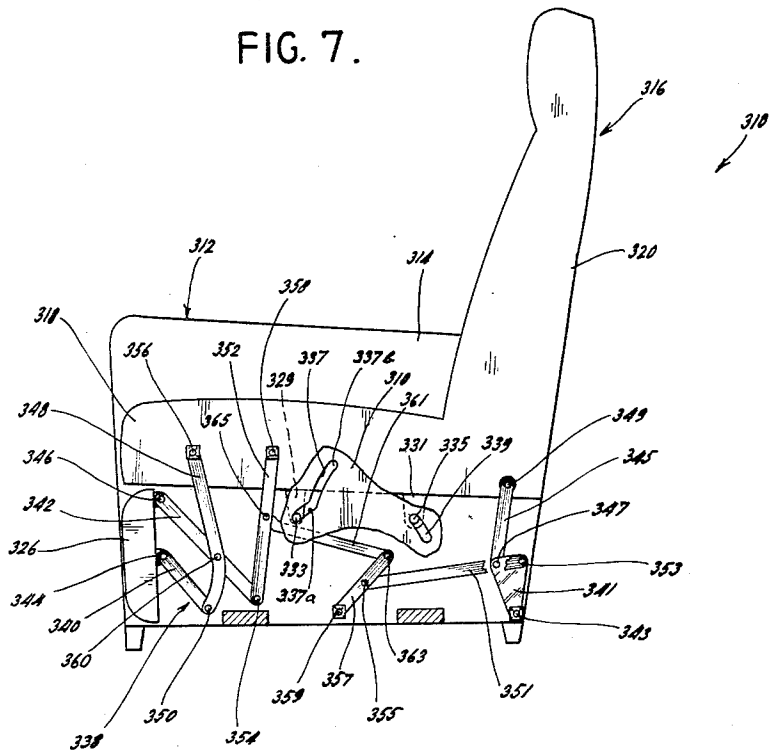
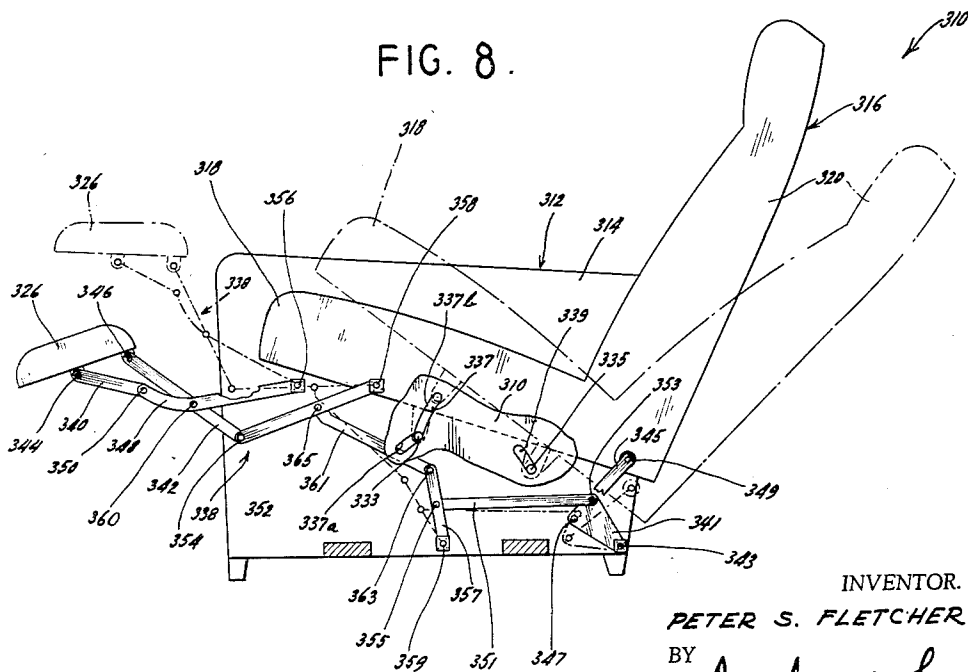


FIG. 8.



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MULTIPLE-POSITION CHAIR

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16 Claims. (Cl. 155—106)

The present invention relates to improvements in reclining chairs of the type in which a body-supporting unit including a seat and back-rest is movably mounted on a support frame and a movable leg-rest is provided for coordinated movement with the body-supporting unit.

In particular, this invention relates to a reclining chair in which the body-supporting unit comprises a rigid seat and back-rest, and in which mounting means are provided to guide the unit for movement to two distinct tilted positions.

Conventional reclining chairs are customarily made with either of two types of body-supporting units. In one type, the body-supporting unit is formed of a seat and back-rest which are independently mounted on the support frame for movement relative to each other to various rearwardly-tilted positions of recline. In the other type, the seat and back-rest are formed rigidly and immovably with each other and the unit so formed is mounted on the support for rearward tilting movement. In some reclining chairs, this tilting movement may be to a slightly tilted "active" position in which the user's body is disposed in a substantially upright attitude wherein the user's head is facing forwardly and the user is in position to read, view television, talk or the like. In other reclining chairs, the body-supporting unit is adapted to be brought to a more sharply tilted or "inactive" position in which the user's body is disposed in a substantially supine or recumbent position of relaxation. In either of such types of chair, a movable leg-rest is customarily provided and is coordinated in its movement with the movement of the body-supporting unit in such a manner that the leg-rest is brought to a fully extended leg-supporting position at the moment in which the body-supporting unit arrives at its completely tilted position, whether the completely tilted position be an "active" or "inactive" one.

In the conventional reclining chair having a rigid seat and back-rest unit, guiding means, which may be in the nature of a linkage or pin and slot arrangement, is customarily used to mount the unit movably on the support frame for movement between an upright sitting position and a rearwardly-tilted position of repose. Normally, the guiding means is arranged to move the unit through a single prescribed path of travel about a single center or axis of rotation. Such chairs presently on the market are subject to several operational disadvantages, the main disadvantage being the difficulty in starting the body-supporting unit into its reclining movement, and the tendency of the unit to pass over a dead center position and fall back into its fully tilted position. In most chairs of this type, where the rigid seat and backrest unit is pivoted at a single point below the rear of the seat, the balance of the unit is basically inferior and considerable friction must be built into the movement in order to permit the unit to maintain the position to which it is brought by the user.

The balance of the chair is effected by the shift in the center of gravity during movement of the unit. In con-

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ventional chairs, the center of gravity of the rigid unit (together with the person sitting therein) turns around a single pivot point with a given radius, as the unit is moved between its upright sitting and its final tilted positions. The center of gravity drops appreciably in a vertical direction as the unit approaches either of its end positions which means that considerable lifting force is necessary to start the unit moving from its upright sitting position and back from its fully tilted position. In a perfectly balanced chair, the center of gravity would move at a uniform rate and in a substantially horizontal plane, and no undue effort would be required to move the unit in any position whatsoever.

It is an object of the present invention to provide in a reclining chair having a rigid seat and back-rest unit, guiding means for the unit which will provide improved balance throughout the movement and therefore smoother operation of the chair. This is accomplished by causing the unit to travel in a dual stage movement through an initial short path of travel about a first instantaneous center of rotation and then along at least one further and longer path of travel about a second instantaneous center of rotation. Each instantaneous center of rotation may be provided by a fixed pivot point or by a fixed center of rotation or a shifting center of rotation and may be a more complex mounting mechanism. By such guiding means, the center of gravity of the unit is guided along a comparatively flat path in a slight upward direction and then in a rearward and gradually descending direction so that its rate of movement is substantially uniform and balance of the chair at all positions is materially improved.

It has been found that the guiding means of the present invention, while useful in reclining chairs generally, is particularly adaptable for use in what may be called "two-position" chairs, that is to say reclining chairs in which the unit is adapted to be brought from an upright sitting position in which the occupant's legs are not supported to a first discrete intermediate, tilted sitting position and then to a fully-tilted position with the occupant's legs elevated and supported. Because of the two instantaneous centers of rotation utilized in the guiding means the unit can be moved about its first instantaneous center of rotation to its intermediate, tilted sitting position, and then can be moved about its second instantaneous center of rotation, along a different path of travel, to its fully-tilted position. In the first or intermediate, tilted sitting position, the body-supporting unit is disposed in an "active" attitude, the user's body being still in a substantially upright position in which the eyes are directed forwardly so that the user may read, knit, view television, etc. The unit may then be selectively brought to the second further tilted position which represents an "inactive" position in which the body is rearwardly inclined for relaxation.

Another object of this invention therefore, is to provide a "two-position" reclining chair of the character described in which the means for mounting the rigid body-supporting unit on the support frame are so arranged and constructed as to provide two separate pivotal centers or instantaneous centers of rotation for the body-supporting unit, the first center being utilized to move the unit to its "active" intermediate, tilted sitting position, and the second center being utilized to move the body-supporting unit from the intermediate, tilted sitting position to the final "inactive" fully tilted position. In accordance with the invention, the mounting means includes a blocking structure which automatically blocks out the first instantaneous center of rotation when the unit reaches its intermediate, tilted sitting position and thereby restricts further tilting movement of the unit to movement about the second instantaneous center of rotation.

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The aforementioned mounting means may be in the form of a linkage, in which case the blocking structure may be in the form of a stop element located on one of the links for engagement with one of the other links to restrain relative movement of the two links. Alternately, the mounting means may include pin-and-slot couplings, in which instance the blocking structure may be provided by the end of one of the slots.

A further object of the invention is the provision of a reclining chair of the character described which also includes a leg-rest and leg-rest control means, the latter being constructed and arranged to move the leg-rest from a retracted position beneath the seat to an extended position forwardly of an substantially at the level of the seat when the body-supporting unit is brought to its intermediate "active" tilted sitting position. The leg-rest control means is also effective to maintain the leg-rest in its extended position substantially at the level of the forward end of the seat when the body-supporting unit is moved to its fully-tilted "inactive" position.

Additional objects and advantages of the present 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 or phantom, the chair in its fully-tilted or "inactive" 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 full line in its intermediate, tilted sitting position and in broken line in its fully-tilted position;

Fig. 5 is an elevational view, with portions broken away and shown in section, of a third embodiment of reclining chair made in accordance with the invention herein, the chair being shown in its upright, sitting position;

Fig. 6 is an elevational view of the chair shown in Fig. 5, the chair being shown in full line in its intermediate, tilted sitting position and in broken line in its fully-tilted position;

Fig. 7 is an elevational view, with portions broken away and shown in section, of a fourth embodiment of reclining chair made in accordance with the invention herein, the chair being shown in its upright, sitting position; and

Fig. 8 is an elevational view similar to Fig. 7, but showing in full line the chair in its intermediate, tilted sitting position, and in broken line the chair 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 10. This reclining chair 10 may be designated as a "two-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 sitting 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 10 includes a base or support frame 12 having spaced side walls 14 interconnected by suitable cross rods or braces. The chair also includes a body supporting unit designated generally by the reference nu-

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meral 16 which comprises a seat 18 and a back-rest 20 formed integrally with each other or rigidly connected to each other to form an integral rigid body supporting unit. This body-supporting unit 16 is movably mounted on the support 12 for movement relative thereto to the two inclined positions previously described.

The seat 18 has a depending bracket member 22 rigidly mounted thereon slightly to the rear of the center of said seat 18. The bracket 22 is connected at its bottom end by a pivot 24 to a support bar 26. This support bar 26 is pivotally mounted on the support 12 by a pivot 28 and is normally maintained in the horizontal position, shown in Fig. 1, and in full line in Fig. 2, resting upon a cross brace or stop member 30 which is rigidly and immovably connected between the side walls 14 of the support 12. In moving from the upright sitting position of Fig. 1 to the intermediate, tilted sitting position shown in full line in Fig. 2, the body-supporting unit 16 pivots about the pivot 24, the support bar 26 remaining in its horizontal position in abutment with the cross brace 30 and the pivot 24 serving in this instance as a fixed pivot which is immovable relative to the support frame 12. In the intermediate tilted position of Fig. 2, the bracket 22 engages and is stopped from further pivoting movement by a stop member 32 which is fixedly and immovably mounted on the support bar 26.

In moving from the intermediate, tilted sitting position shown in full line in Fig. 2, to the fully reclined position shown in broken line in Fig. 2, the unit 16 pivots about the pivot 28, the link 26 rising from its seated position upon the cross brace 30 and pivoting in fixed relation to the bracket 22 to permit this further movement.

It will be appreciated that the pivot 24 is located a slight distance behind the center of gravity of the body-supporting unit 16 in the upright sitting position of Fig. 1 and is then moved to a position in which it is an appreciable distance forward of the center of gravity in the intermediate, tilted sitting position, since the body-supporting unit 16 has moved rearwardly in relation thereto. Thus, in order to maintain proper balancing of the unit, the center of rotation of the unit must be changed, which is what is accomplished by shifting the pivot point of the unit rearwardly when the unit is moved from its intermediate, tilted sitting position to its fully reclined position.

The center of gravity of the unit initially travels rearwardly about the first instantaneous center of rotation provided by the pivot 24 in a relatively shallow arc, and then travels further in a different path about the second instantaneous center of rotation provided by the pivot 28 along a second relatively shallow arc. There is thus avoided the sharp rise and drop at the extremes of movement which would be encountered if a single pivot point or single instantaneous center of rotation were employed for mounting the unit on the support. It will thus be appreciated that the guiding means for the unit may be employed advantageously in a conventional reclining chair having a single tilted position to afford improved balance, as well as in the two-position reclining chair illustrated herein.

In the fully reclined position shown in broken line in Fig. 2, the rear portion of the seat 18 engages a cross brace 34 which is fixedly secured to the support frame 12 the cross brace 34 serving as a stop to prevent further rearward tilting movement of the body-supporting unit 16 past its fully reclined position.

The reclining chair 10 also includes a leg-rest 36 which is mounted on a leg-rest control linkage designated generally by the reference numeral 38 in such a manner that upon rearward tilting of the body-supporting unit 16, the leg-rest 36 is raised from the retracted position of Fig. 1, in which it is located beneath the forward end of the seat 18, to the extended position of Fig. 2 in which it is located forwardly of and substantially at the level of the forward end of the seat 18.

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The leg-rest linkage 38 includes a pair of links 40 and 42 connected at spaced points to the leg-rest 36 by a respective pair of pivots 44 and 46. At its rear end the link 40 is connected to a link 48 by a pivot 50, and the link 42 is connected at its rear end to a link 52 by pivot 54. The free end of the link 48 is pivotally mounted on the forward end of the seat 18 by a pivot 56. The free end of the link 52 is pivotally mounted on the support 12 by a pivot 58. The link 42 crosses the link 48 and is pivotally connected thereto at its crossing over point by a pivot 60. The leg-rest linkage 38 is actuated by a pusher link 62, one end of which is pivotally mounted on the support 12 by a pivot 64 and the other end of which is connected to the link 48 by a pivot 66 at a point intermediate the pivots 56 and 60.

When the body-supporting unit 16 is moved from its upright sitting position of Fig. 1 to the intermediate, tilted sitting position shown in full line in Fig. 2, the forward end of the seat 18 is raised and carries with it the link 48. This movement moves the seat pivot 56 closer to the pivot 64 on the support which causes the pusher link 62 to push the link 48 forwardly and upwardly, raising the leg-rest linkage 38 and bringing the leg-rest 36 to its extended position. A stop element 68 is fixed to the link 42 intermediate the pivots 54 and 60, said stop element 68 being positioned to engage the link 48 in the intermediate, tilted sitting position shown in full line in Fig. 2. This engagement of the stop element 68 with the link 48 maintains a fixed angular relationship between the links 42 and 48, so that the leg-rest is maintained or locked in its extended position when the body supporting unit 16 is moved from the intermediate, tilted sitting position shown in full line in Fig. 2 to the fully tilted position shown in broken line in Fig. 2. In this movement from the intermediate, tilted sitting position to the fully tilted position, the pusher link 62 pivots from a relatively horizontal position to a relatively vertical upright position, and the stop element 68 supporting the link 48 prevents the leg rest linkage 38 from collapsing.

When a person is seated in the reclining chair 10 in the upright sitting position of Fig. 1 and wishes to move to a rearwardly tilted position, he applies rearward pressure to the back-rest 20, causing the body-supporting unit 16 to pivot about the pivot 24 until the bracket 22 engages the stop 32 and the unit 16 is retained in its intermediate or "active" tilted sitting position. Thus, the bracket 22 and pivot 24 may be designated as a first guiding means which guides the unit 16 in a first path of movement from the upright sitting position to the intermediate, tilted sitting position. In this position, the pusher link 62 has raised the leg-rest linkage 38, and leg-rest 36 is brought to the extended position forwardly of and at the level of the front of the seat 18. This intermediate, tilted sitting position, shown in full line in Fig. 2, represents an active sitting position in which the user's legs are raised and supported by the leg-rest 36 and in which the user's body is slightly tilted to the rear but is still in a relatively upright sitting position in which the user may view television, read, or the like.

If the user then wishes to move to a more fully tilted position, he shifts his weight rearwardly and applies a greater pressure to the back-rest 20 causing the body-supporting unit 16 to pivot further rearwardly about the pivot 28, and moving the body supporting unit to the fully tilted position shown in broken line in Fig. 2, in which the rear of the unit engages and is stopped by the cross brace 34. The leg-rest linkage 38 during this second movement phase is locked by the stop element 68 and moves as a unit with the forward end of the seat 18 without changing its position relative thereto. This fully tilted position represents a position of relaxation in which the user's body is supported in an inactive condition.

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In moving from the intermediate, tilted sitting position to the fully-tilted position, the unit 16 can no longer turn about pivot 24 because the bracket 22 is engaged with the stop 32 and bracket 22 is thus locked rigidly to support bar 26. The center of rotation is thus shifted rearwardly to pivot 28. The pivot 28 may thus be designated as second guiding means which guides the unit about a second path of movement from the tilted sitting to the fully-tilted position.

To return from the fully reclined position to the intermediate, tilted sitting position, it is only necessary for the user to shift his weight forwardly, the forward shift of the center of gravity of the body-supporting unit 16 causing the unit to pivot forwardly about the pivot 28 until it reaches its intermediate tilted position. To return from the intermediate, tilted sitting position to the upright sitting position, it is merely necessary for the user to apply downward pressure on the leg-rest 36, this pressure causing the unit 16 to pivot forwardly about the pivot 24.

Referring now to Figs. 3 and 4, there is illustrated therein a reclining chair 110 having a somewhat modified structure but which is also made in accordance with the invention herein. The chair 110 includes a support frame 112 having spaced side walls 114, and a body-supporting unit 116 comprising a seat 118 formed rigidly with a back-rest 120. 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 of the support bar 126. The leg-rest linkage 138 includes a pair of links 140 and 142 which are connected at spaced 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 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.

The rear guiding link 123 extends downwardly below the pivot 127 and at its free end is connected to 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. 3, 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 in Fig. 3 to its intermediate, tilted sitting position shown in full line in Fig. 4, 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. 3 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

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the rear guiding link 123. In the intermediate, tilted sitting 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 sitting position.

As the upper portion of the rear guiding link 123 pivots rearwardly about pivot 127 in moving toward the intermediate, tilted sitting position, the lower portion of said link 123 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 of Fig. 4.

If the user in the intermediate, tilted sitting position of the chair now wishes to move to a fully reclined position, he applies further rearward pressure upon the back-rest 120. However, the front guiding link 122 is now locked from further pivoting movement on the support bar 126 by engagement with the stop 132, and the body-supporting unit 116 is thus prevented from moving rearwardly relative to said support bar 126. The body-supporting unit 116 is thus now required to pivot about the single pivot point 128. Thus, the body-supporting unit 116 maintains a fixed relationship to the support bar 126 and the entire unit and linkage structure pivots as a unit about the pivot 128. Since the rear guiding link 123 maintains its inclined position relative to the support bar 126, the leg-rest linkage is maintained in its extended position and the leg-rest continues to be positioned at a point forwardly and at the level of the front of the seat.

The guiding links 122 and 123 thus constitute first guiding means which guide the unit along a first path of movement and about a first instantaneous center of rotation when the unit is brought from its upright sitting position to its intermediate, tilted sitting position. This first path of movement is a compound movement, as has been previously described. The support bar 126 and its pivot 128 constitute second guiding means which guide the body-supporting unit along a second path of movement and about a second instantaneous center of rotation when the first guiding means is blocked by the stop member 132 and the unit is moved from the intermediate, tilted sitting position to the fully tilted position. This second path of movement is an arcuate path about the pivot 128, so that the second instantaneous center of rotation in this instance is a fixed pivot point.

Referring now to Figs. 5 and 6, there is shown a reclining chair 210 with a somewhat modified construction enabling it to be brought from an upright sitting position shown in Fig. 5 to an active, intermediate, tilted sitting position shown in full line in Fig. 6, and thence to an inactive, fully-tilted position shown in broken line in Fig. 6.

The chair 210 includes a support frame 212 having side walls 214 connected by cross-braces which include the cross braces 230, 234 and 288. The body-supporting unit 216, formed by the rigidly connected seat 218 and back-rest 220 is mounted on the support 212 for movement to the active and inactive tilted positions. The mounting means is so constructed as to produce a movement which is the opposite of that achieved in the chair 110 of Figs. 3 and 4, that is to say, the movement of the body-supporting means to the intermediate, tilted sitting position is a pivotal movement about a fixed pivot point, and the further movement from the intermediate, tilted sitting position to the fully tilted position is a compound movement afforded by a pair of guiding links.

The mounting means for the body-supporting unit 212 includes a bracket 222 fixed to the seat 218 and depending from the lower surface thereof at a point rearwardly of the center of the seat. The lower end of the bracket 222 is connected by pivot 224 to an intermediate portion of a support bar 226 which carries a stop member 232. The support bar 226 is mounted on the support 212 by a

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pair of guiding links 276 and 278. The guiding links 276 and 278 are connected at one end to the opposite ends of the support bar 226 by respective pivots 280 and 282, and are connected at their other ends to the support 212 by respective pivots 284 and 286.

The support bar 226 is normally maintained in the horizontal position shown in Fig. 5 by the weight of the body-supporting unit, the end of support bar 226 resting upon the cross-brace 230 which acts as a support to prevent the bar 226 from moving downwardly due to forward pivoting movement of the guiding links 276 and 278. It will also be noted that in the upright sitting position of Fig. 5, the seat 218 rests upon and is supported by the cross-brace 288 which is located forwardly of the bracket 222 and acts as a stop to prevent the body-supporting unit 212 and its rigid bracket 222 from pivoting forwardly about the pivot 224.

When the person seated in the chair 210 applies his weight rearwardly upon the back-rest 220, the body-supporting unit 216 pivots rearwardly about the pivot 224 until the depending bracket 222 engages the stop member 232 preventing further pivoting movement and defining the active, intermediate, tilted sitting position shown in full line in Fig. 6. This initial movement is a simple pivoting movement, the pivot 224 serving as a fixed pivot during this movement phase.

In the intermediate tilted position, the engagement of the bracket 222 with the stop member 232 affords a rigid and immovable connection between the bracket 222 and the support bar 226 insofar as further rearward movement is concerned. When the person in the intermediate, tilted sitting position then wishes to move to a fully tilted position, he applies his weight further upon the back-rest, and since the unit 216 is now locked against further pivoting movement about pivot 224, the support bar 226 is shifted rearwardly. This rearward shifting movement of bar 226 is a compound movement afforded by the guiding links 276 and 278, the latter pivoting rearwardly about the respective pivots 284 and 286. It will be observed that the front guiding link 276 is longer and is disposed at a more forwardly-inclined angle than the rear guiding link 278, so that when the bar 226 translates rearwardly, the forward end thereof is raised relative to the rear end and the body-supporting unit is further tilted rearwardly. The body-supporting unit 216 is stopped in its fully-tilted position, shown in broken line in Fig. 6, by engagement of its rear end portion with the cross-brace 234.

It will thus be apparent that the pivot 224 constitutes a first guiding means which permits movement of the body-supporting unit 216 about a first instantaneous center of rotation and along a first arcuate path of movement from the upright sitting position to the intermediate, tilted sitting position. The guiding links 276 and 278 constitute a second guiding means which guides the body-supporting means about a second instantaneous center of rotation and along a second path in a compound movement from the intermediate, tilted sitting position to the fully tilted position.

The leg-rest 236 of the chair 210 is mounted on links 240 and 242 by respective spaced pivots 244 and 246. The ends of links 240 and 242 are connected to the ends of links 248 and 252 by respective pivots 250 and 254. The links 248 and 252 are mounted on the seat 218 by respective pivots 256 and 258. At their crossing-over point, the links 242 and 248 are interconnected by pivot 260.

The leg-rest linkage 238 is actuated by a pusher link 262 mounted at one end upon the support frame 212 by pivot 264, and connected at its other end to an intermediate point on link 252 by a pivot 266. When the body-supporting unit 212 is brought to its intermediate, tilted sitting position shown in full line in Fig. 6, the pivot 258 is raised with the seat 218 and moved rearwardly closer to the pivot 264. This movement causes the pusher link 262 to pivot upwardly about pivot 264, raising the

link 252, and actuating the leg-rest linkage 238 to bring the leg-rest 236 to its extended position shown in full line in Fig. 6. In this position, the pivots 258, 264, and 266 are arranged in a triangular relationship which holds the leg-rest linkage immovably in its extended position. The link 252 in the region of the pivot 266 must pivot downwardly and rearwardly, while the link 262 in the region of pivot 266 must pivot downwardly and forwardly, so that these links 252 and 262 are effectively locked in the full line position of Fig. 6 so long as the body-supporting unit remains in its intermediate, tilted sitting position.

When the body-supporting unit 216 is brought to its fully-tilted position, the pivot 258 is moved rearwardly of the fixed pivot 264, and the pusher link 262 pivots to a substantially upright position, shown in broken line in Fig. 6, to maintain the link 252 in its raised position and the leg-rest 236 in its extended position.

Referring now to Figs. 7 and 8, there is shown a further modification of a reclining chair 310 made according to the invention, the chair again including a body-supporting unit 316 having a rigidly-formed seat 318 and back-rest 320. The body-supporting unit 316 is again movably mounted on a support frame 312 between its side walls 314. In this instance, however, instead of links serving as the mounting means, pin and slot connections are utilized.

The seat 318 has a pair of spaced depending brackets 329 and 331, each carrying a respective pin 333 and 335. The pins 333 and 335 extend through respective slots 337 and 339 in the support frame 310 and are guided for movement therein. As can be seen in Fig. 7, the rear slot 339 is arcuately-shaped and curves downwardly and rearwardly. The front slot 337 has two arcuate sections 337a and 337b, and is longer than the rear slot 339. The slot section 337a is the smaller of the two sections and curves upwardly and rearwardly. The slot section 337b is curved along a larger radius and extends upwardly at a more severe angle. The slot section 337b forms an arc of a circle whose center is located at the lower end of the rear slot 339.

In the upright sitting position of the body-supporting unit 316, shown in Fig. 7, the pin 333 is located at the bottom end of the front slot section 337a, and the pin 335 is located at the top end of the rear slot 339. Engagement of the pin 333 with the end of front slot 337 prevents the body-supporting unit from tipping forwardly, so that no other stop means is required for this purpose.

When the user applies his weight rearwardly to the back-rest 320, the body-supporting unit 316 will move to its intermediate, tilted setting position shown in full line in Fig. 8. To effect such movement, the pin 335 rides downwardly in the rear slot 339 until it engages the bottom end of said slot. At the same time, the pin 333 is guided upwardly to the top of the front slot section 337a and is located at the junction of the slot sections 337a and 337b.

It will be appreciated that the initial movement of the body-supporting unit 316 from the upright sitting position to the intermediate, tilted sitting position is a compound movement in which the forward end of the seat 318 is raised and the rear end of said seat is lowered. This movement is stopped by engagement of the pin 335 with the bottom end of the rear slot 339.

If the user, in the intermediate, tilted sitting position, now shifts his weight further rearwardly against the back-rest 320, the body-supporting unit 316 will move to the fully-tilted position shown in broken line in Fig. 8. Since the pin 335 is now seated in the bottom end of the rear slot 339 and cannot travel further in a downward direction, the pin 335 now serves as a fixed pivot about which the body-supporting unit 316 moves in a simple pivoting movement. This pivoting movement is permitted by the front slot section 337b which provides clearance for upward movement of the pin 333 and

guides the pin 333 upwardly in an arcuate path. When the body-supporting unit reaches its fully-tilted position, the pin 333 engages the top of the front slot section 337b to limit further movement.

In the instance the slots 337 and 339 and the pins 333 and 335 serve as first guiding means in moving the body-supporting unit 316 along a first path of movement from the upright sitting position to the intermediate, tilted sitting position, while the pin 335 in engagement with the end of slot 339 serves as a second guiding means to guide the body-supporting unit in a second path of pivotal movement from the tilted sitting position to the fully-tilted position. The first instantaneous center of rotation is provided by slots 337 and 339, while the second instantaneous center of rotation is the fixed pivot point provided by the engagement of pin 335 with the end of slot 339.

The chair 310 includes a leg-rest 326 by a leg-rest linkage 338 which in this instance is mounted entirely on the support 312 instead of being mounted on the seat as in the previously described embodiments of the invention.

The leg-rest linkage 338 includes a pair of links 340 and 342 connected at spaced points to the leg-rest 326 by respective pivots 344 and 346. The link 340 is connected by pivot 350 to a link 348, the other end of which is mounted on the support 312 by pivot 356. The link 342 is connected by pivot 354 to a link 352, whose other end is mounted by pivot 358 on the support at a point spaced rearwardly from the pivot 356. The links 342 and 448 are connected at their crossing-over point by a pivot 360. A triangular plate 341 is pivotally mounted at one corner to the support 312 by a pivot 343. A link 345 is connected to another corner of the plate 341 by a pivot 347. The other end of link 345 is connected to the rear end of the body-supporting unit 316 by a pivot 349. The remaining corner of the plate 341 is connected to the end of a link 351 by a pivot 353. The forward end of link 351 is connected by a pivot 355 to an intermediate point of a link 357. The lower end of link 357 is pivotally mounted on the support at 359. The upper end of link 357 is connected to one end of a link 361 by pivot 363. The other end of link 361 is connected to an intermediate portion of link 352 by pivot 365.

When the body-supporting unit 312 is brought to its intermediate, tilted sitting position, the rear end thereof is lowered, causing link 345 to push downwardly upon the forward end of the triangular plate 341 and thus causing the plate 341 to pivot forwardly about pivot 343. Such forward pivoting of plate 341 carries link 351 forwardly, causing link 357 to pivot forwardly about pivot 357, and in turn causing the link 361 to push the leg-rest link 352 forwardly and upwardly so that the links 352 and 348 pivot forwardly about their fixed pivots 358 and 356, and the leg-rest 326 is raised to its extended position shown in full lines in Fig. 8. In this extended position, the leg-rest 326 is located forwardly of and substantially at the level of the seat 318 in its intermediate, tilted sitting position.

When the body-supporting unit 316 is brought to its fully-inclined or tilted position, the rear end thereof is further lowered, causing the triangular plate 341 to pivot further downwardly as shown in broken line in Fig. 8. This further pivoting movement of plate 341 causes the links 348 and 352 to pivot further upwardly about pivots 356 and 358, raising the leg-rest 326 to a second extended position, shown in broken line Fig. 8. In this second extended position, the leg-rest is located on a higher level and is again at substantially the level of the forward end of the seat 318 which is now in the full-tilted position.

While preferred embodiments of the invention have been shown and described herein, it is obvious that numerous additions, changes and omissions may be made

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in the structure and form of the illustrated embodiments without departing from the spirit and scope of the invention.

What I claim is:

1. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other mounted on said support, a leg-rest, a leg-rest linkage carrying said leg-rest and operatively connected to the body-supporting unit for coordinated movement from a retracted position beneath the seat to an extended position forwardly of and substantially at the level of the forward end of the seat in response to movement of the body supporting unit, first guiding means mounting said body-supporting unit on the support for movement of the latter about a first instantaneous center of rotation along a first path of movement from an upright, sitting position to an intermediate, rearwardly tilted position, blocking means positioned to block said first guiding means from further rearward movement when said body-supporting means reaches said intermediate tilted position, second guiding means mounting said body-supporting unit on said support for further rearward movement about a second instantaneous center of rotation along a second path of movement, said body-supporting unit being moved by said second guiding means about said second instantaneous center of rotation from its intermediate tilted position to its fully tilted position when said first guiding means is blocked by said blocking means, said leg-rest control means including means to raise said leg-rest to its extended position when the body supporting unit is brought to its intermediate tilted position and to maintain said leg-rest in its extended position when the unit is moved from its intermediate tilted position to its fully tilted position.

2. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other mounted on said support, a leg-rest, a leg-rest linkage carrying said leg-rest and operatively connected to the body-supporting unit for coordinated movement in response to movement of the body-supporting unit, first guiding means mounting said body-supporting unit on the support for movement of the latter along a first path of movement from an upright, sitting position to an intermediate, rearwardly tilted position, blocking means positioned to block said first guiding means from further rearward movement when said body-supporting means reaches said intermediate tilted position, second guiding means mounting said body-supporting unit on said support for movement along a second path of movement, said body-supporting unit being moved by said second guiding means along said second path of movement from the intermediate tilted position to its fully tilted position when said first guiding means is blocked by said blocking means, one of said guiding means including a pair of spaced guiding elements movably connecting spaced points on said seat to said support and adapted to produce a compound rearward movement of the body-supporting unit, the other guiding means comprising a fixed pivotal connection of the body-supporting unit to the support to provide a simple pivoting movement of the body-supporting unit relative to the support, said leg-rest control means including means to raise said leg-rest to its extended position when the body supporting unit is brought to its intermediate tilted position, and to maintain said leg-rest in its extended position when the unit is moved from its intermediate tilted position to its fully tilted position.

3. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other, and means mounting the body-supporting unit movably on the support, said mounting means comprising a support bar, first pivot means mounting the support bar on the support in a normal position in which the support bar extends in a substantially horizontal direction, second pivot means mounting the body-supporting

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unit on the support bar, the body-supporting unit being turnable rearwardly about said second pivot means relative to said support bar, and blocking means to limit the rearward movement of said body-supporting means about said second pivot means, the support bar being turnable rearwardly about said first pivot means after the blocking means has halted rearward pivoting movement of said body-supporting means about said second pivot means.

4. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other, and means mounting the body-supporting unit movably on the support, said mounting means comprising a support bar, first pivot means mounting the support bar on the support in a normal position in which the support bar rests on a portion of the support, second pivot means located rearwardly of the first pivot means and mounting the body-supporting unit on the support bar, the body-supporting unit being turnable rearwardly about said second pivot means relative to said support bar, and blocking means on said support bar engageable with said second pivot means to limit the rearward movement of said body-supporting means thereabout, the support bar being turnable rearwardly about said first pivot means after the blocking means has engaged said second pivot means.

5. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other mounted on said support, a leg-rest, a leg-rest linkage carrying said leg-rest and operatively connected to the body-supporting unit for coordinated movement from a retracted position beneath the seat to an extended position forwardly of and substantially at the level of the forward end of the seat in response to movement of the body-supporting unit, a guiding bar, first pivot means mounting said guiding bar on said support with the guiding bar normally resting in a fixed position, second pivot means mounting the seat on said guiding bar for movement of said body-supporting means on said guiding bar along a first path of movement from an upright sitting position to an intermediate, rearwardly tilted position, blocking means positioned to block said second pivot means from further movement when said body-supporting means reaches said intermediate tilted position, said guiding bar thereafter pivoting on said first pivot means to move said body-supporting unit along a second path of movement from its intermediate tilted position to its fully tilted position, said leg-rest linkage including means to raise said leg-rest to its extended position when the body-supporting unit is brought to its intermediate tilted position, and to maintain said leg-rest in its extended position when the unit is moved from its intermediate tilted position to its fully tilted position.

6. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other mounted on said support, a leg-rest, a leg-rest linkage carrying said leg-rest and operatively connected to the body-supporting unit for coordinated movement, in response to movement of the body-supporting unit, from a retracted position beneath the seat to an extended position forwardly of and substantially at the level of the forward end of the seat, a support bar, a first pivot mounting the rear end of said support bar on said support with the support bar normally resting in a fixed horizontal position, a depending extension on said seat, a second pivot mounting said extension on the forward end of said support bar for pivoting movement of said body-supporting means on said support bar along a first arcuate path of movement from an upright sitting position to an intermediate, rearwardly tilted position, a blocking member rigid with the support bar and positioned to engage said depending extension and limit further rearward pivoting movement of said body-supporting unit when the latter reaches said intermediate tilted position, said support bar thereafter pivoting rear-

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wardly on said first pivot to move said body-supporting unit along a second arcuate path of movement from its intermediate tilted position to its fully tilted position, said leg-rest linkage including means to raise said leg-rest to its extended position when the body-supporting unit is brought to its intermediate tilted position, and to maintain said leg-rest in its extended position when the unit is moved from its intermediate tilted position to its fully tilted position.

7. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other mounted on said support, a leg-rest, a leg-rest linkage carrying said leg-rest and operatively connected to the body-supporting unit for coordinated movement, in response to movement of the body-supporting unit, from a retracted position beneath the seat to an extended position forwardly of and substantially at the level of the forward end of the seat, a support bar, a fixed pivot mounting the rear end of said support bar on said support with the support bar normally resting in a fixed horizontal position, a pair of guiding links pivotally mounted at spaced points on an intermediate portion of said support bar and pivotally connected to spaced points on said seat for movement of said body-supporting means on said support bar along a first path of movement from an upright sitting position to an intermediate, rearwardly tilted position, a blocking member rigid with said support bar and positioned to engage one of said pair of guiding links and limit further rearward movement of said body-supporting means when the latter reaches said intermediate tilted position, said support bar thereafter pivoting on said fixed pivot to move said body-supporting unit along a second arcuate path of movement from its intermediate tilted position to its fully tilted position, said leg-rest linkage including means to raise said leg-rest to its extended position when the body-supporting unit is brought to its intermediate tilted position, and to maintain said leg-rest in its extended position when the unit is moved from its intermediate tilted position to its fully tilted position.

8. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other mounted on said support, a leg-rest, a leg-rest linkage carrying said leg-rest and operatively connected to the body-supporting unit for coordinated movement, in response to movement of the body-supporting unit, from a retracted position beneath the seat to an extended position forwardly of and substantially at the level of the forward end of the seat, a support bar, a pair of guiding links mounting said support bar on said support with the support bar normally resting in a fixed horizontal position, one end of each guiding link being pivotally connected to the supported, the other end of each guiding link being pivotally connected to a respective end of said support bar, a depending extension on said seat, a fixed pivot connecting the lower end of said depending extension to an intermediate point on the support bar for pivoting movement of the body-supporting means on said support bar along a first arcuate path of movement from an upright sitting position to an intermediate, rearwardly tilted position, a blocking member rigid with the support bar and positioned to engage said depending extension and limit further rearward pivoting movement of said body-supporting unit relative to the support bar, when the unit reaches said intermediate tilted position, said support bar thereafter moving rearwardly on said pair of guiding links to move said body-supporting unit along a second path from its intermediate tilted position to its full-tilted position, said leg-rest linkage including means to raise said leg-rest to its extended position when the body-supporting unit is brought to its intermediate tilted position, and to maintain said leg-rest in its extended position when the unit is moved from its intermediate tilted position to its fully tilted position.

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9. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other mounted on said support, a leg-rest, a leg-rest linkage carrying said leg-rest and operatively connected to the body-supporting unit for coordinated movement, in response to movement of the body-supporting unit, from a retracted position beneath the seat to an extended position forwardly of and substantially at the level of the forward end of the seat, means for movably mounting the body-supporting unit on the support, said mounting means including a first pin rigid with the forward end of said seat, a second pin rigid with the rearward end of said seat, a first guide slot receiving said first pin and a second guide slot receiving said second pin, said first guide slot being of arcuate shape and extending rearwardly and upwardly, the second guide slot being of arcuate shape and extending rearwardly and downwardly, the first pin being located at the bottom end of said first guide slot and the second pin being located at the top end of said second guide slot when the body-supporting unit is in an upright sitting position, said first pin being slidable to the top end of said first guide slot and the second pin being slidable to the bottom end of said second guide slot whereby to guide the unit rearwardly along a first path of movement from its upright sitting position to an intermediate tilted position, the second pin engaging the bottom end of said second slot to limit further movement of said unit along said first path of movement when the unit reaches its intermediate tilted position, said first guide slot having an arcuate extension slot communicating with its top end, the unit being pivotable rearwardly about said second pin as a fixed pivot along a second path of movement from its intermediate tilted position to a fully tilted position with the first pin traversing the arcuate extension of said first guide slot, said leg-rest linkage including means to raise said leg-rest to its extended position when the body-supporting unit is brought to its intermediate tilted position, and to maintain said leg-rest in its extended position when the unit is moved from its intermediate tilted position to its fully tilted position.

10. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other, and means movably mounting the body-supporting unit on said support for rearward tilting movement relative thereto, said mounting means including first guiding means providing a first instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said first instantaneous center of rotation along a first path of movement from an upright sitting position to an intermediate, tilted sitting position in response to rearward pressure applied by the chair occupant upon the body-supporting unit, second guiding means providing a second instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said second instantaneous center of rotation along a second path of movement from said intermediate, tilted sitting position to a fully-tilted position in response to further rearward pressure applied by the chair occupant upon the body-supporting unit, said centers of rotation being independent of each other and the second instantaneous center of rotation being located rearwardly of the first instantaneous center of rotation in the intermediate, tilted sitting position, and blocking means for limiting the movement of the first guiding means at said intermediate, tilted sitting position whereby to halt further movement of said body-supporting unit about said first instantaneous center of rotation and constrain further rearward movement of the body supporting means to movement about said second instantaneous center of rotation.

11. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other, and means movably mounting the body-sup-

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porting unit on said support for rearward tilting movement relative thereto, said mounting means including first guiding means providing a first instantaneous center of rotation for said body-supporting unit, said body supporting unit being movable rearwardly about said first instantaneous center of rotation along a first path of movement from an upright sitting position to an intermediate, tilted sitting position in response to rearward pressure applied by the chair occupant upon the body-supporting unit, second guiding means providing a second instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said second instantaneous center of rotation along a second path of movement from said intermediate, tilted sitting position to a fully-tilted position in response to further rearward pressure applied by the chair occupant upon the body-supporting unit; said centers of rotation being independent of each other and the second instantaneous center of rotation being located rearwardly of the first instantaneous center of rotation, and blocking means for limiting the movement of the first guiding means at said intermediate tilted position whereby to halt further movement of said body-supporting unit about said first instantaneous center of rotation and constrain further rearward movement of the body supporting means to movement about said second instantaneous center of rotation, said blocking means including an element rigid with the support during movement of said body-supporting unit about the first instantaneous center of rotation, and positioned to engage a portion of said first guiding means as the unit moves about the first instantaneous center of rotation.

12. In a reclining chair of the multiple position type, a support, a body-supporting unit including a rigid seat and back-rest, means operatively connected to and mounting said body-supporting unit on said support for tilting movement through a first phase from a sitting position to an intermediate tilted position and through a second phase from said tilted position to a fully-tilted position, said means including a forward pin and slot interconnection between said body-supporting unit and said support, said forward slot having a first section cooperating with said forward pin to impart a first guiding action to said body-supporting unit during said first phase and a second section cooperating with said forward pin to impart a second guiding action to said body-supporting unit during said second phase, the inner ends of said first and second sections being in communication and serving as an intermediate seating means for said forward pin at the end of said first phase of said tilting movement, the outer ends of said first and second sections serving as end stops for said pin in said sitting and fully-tilted positions, said means further including a rearward pin and slot interconnection between said body-supporting unit and said support, said rearward pin being disposed at one end of said rearward slot in said sitting position and moving to the other end of said rearward slot in said tilted position, said second section having a curvature on a radius from said rearward pin when at the other end of said rearward slot such that said forward pin may translate along said second section with said rearward pin journaled at said other end of said rearward slot.

13. A reclining chair of the multiple position type comprising a support, a body-supporting unit including a rigid seat and back-rest, means operatively connected to and mounting said body-supporting unit on said support for tilting movement through a first phase from a sitting position to an intermediate tilted position and through a second phase from said intermediate tilted position to a fully-tilted position, said means including a pin and slot interconnection between said body-supporting unit and said support, said slot having a first section cooperating with said pin to impart a first guiding action to said body-supporting unit during said first phase and a second section cooperating with said pin to impart a second guiding action

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to said body-supporting unit during said second phase, the inner ends of said first and second sections being in communication and serving as an intermediate seating means for said pin at the end of said first phase of said tilting movement, the outer ends of said first and second sections serving as end stops for said pin in said sitting and reclining positions, a leg-rest, means mounting said leg-rest for elevating movement from a stored position beneath said seat to an elevated leg-supporting position forwardly of said seat, and leg-rest control means operatively connected to said leg-rest and to said body-supporting unit for elevating said leg-rest in response to said tilting movement.

14. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other, means movably mounting the body-supporting unit on said support for rearward movement relative thereto, said mounting means providing a first instantaneous center of rotation for said body-supporting unit, said body supporting unit being movable rearwardly about said first instantaneous center of rotation along a first path of movement from an upright sitting position to a tilted sitting position in response to rearward pressure applied by the chair occupant upon the body-supporting unit, said mounting means providing a second instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said second instantaneous center of rotation along a second path of movement from said tilted sitting position to a fully-tilted position in response to further rearward pressure applied by the chair occupant upon the body-supporting unit, and blocking means for limiting the movement of the body-supporting unit about said first instantaneous center of rotation at the tilted sitting position and constrain further rearward movement of the body supporting means to movement about said second instantaneous center of rotation, said first instantaneous center of rotation being displaceable when the body-supporting unit is moved along said first path of movement.

15. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other, means movably mounting the body-supporting unit on said support for rearward movement relative thereto, said mounting means providing a first instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said first instantaneous center of rotation along a first path of movement from an upright sitting position to a tilted sitting position in response to rearward pressure applied by the chair occupant upon the body-supporting unit, said mounting means providing a second instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said second instantaneous center of rotation along a second path of movement from said tilted sitting position to a fully-tilted position in response to further rearward pressure applied by the chair occupant upon the body-supporting unit, and blocking means for limiting the movement of the body-supporting unit about said first instantaneous center of rotation at the tilted sitting position and constrain further rearward movement of the body-supporting means to movement about said second instantaneous center of rotation, said second instantaneous center of rotation being displaceable when said body-supporting unit is moved along said second path of movement.

16. A reclining chair comprising a support, a body-supporting unit including a seat and a back-rest rigid with each other, means movably mounting the body-supporting unit on said support for rearward movement relative thereto, said mounting means providing a first instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said first instantaneous center of rotation along a first path of movement from an upright sitting position to a

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tilted sitting position in response to rearward pressure applied by the chair occupant upon the body-supporting unit, said mounting means providing a second instantaneous center of rotation for said body-supporting unit, said body-supporting unit being movable rearwardly about said second instantaneous center of rotation along a second path of movement from said tilted sitting position to a full-tilted position in response to further rearward pressure applied by the chair occupant upon the body-supporting unit, blocking means for limiting the movement of the body-supporting unit about said first instantaneous center of rotation at the tilted sitting position and constrain further rearward movement of the body-supporting means to movement about said second instantaneous center of rotation, said first instantaneous center of rotation being displaceable and said second instantaneous center of rotation being a fixed center, a leg-rest, leg-rest actuating means carrying the leg-rest and operatively connected to the body-supporting unit for coordinated movement of the leg-rest between a retracted position beneath the seat and an extended position forwardly

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of and substantially at the level of the forward end of the seat in response to movement of the body-supporting unit, said leg-rest actuating means including means to raise the leg-rest to its extended position when the body-supporting unit is brought to its tilted sitting position and to maintain said leg-rest in its extended position when the unit is moved from its tilted sitting position to its fully tilted position.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,940,509

June 14, 1960

Peter S. Fletcher

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 11, lines 15 and 42, for "the latter", each occurrence, read -- said body-supporting unit --.

Signed and sealed this 15th day of May 1962.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents