Dec. 24, 1963 F. F. SCHLIEPHACKE 3,115,363

LEG-REST CONTROL MEANS FOR MULTIPLE POSITION RECLINING CHAIR

Filed April 7, 1960 2 Sheets-Sheet 1

FIG. 1.

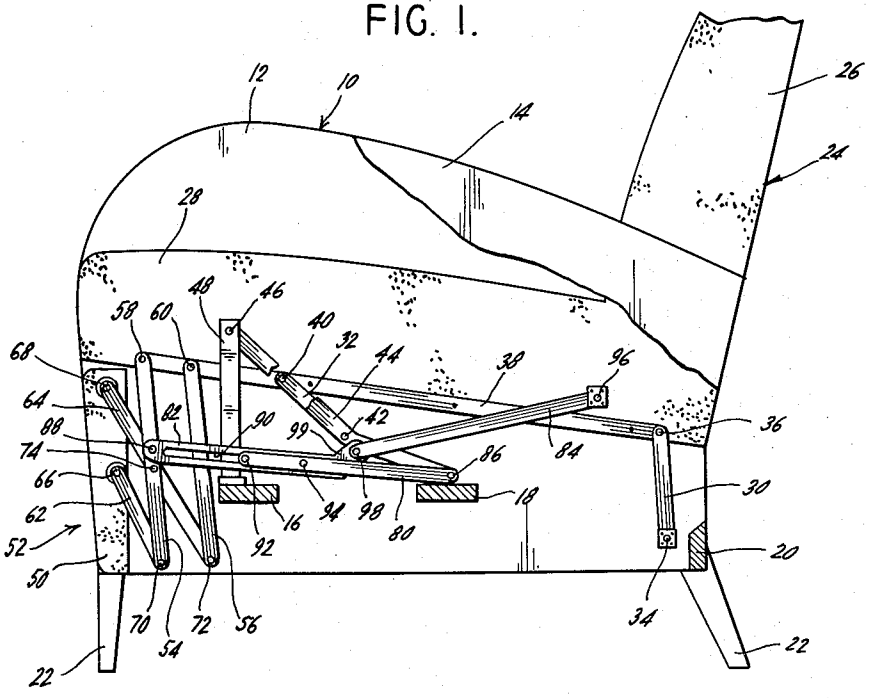
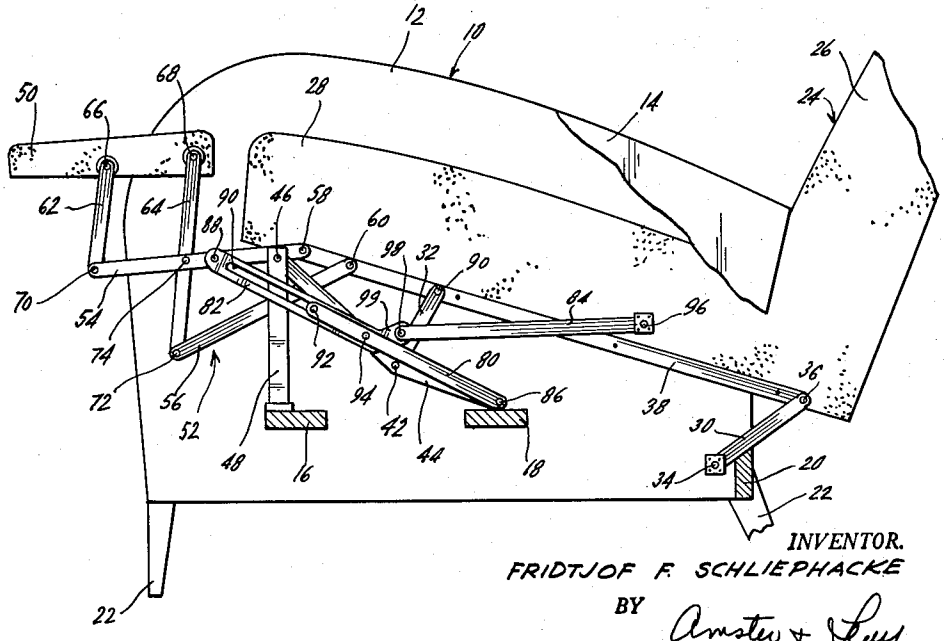


FIG. 2.



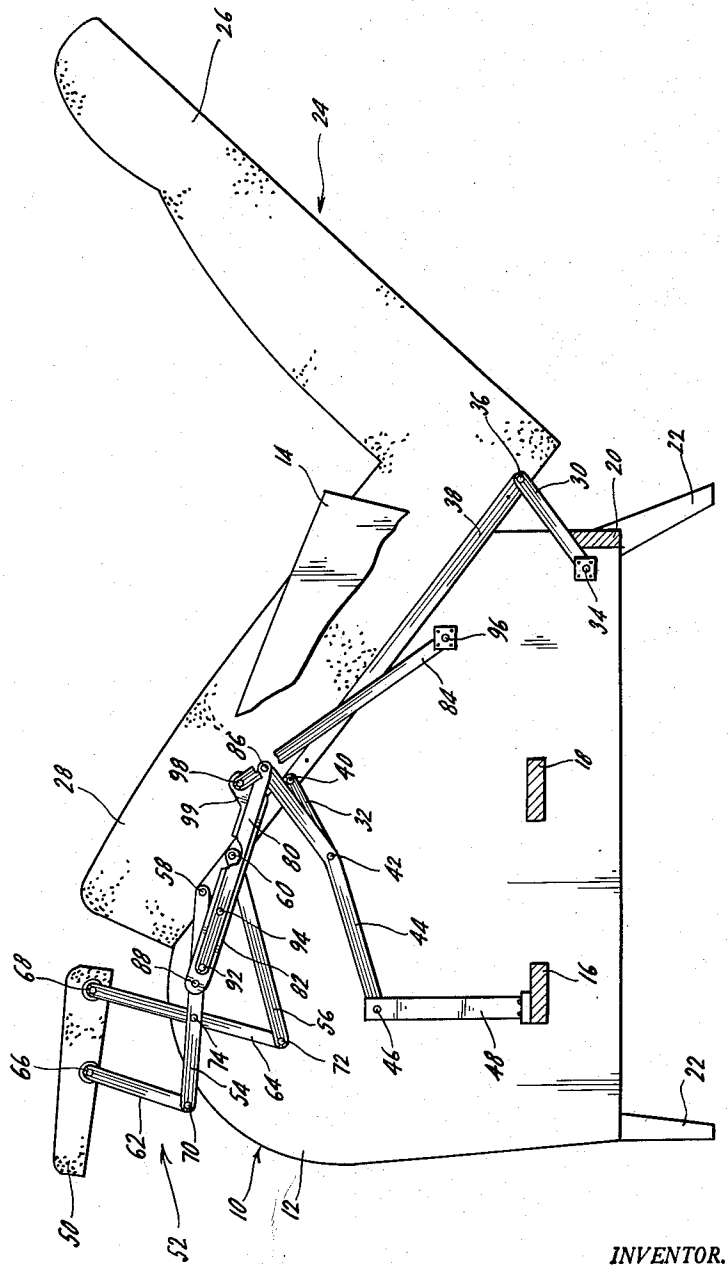
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FIG. 3.



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LEG-REST CONTROL MEANS FOR MULTIPLE POSITION RECLINING CHAIR

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11 Claims. (Cl. 297—89)

The present invention relates to improvements in adjustable reclining chairs and in particular relates to leg-rest actuating means for a reclining chair of the multiple position type.

The typical multiple position reclining chair includes a body-supporting unit consisting of a seat and a back-rest formed rigidly with each other, and mounted upon a support frame for rearward movement from an upright sitting position to an intermediate, tilted sitting position and then to a fully-tilted or reclined position. The chair also includes a leg-rest which is mounted for movement from a retracted position beneath the seat to an extended position forwardly of the seat. The leg-rest must be brought to an extended, leg-supporting position when the body-supporting unit is in its intermediate, tilted sitting position, and maintained in proper leg-supporting position when the unit is brought through various reclined positions to its fully tilted position. The intermediate, tilted sitting position of the body-supporting unit is a slightly-tilted "active position" with the occupant's body in a substantially upright attitude suitable for viewing television, talking, reading or the like. In such position, the leg-rest has already moved to an extended position for supporting the occupant's out-stretched legs. The body-supporting unit can then, when desired, be tilted further to an "inactive," fully-tilted reclining position in which the occupant's body is supported in a more supine or recumbent position for greater relaxation. In this fully-tilted position, the leg-rest maintains the optimum extended leg-supporting position and remains substantially in a horizontal position relative to the floor surface.

It is an object of the present invention to provide leg-rest actuating means for advancing the leg-rest to its extended leg-supporting position rapidly in response to movement of the body-supporting unit to its intermediate, tilted sitting position, and for maintaining the leg-rest in its extended position with a slower rate of movement relative to the forward end of the seat when the unit is further advanced to its fully-tilted position.

A further object of the invention is the provision of leg-rest actuating means for multiple position reclining chairs which includes a connecting link of telescopic construction connecting the leg-rest control means and the seat control means, and so arranged as to permit variance in its over-all length during the chair movement producing a rapid elevation of the leg-rest during a first phase of movement and a slower elevation during a second phase of movement.

In accordance with the present invention, the chair body-supporting unit is mounted on a support frame by a pair of guide links. The rear guide link is mounted on the support frame while the front guide link is mounted on a carrier member which in turn is mounted on the support frame. The carrier member is temporarily maintained in a stationary position during the first motion phase and both guide links pivot rearwardly to guide the

body-supporting unit to the intermediate, tilted sitting position. During the second motion phase, the rear guide link is stopped from rearward movement and the seat turns about its pivotal connection with the stationary rear guide link, the carrier member and the front guide link rising with the seat. The leg-rest is actuated by a connecting link which couples the carrier member with the leg-rest control linkage, the connecting link being formed of two telescoping link sections to produce a connecting link of variable length during the first and second motion phase. An actuating link is pivotally mounted on the support frame and connected through the forward link section of the connecting link to the leg-rest control linkage.

Additional objects and advantages of this invention will be 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, with parts broken away and shown in section, of a reclining chair incorporating the leg-rest actuating means of the present invention, the chair being shown in an upright sitting position;

FIG. 2 is a similar side elevational view showing the chair of FIG. 1 in its intermediate, tilted sitting position with the leg-rest extended in leg-supporting position; and

FIG. 3 is a similar side elevational view showing the chair of FIGS. 1 and 2 in its fully-tilted reclining position.

Referring in detail to the drawings, there is shown therein a reclining chair made in accordance with the invention herein, and generally comprising a support frame 10 and a body-supporting structure 24 movably mounted thereon. The support frame 10 includes a pair of side frames 12 and 14 connected together in spaced relationship by cross bars or braces 16, 18 and 20 and mounted upon the usual legs 22.

The body-supporting structure 24 includes a back-rest 26 and a seat 28 formed integrally with each other to provide a rigid seat and back-rest unit. Seat control means are provided to mount the body-supporting unit 24 on the support frame 10 for rearward movement from the upright sitting position of FIG. 1 through a first motion phase to an intermediate, tilted sitting position of FIG. 2, and then through a second motion phase to the fully-tilted reclining position of FIG. 3. Such seat control means includes a rear guide link 30 and a front guide link 32.

The rear guide link 30 is mounted by fixed pivot 34 on the support frame 10 and is connected by pivot 36 to a bar 38 which is affixed to the seat 28. The front guide link 32 is connected by pivot 40 to the bar 38 and therefore to the forward portion of the seat 28, and is mounted by pivot 42 on a carrier member 44 at an intermediate point thereon. One end of the carrier member 44 is mounted by pivot 46 on a bracket 48 which is immovably mounted on cross bar 16 and therefore serves as a rigid portion of the support frame 10.

The chair also includes a leg-rest 50 and a leg-rest supporting linkage designated generally by the reference numeral 52. This leg-rest supporting linkage 52 includes a pair of links 54 and 56 mounted at spaced points on the forward end of the seat 28 by respective pivots 58 and 60, and a pair of links 62 and 64 connected by respective pivots 66 and 68 to spaced points on the leg-rest 50. The end of link 54 is connected by pivot 70 to the end of link

62, while the end of link 56 is connected by pivot 72 to the end of link 64. The link 54 crosses over the link 64 and is connected thereto at its crossing-over point by pivot 74 in order to coordinate movement of the link pairs.

The leg-rest supporting linkage 52 is arranged to guide the leg-rest 50 for movement between a retracted position beneath the seat, shown in FIG. 1, and the extended leg-supporting positions of FIGS. 2 and 3. Actuating means are also provided to impart movement to the leg-rest in response to movement of the body-supporting unit 24. Such actuating means includes a pair of connecting links 80 and 82 and an actuating link 84, and also includes the carrier member 44.

The connecting link 80 is connected by pivot 86 to the lower end of the carrier member 44, while the other connecting link 82 is connected by pivot 88 to an intermediate point on the link 54. The link 82 has an elongated longitudinal slot 90 which extends substantially the entire length thereof, and the link 80 carries at its forward end portion a pair of spaced pins 92 and 94 which extend slidably through said slot 90. The provision of the spaced pins 92 and 94 prevents the link 80 from turning relative the link 82, but permits longitudinal sliding movement of the links 80 and 82 relative to each other. The pin-and-slot arrangement therefore provides a telescopic action of the links 80 and 82 whereby the distance between the end pivots 86 and 88 may be varied. In effect, the link 80 and 82 may thus be regarded as a pair of telescopic links acting as a single link, the length of which is varied during the chair movements.

The control link 84 is mounted at one end on the support frame 10 by pivot 96. The other end of said actuating link is connected by pivot 98 to an integral offset extension 99 of the connecting link 82.

FIG. 1, the body-supporting unit 24 is shown in its upright sitting position. The rear guide link 30 is in an upright position and the front guide link 32 is inclined upwardly and forwardly from its pivotal mount 42 on the carrier member 44 to its pivotal connection 40 with the seat. The connecting link 80 and the carrier member 44 rest upon the cross bar 18 adjacent their pivotal connection 86, thereby providing a rigid support for the front guide link 32 at the pivot 42. The connecting links 80 and 82 are partially extended relative to one another with the pins 92 and 94 located at an intermediate portion of the slot 90, and the leg-rest 50 is in its retracted position beneath the forward end of seat 50.

When the occupant of the chair in the upright sitting position of FIG. 1 wishes to assume a more comfortable position, he applies his weight rearwardly against the body-supporting unit 24. The rear guide link 30 turns about its fixed pivotal mount 34 to guide the rear portion of the body-supporting unit 24 rearwardly and downwardly. The front guide link 32 also turns about its pivotal mount 42 on the temporarily stationary carrier member 44 to guide the forward portion of the seat 28 upwardly and rearwardly. This first motion phase, produced by the simultaneous pivoting movement of both guide links 30 and 32, continues until the body-supporting unit 24 reaches the intermediate, tilted sitting position of FIG. 2. At this point, the rear guide link 30 engages the cross-bar 20, the latter halting further pivoting movement of the guide links and therefore defining the end of the first motion phase.

In the intermediate, tilted sitting position of FIG. 2, the body-supporting unit is slightly tilted but is still essentially upright and in an "active" position in which the user's body is supported with the head and eyes forwardly-directed. This position is suitable for television, reading, sewing or the like. At the same time, the leg-rest 50 has been brought to an extended, leg-supporting position in the manner which will now be described.

As the body-supporting unit 24 moves rearwardly during the first motion phase, the seat 28 carries the leg-rest control linkage 52 upwardly and rearwardly with

it. The actuating link 84 pivots upwardly about its fixed pivot 96 and pushes forwardly upon the connecting link 82 through the pivotal connection 98 on the extension 99. The connecting link 82 thus slides forwardly until the pins 92 and 94 are located at the rear end of slot 90, and the distance between pivots 86 and 88 is increased. The over-all length of the link formed by the two telescopic connecting links 80, 82 is therefore increased during the first motion phase. As a result, link 82 exerts a forward push against the rearwardly-moving leg-rest link 54 at point 88, causing said link 54 to turn upwardly and forwardly about its pivotal mount 58 on the seat 28. The leg-rest control linkage 52 is thus actuated to raise the leg-rest 50 to the extended position of FIG. 2. In this position, the control member 44 is still seated, at the pivot 86, upon the cross-bar 18.

It will be appreciated that because the overall length of the link formed by connecting links 80, 82 is increased during this first motion phase, a greater forward push is exerted against the link 54 than if the connecting link were of a constant length, and the leg-rest 50 is raised at a more accelerated rate during this first motion phase.

If the occupant of the chair now wishes to assume a more reclined position for greater relaxation, he applies further rearward pressure against the body-supporting unit 24. This causes the body-supporting unit 24 to turn about the pivotal connection 36 between the now stationary rear guide link 30 and the seat 28. The second motion phase is therefore a simple pivoting movement of the body-supporting unit about the pivot 36 of the rear guide link 30.

During the second motion phase, the forward portion of the seat is lifted and carries upwardly with it the front guide link 32. The latter in turn lifts the carrier member 44 through its pivotal connection 42, causing the carrier member to pivot upwardly about its fixed pivotal mount 46. A lost motion action is therefore produced during the second motion phase, in which the lower end of the front guide link 32 moves upwardly relative to the support frame and freely follows the seat as the latter turns about the stationary pivot 36.

As the forward portion of the seat turns upwardly and rearwardly during the second motion phase, it again carries with it the leg-rest control linkage 52 through the pivots 58 and 60. Rearward movement of the connecting link 82 is again restrained by the control link 84 which pivots upwardly and continues to push forwardly through link 82 upon the leg-rest link 54. The leg-rest 50 is therefore retained extended in proper leg-supporting position forwardly of the seat 28 and substantially in a horizontal plane at the level of the front end of the seat. This second motion phase may be continued until the body-supporting unit 24 reaches the fully-tilted position of FIG. 3 in which the occupant's body is disposed in a reclined position for maximum relaxation.

When the carrier member 44 pivots upwardly and forwardly on the fixed pivot 46 during the second motion phase, it carries with it the rear end of the connecting link 80. Since at this time the other connecting link 82 is moving rearwardly with the seat 28 and leg-rest control linkage 52, with the result that the pins 92 and 94 slide to the forward end of the slot 90. The link formed by the link sections 80 and 82 therefore decreases in length to produce a slower upward movement of the leg-rest, thereby maintaining the leg-rest 50 at a proper leg-supporting position substantially level with the forward end of the seat 28 or slightly below, and substantially horizontal or parallel to the floor surface.

In the position of FIG. 3 the front guide link 32 has become axially aligned with the carrier member 44 and acts as an extension thereof providing a link of constant length between pivots 40 and 46 which will prevent further rearward pivoting of the body-supporting unit past the fully-tilted position.

It will be observed that the leg-rest actuating means comprises a four-bar linkage with the control link 84,

the carrier member 44 and the portion of the telescopic link between the pivots 86 and 98 representing the three movable links, and the portion of the support frame 10 between the fixed pivots 46 and 96 representing the stationary link. During the first motion phase, however, the carrier member 44 remains temporarily inactive and stationary, so that pivot 86 becomes a fixed pivot. There is then provided a three-bar or triangular actuating linkage comprising the control link 84 and the telescopic link between pivots 86 and 98 as the movable links and the portion of the support frame 10 between pivots 86 and 96 as the fixed immovable link. Such a three-bar linkage would bind were it not for the pin-and-slot coupling 90, 92, 94 which permits extension during the first motion phase of the telescopic link formed by the link sections 80 and 82. During the second motion phase, the same pin-and-slot coupling 90, 92, 94 provides a decrease in the over-all length of the connecting link formed by the telescopic sections 80, 82 with the result that a slower elevation of the leg-rest is effected during the second motion phase. The linkage thus provides rapid movement of the leg-rest to the extended leg-supporting position during the first motion phase and then movement at a slower rate during the second motion phase to maintain the leg-rest in the extended leg-supporting position.

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

What I claim is:

1. A multiple position reclining chair comprising a support frame, a body-supporting unit including a seat and back-rest formed rigidly with each other, seat control means mounting the body-supporting unit on the support frame for movement rearwardly through a first motion phase from an upright sitting position to an intermediate, tilted sitting position and then through a second motion phase from said intermediate, tilted sitting position to a fully-tilted reclining position, a leg-rest, leg-rest control means mounting the leg-rest for movement from a retracted position beneath the seat to an extended leg-supporting position forwardly of the seat, and actuating means associated with the leg-rest control means for moving the leg-rest rapidly to an extended leg-supporting position during said first motion phase and for moving the leg-rest at a slower rate during the second motion phase to maintain said leg-rest in extended leg-supporting position, said actuating means including a variable length telescopic link connecting the seat control means with the leg-rest control means, said telescopic link including link sections which are slidable relative to each other during said first and second motion phases to change the effective length of said telescopic link, said link sections sliding relative to each other during said first motion phase to increase the effective length of said telescopic link and sliding relative to each other during said second motion phase to decrease the effective length of said telescopic link, and an actuating link pivotally mounted on the support frame and connected to said telescopic link for controlling the telescoping movement thereof.

2. A multiple position reclining chair comprising a support frame, a body-supporting unit including a seat and back-rest formed rigidly with each other, seat control means mounting the body-supporting unit on the support frame for movement rearwardly through a first motion phase from an upright sitting position to an intermediate, tilted sitting position and then through a second motion phase from said intermediate, tilted sitting position to a fully-tilted reclining position, a leg-rest and leg-rest control means mounting the leg-rest for movement from a retracted position beneath the seat to an extended leg-supporting position forwardly of the seat, and actuating means responsive to movement of the body-supporting unit and operatively connected to the leg-rest control means for moving the leg-rest rapidly to said extended position during said first motion phase and for moving the leg-rest at a slower rate during the second motion phase to maintain the leg-rest in extended leg-supporting position, said actuating means comprising a four-bar actuating linkage including a carrier member pivotally mounted on the support frame, an actuating link pivotally mounted at a spaced point on the support frame, a variable length connecting link pivotally mounted on the carrier member, and the portion of the support frame between the pivotal mounts of the carrier member and actuating link thereon, said connecting link comprising a pair of telescopic link sections, one of said link sections being mounted on said carrier member, the other link section being connected to said actuating link, said link sections moving relative to each other during said first motion phase to increase the effective length of said connecting link and moving relative to each other during the second motion phase to decrease the effective length of said connecting link.

3. A multiple position reclining chair according to claim 2 in which said support frame has a fixed portion supporting said carrier member temporarily in a stationary position during the first motion phase, the carrier member turning upwardly about its pivotal mount on the support frame during the second motion phase.

4. A multiple position reclining chair comprising a support frame, a body-supporting unit including a seat and back-rest formed rigidly with each other, seat control means mounting the body-supporting unit on the support frame for rearward movement through a first motion phase from an upright sitting position to an intermediate, tilted sitting tilted position and then through a second motion phase from said intermediate, tilted sitting position to a fully-tilted reclined position, said seat control means including a carrier member pivotally mounted on the support frame and connected to the seat, and stop means supporting said carrier member immovably during the first motion phase, the carrier member pivoting upwardly away from said stop means during the second motion phase, a leg-rest, a leg-rest control means for guiding said leg-rest from a retracted position beneath the seat to an extended leg-supporting position forwardly of the seat, and leg-rest actuating means for actuating said control means to bring said leg-rest rapidly to said extended leg-supporting position during the first motion phase and for moving said leg-rest at a slower rate during the second motion phase whereby to maintain the leg-rest in extended leg-supporting position, said actuating means including a variable length connecting link coupling the carrier member with the leg-rest control means, said connecting link comprising a pair of telescoping link sections respectively connected to the carrier member and the leg-rest control means, said link sections moving relative to each other during said first motion phase to increase the effective length of said connecting link and moving relative to each other during the second motion phase to decrease the effective length of said connecting link, and an actuating link pivotally mounted on the support frame and connected to one of said link sections.

5. A multiple position reclining chair according to claim 4 in which said control link is pivotally connected to the link section which is connected to the leg-rest control means.

6. A multiple position reclining chair comprising a support frame, a body-supporting unit including a seat and back-rest formed rigidly with each other, a leg-rest, means mounting the leg-rest on the seat for movement between a retracted position beneath the seat and an extended leg-supporting position forwardly of the seat, a carrier member pivotally mounted on the support frame, a front guide link pivotally mounted on the carrier member and pivotally conected to the forward end of the seat, a rear guide link pivotally mounted on the support and pivotally connected to the rear portion of the seat, a connecting link coupling

the carrier member with the leg-rest for actuation of the latter, said connecting link comprising a pair of link sections slidably connected to each other for longitudinal sliding movement relative to each other, whereby the overall length of the connecting link is continuously varied during movement of the leg-rest, one of said link sections being pivotally connected to said carrier member, the other of said link sections being pivotally connected to the leg-rest, said link sections moving relative to each other during said first motion phase to increase the effective length of said connecting link and moving relative to each other during the second motion phase to decrease the effective length of said connecting link and an actuating link pivotally mounted on the support frame and pivotally connected to one of said link sections.

7. A multiple position reclining chair comprising a support, a body-supporting unit including a seat and back-rest mounted on said support for movement through first motion phase from an upright sitting position into an intermediate, tilted sitting position, and for further movement through a second motion phase from said intermediate, tilted sitting position into a fully reclined position, a carrier member, fixed stop means on the support frame for temporarily supporting said carrier member in a relatively stationary position during said first motion phase, a front guiding link pivotally mounted on said carrier member and pivotally connected to said body-supporting unit, said front guiding link turning about said temporarily stationary carrier member during said first motion phase, a rear guiding link pivotally mounted on said support and pivotally connected to said body-supporting unit, said rear guiding link turning rearwardly about its pivotal mount on the support during said first motion phase, means for blocking said rear guiding link against further rearward movement at the end of the first motion phase such that the pivotal connection of said rear guiding link with said body-supporting means serves as a pivotal mount for said body-supporting unit during said second motion phase, a leg-rest, control means mounting said leg-rest on said seat for movement to an elevated leg-supporting position during said first motion phase, an adjustable length coupling member pivotally connected to the leg-rest control means and pivotally mounted on said carrier member, an actuating link pivotally mounted on said support and operatively connected to said coupling member, said actuating link being operable in response to the rearward movement of said body-supporting unit during said first motion phase under control of said front and rear guiding links to move said leg-rest rapidly to said elevated leg-supporting position, and means pivotally mounting said carrier member on said support for a slower rate movement relative thereto during said second motion phase, during which said body-supporting unit pivots about the pivotal connection of said rear guiding link with said body-supporting unit and the coupling member decreases in length to raise the leg-rest at a slower rate and maintain it in leg-supporting position relative to the seat, said carrier member extending rearwardly and downwardly from its pivotal mount on the support to the fixed stop means supporting the carrier member in the upright sitting position, said carrier member being lifted by the front guide link and turning upwardly about its pivotal mount on the support during the second motion phase, the adjustable length coupling member being connected to the end portion of the carrier member opposite the pivotal mount of the latter, the coupling member decreasing in length when the carrier member turns about its pivotal mount during the second movement phase.

8. A multiple position reclining chair according to claim 7 in which the adjustable length coupling member comprises a front connecting link, a rear connecting link and means movably coupling said links for longitudinal sliding movement relative to each other, said actuating link being pivotally connected to the front connecting link.

9. A multiple position reclining chair according to claim 8 in which the means movably coupling said connecting links includes a slot in one connecting link and a pair of spaced pins carried by the other connecting link and slidably received in said slot.

10. A multiple position reclining chair comprising a support, a body-supporting unit including a seat and back-rest mounted on said support for movement through a first motion phase from an upright sitting position into an intermediate, tilted sitting position and for further movement through a second motion phase from said intermediate, tilted sitting position into a fully reclined position, a carrier member, means for establishing a relatively stationary position for said carrier member during said first motion phase, front guiding means pivotally connected between said carrier member and said body-supporting unit and turning about said relatively stationary carrier member during said first motion phase, rear guiding means pivotally connected between said support and said body-supporting unit and turning about the pivotal mount on the support during said first motion phase, means for blocking said rear guiding means against movement at the end of the first motion phase such that the pivotal connection of said rear guiding means to said body-supporting means serves as a pivotal mount for said body-supporting unit during said second motion phase, a leg-rest, means mounting said leg-rest on said seat for movement to an elevated leg-supporting position during said first motion phase, an adjustable length coupling member operatively connected to the leg-rest and to said carrier member and including link sections movable relative to each other, direct actuating means pivotally mounted on said support at a pivotal mount and operatively connected to said coupling member, said actuating means being operable during said first motion phase in response to the rearward movement of said body-supporting unit under control of said front and rear guiding means to move said leg-rest to said elevated leg-supporting position, said link sections moving relative to each other during said first motion to progressively change the effective length of said coupling member during said first motion phase, and means mounting said carrier member on said support for movement relative thereto during said second motion phase during which said body-supporting unit pivots about the pivotal connection of said rear guiding means with said body-supporting unit, said link sections moving relative to each other during said second motion phase to progressively change the effective length of said coupling member during said second motion phase.

11. A multiple position reclining chair comprising a support, a body-supporting unit including a seat and back-rest mounted on said support for movement through a first motion phase from an upright sitting position into an intermediate, tilted sitting position, and for further movement through a second motion phase from said intermediate, tilted sitting position into a fully reclined position, a carrier member, means for establishing a relatively stationary position for said carrier member during said first motion phase, front guiding means pivotally connected between said carrier member and said body-supporting unit and turning about said relatively stationary carrier member during said first motion phase, rear guiding means pivotally connected between said support and said body-supporting unit and turning about the pivotal mount on the support during said first motion phase, means for blocking said rear guiding means against movement at the end of the first motion phase such that the pivotal connection of said rear guiding means to said body-supporting means serves as a pivotal mount for said body-supporting unit during said second motion phase, a leg-rest, means mounting said leg-rest on said seat for movement to an elevated leg-supporting position during said first motion phase, an adjustable length coupling member operatively connected to the leg-rest and to said carrier member and including link sections movable relative to each other, direct actuating means pivotally mounted on said support

at a pivotal mount and operatively connected to said coupling member, said actuating means being operable during said first motion phase in response to the rearward movement of said body-supporting unit under control of said front and rear guiding means to move said leg-rest to said elevated leg-supporting position, said link sections moving away from each other during said first motion to progressively increase the effective length of said coupling member during said first motion phase, and means mounting said carrier member on said support for movement relative thereto during said second motion phase during which said body-supporting unit pivots about the pivotal connection of said rear guiding means with said body-supporting

unit, said link sections moving toward each other during said second motion phase to progressively decrease the effective length of said coupling member during said second motion phase.

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