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RECLINING CHAIR WITH FOLDED BACK-REST AND CONTROL

Filed March 28, 1958

2 Sheets-Sheet 1

FIG. 1.

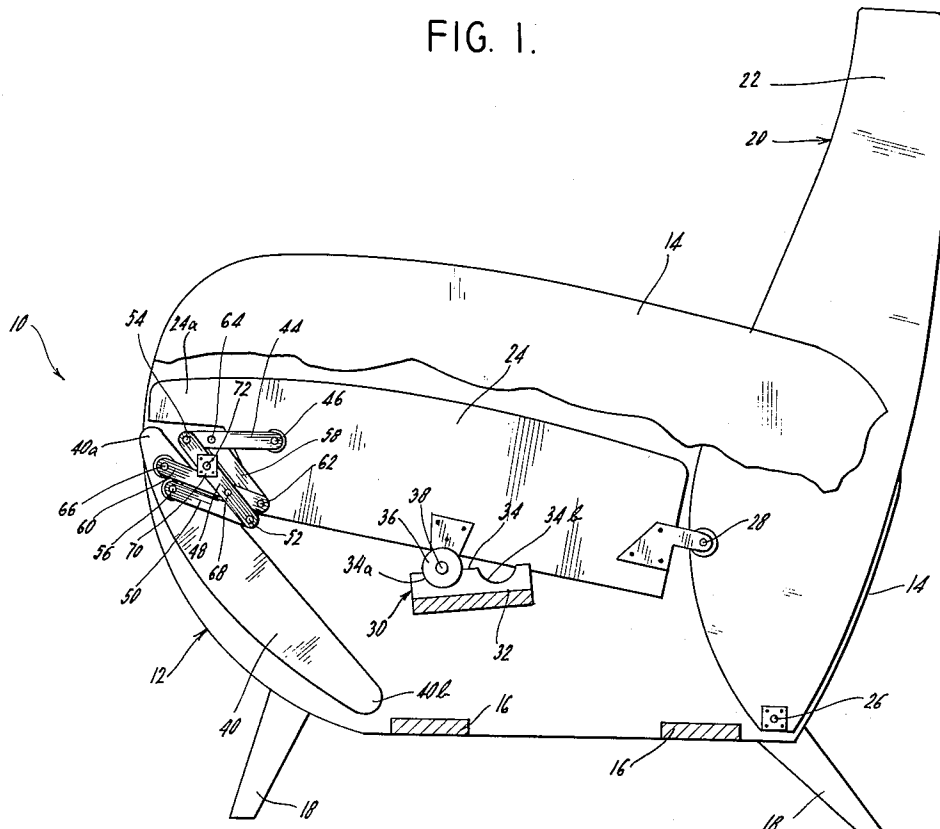
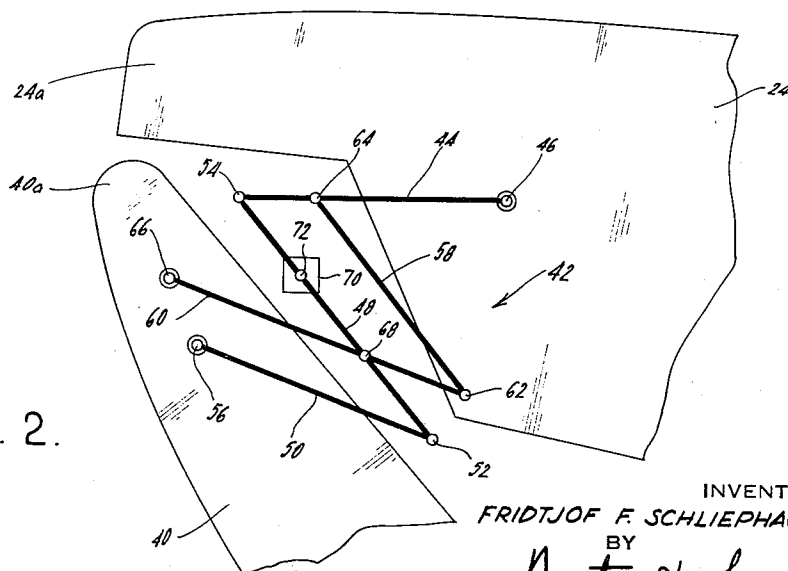


FIG. 2.



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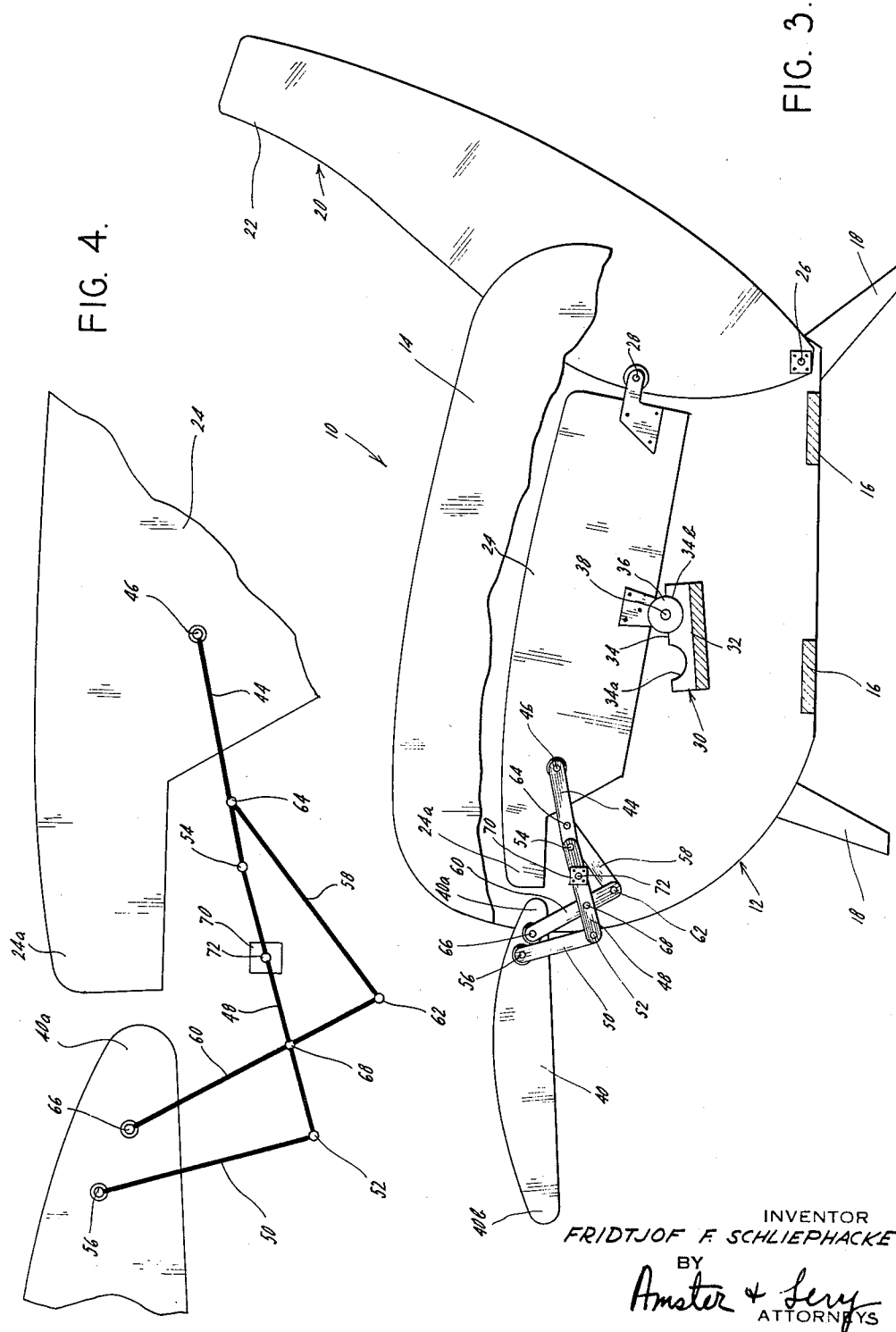
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RECLINING CHAIR WITH FOLDED BACK-REST AND CONTROL

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6 Claims. (Cl. 297—85)

The present invention relates to reclining chairs of the type including a body-supporting unit having a seat, back-rest and leg-rest mounted on a support for coordinated movement, and in particular to an improved leg-rest and control arrangement for such reclining chairs.

The well known reclining chair comprises a support, a body-supporting unit including a seat and a back-rest movably or rockably mounted on the support, and a leg-rest and control arrangement coordinated to the body-supporting unit for elevating the leg-rest as a function of the reclining movement of the chair. Of recent times one of the problems which has faced the industry is to design a reclining chair of a modern and stream-line appearance. This problem may be met in part by the design of a chair in which the chair frame does not extend from the level of the seat down to the floor; but rather, is reduced in overall height and supported by depending feet or legs such that the area beneath the chair is opened up thereby contributing to the modern appearance of the chair design. In order to incorporate an adequate leg-rest in this type of chair, which leg-rest will be stored substantially within the outline of the frame, resort has been made to a number of many and varied arrangements, for example, a two-part leg-rest having a leg-rest proper and a leg-rest extension which are arranged relative to each other to be stored within the outline of the chair frame. In this type of chair the leg-rest and the leg-rest extension are coordinated to the movement of the body-supporting unit such that the leg-rest extension is brought into alignment with the leg-rest proper, and both the leg-rest and its extension are elevated in response to reclining movement of the chair. Although this approach to the problem presents an entirely feasible solution, there are situations where cost and/or design requirements preclude the employment of a two-part leg-rest and necessitates a realization of both the design and functional requirements for a satisfactory reclining chair using a one-piece leg-rest of sufficient length to adequately support the legs of the chair occupant when elevated.

Broadly, it is an object of the present invention to provide a reclining chair having an improved leg-rest and control arrangement. Specifically, it is within the contemplation of the present invention to provide a reclining chair in which the leg-rest is folded back beneath the chair seat in a stored position accommodated within the outline of the chair frame, with improved linkage mechanisms for moving the leg-rest out of the stored position and into the various elevated leg-supporting positions.

In accordance with an illustrative embodiment demonstrating features of the present invention, my reclining chair includes a support, a body-supporting unit including a seat and back-rest mounted on the support for movement relative to the support, a leg-rest disposed in a stored position beneath the forward end of said seat and adapted to be moved to various elevated leg-supporting positions projecting forwardly of said seat, and a leg-rest control linkage operatively connected between said body-supporting unit and said leg-rest for effecting pivotal movement of said leg-rest about a fixed pivot into various elevated leg-supporting positions in response to movement of said body-supporting unit. The leg-rest control linkage includes a supporting link having a pivotal connection to said seat, a first four-bar linkage suspended from said supporting link, a second four-bar linkage controlled by

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said first four-bar linkage and including as movable links thereof extensions of two links of said first four-bar linkage and said leg-rest as a further movable link thereof, and means pivotally connecting one link of said first four-bar linkage to said support to provide said fixed pivot.

The above brief description, as well as further objects, features and advantages of the present invention will be more fully understood by reference to the following detailed description of a number of illustrative embodiments of the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is an elevational view, with parts broken away, of a reclining chair embodying features of the present invention, the chair being shown in the upright sitting position;

FIG. 2 is an enlarged fragmentary elevational view similar to FIG. 1 showing the leg-rest control linkage diagrammatically;

FIG. 3 is an elevational view similar to FIG. 1 but showing the chair in a reclining position; and,

FIG. 4 is an enlarged fragmentary elevational view similar to FIG. 3 showing the leg-rest control linkage diagrammatically.

Referring now specifically to the drawings, there is shown an improved reclining chair in accordance with the present invention, generally designated by the reference numeral 10, which includes a chair frame or support 12 having spaced-apart side members 14 connected by suitable cross-braces 16. The chair frame 12 is supported above the level of the floor by four depending legs 18.

Movably or rockably mounted on the chair frame or support 12 is a body-supporting unit 20, including a back-rest 22 and a seat 24. The back-rest 22 is mounted adjacent its lower end for reclining movement on a back-rest pivot 26 such that the back-rest 22 may be moved from the upright position of FIG. 1 into the reclined position of FIG. 3. The seat 24 is mounted adjacent its rearward end for inclining movement on a seat pivot 28 on the back-rest 22. The seat pivot 28 is spaced above the back-rest pivot 26 such that the seat moves rearwardly in response to the reclining movement. In this embodiment the seat pivot 28 is disposed forwardly of a dead center position vertically above the back-rest pivot 26 such that the rear portion of the seat is somewhat elevated in response to the reclining movement, as may be appreciated by progressively inspecting FIGS. 1 and 3.

Operatively connected to or engaging the seat 24 is a seat control means, generally designated by the reference numeral 30, which is effective to impart a prescribed inclination to the seat as a function of the reclining movement. In this illustrative embodiment the seat control means 30 includes a cam plate 32 fixed to the frame 12 and formed with an upwardly and rearwardly inclined cam track 34 having spaced dwell sections 34a, 34b. Riding on the cam track 34 is a roller 36 which is journaled on an axle 38 carried on the underside of the seat 24. In the upright sitting position of the chair illustrated in FIG. 1, the roller 36 is in the forward dwell section 34a; and in response to movement into the reclining position illustrated in FIG. 3 the roller moves up the cam track 34 into the rearward dwell section 34b. It will thus be appreciated that the seat 24 experiences a compound inclining movement as established by the seat control 30 in association with the arrangement of the seat pivot 28 relative to the back-rest pivot 26. By properly proportioning the seat-supporting and control arrangement, the inclination of the seat 24 may be coordinated to the reclining movement of the leg-rest. In some instances very little inclination of the seat is desired while in other instances a greater inclination of the seat is desired. Either of these conditions may be met by appropriate proportioning of the seat control arrangement.

In accordance with the present invention a leg-rest 40 is disposed in a stored position folded back beneath the seat 24 and extending in an inclined plane downwardly and rearwardly from its upper end 40a to its lower end 40b. The inclination of the leg-rest 40 is determined by design considerations and is selected such that the required leg-rest size may be accommodated entirely within the chair frame 12 when the chair is in the upright sitting position of FIG. 1. The upper end 40a of the leg-rest 40 is disposed beneath the forward lip or edge 24a of the seat 24 and the lower end 40b of the leg-rest is disposed within the outline of the chair frame 12 and at a level above its undersurfaces.

Operatively connected to the upper end of the leg-rest 40 is a leg-rest control arrangement, generally designated by the numeral 42, which mounts the leg-rest 40 on the support for pivotal movement about a fixed pivot from the stored position illustrated in FIG. 1, through a downward arc and then through an upward arc to various elevated leg-supporting positions projecting forwardly of the seat 24.

The leg-rest control linkage 42, seen best in the diagrammatic showings of FIGS. 2 and 4 includes a compensating or supporting link 44 which is normally disposed in a substantially horizontal position adjacent the forward lip 24a of the chair 24 and has its rearward end mounted on the seat 24 at a seat pivot 46. The compensating or supporting link moves rearwardly at substantially the same level in response to the reclining movement of the body-supporting unit 20 and is effective to impart the prescribed thrust to the leg-rest 40. Suspended from the compensating or supporting link 44 is a first link pair 48, 50, which are pivotally connected together at the intermediate pivot 52. The upper end of the first link 48 of the first link pair is pivotally connected to the forward end of the supporting or compensating link 44 at a suspending pivot 54 and the forward end of the second link 50 of the first link pair is pivotally connected to the leg-rest 40 at the leg-rest pivot 56. A further or second link pair 58, 60 is suspended from the compensating or supporting link 44, with the lower end of the first link 58 pivotally connected to the rearward end of the second link 60 at the intermediate pivot 62. The upper end of the first link 58 is pivotally connected to the supporting or compensating link 44 at a further suspending pivot 64 which is spaced rearwardly of the suspending pivot 54, while the forward end of the second link 60 is pivotally connected to the leg-rest at the leg-rest pivot 66 which is spaced above the pivot 56. The second link 60 of the second link pair 58, 60 crosses over the first link 48 of the first link pair 48, 50 and at this cross over point the links are connected together at the cross over pivot 68.

The described leg-rest control linkage 42 will be recognized as providing a first four-bar linkage suspended from the compensating or supporting link 44, which first four-bar linkage includes as movable links thereof the portion of the link 44 intermediate the pivots 54, 64, the link 58, the portion of the link 60 intermediate the pivot 62, 63 and the portion of the link 48 intermediate the pivots 68, 54. Further a second four-bar linkage is provided which is controlled by the first four-bar linkage and includes as movable links thereof the extension of the link 48 intermediate the pivots 68, 52, the extension of the link 60 intermediate the pivots 68, 66, the portion of the leg-rest intermediate the pivots 66, 56, and the link 50.

The leg-rest control linkage 42 is completed by pivotally connecting one link of the first four-bar linkage to the support 12 to provide a fixed pivot about which the leg-rest control linkage 42 rotates in achieving the elevation of the leg-rest 40 to the leg-supporting position forwardly of the seat 24, as illustrated in FIG. 3 and 4. In this embodiment, the pivot is provided on the first link 48 of the first link pair 48, 50 intermediate the pivots 54, 68 by the provision of a bracket 70 fixed to the support 12 and a pivot 72 on the bracket connected to the first link 48.

It will be appreciated that the fixed pivot to the support 12 need not be provided on the link 48 and can be provided on the link 58 such as to translate the rearwardly directed thrust imparted to the supporting or compensating link 44 into a forwardly directed thrust on the links 50, 60 of the second four-bar linkage whereby the leg-rest 40 is moved to the elevated leg-supporting position.

In the stored position of the leg-rest shown in FIGS. 1 and 2, the control linkage or arrangement 42 is in a folded configuration with the first links 48, 58 of the respective link pairs contiguous to each other and substantially coextensive and with the second links 50, 60 likewise contiguous and coextensive. The stored linkage 42 is nested into a rather compact unit at the upper end 40a of the leg-rest 40 and at the adjacent forward end or lip 24a of the seat 24. It should be appreciated that a similar linkage is provided at the opposite sides of the chair 10. In the elevated leg-supporting position of the leg-rest 40, the spacing of the leg-rest pivots 56, 66 increase relative to the fixed pivot 72, with the forward end or lip 24a of the seat moving rearwardly relative to the fixed pivot 72 such that an effectively longer leg-rest support is achieved in response to the reclining movement of the chair 10.

A typical sequence of operation will now be described in detail to facilitate a more thorough understanding of the present invention:

When the chair occupant is seated and leans back against the back-rest 22, the back-rest pivots about its pivot 26 in a rearwardly directed arc and compound movement is imparted to the seat 24 which is inclined in accordance with the design of the seat control 30. As the seat 24 moves rearwardly, a rearwardly directed pulling force is applied to the supporting or compensating link 44 which in turn imparts a turning movement to the link 48 about the fixed pivot 72, which through the leg-rest control 42 moves the leg-rest 40 out of its stored position through a somewhat downward arc depending upon the spacing between the pivots 72, 68 and 52 and then through an upward and forward arc into the elevated leg-supported position, with the roller 36 of the seat control 30 moving from the forward section 34a of the cam track 34 to the rearward section 34b. Although the portion of the link 48 intermediate the pivots 54, 72 travels through a descending arc during the movement of the leg-rest 40 into the leg-supporting position, the supporting and compensating link 44 does not couple this downward movement to the seat 24 and thereby serves both as a driving and compensating connection between the seat and the leg-rest control 42 such that the movement of the leg-rest control links 48, 58 through descending arcs do not contribute to or modify the inclining movement of the seat. It should be appreciated that the requirement that the links 48, 58 move past the vertical or dead center position and through descending arcs is imposed upon the leg-rest control linkage 42 in that it is necessary to displace the leg-rest 40 through an appreciable arc in excess of 90° to move the same from its stored position within the outline of the chair into its elevated leg-supporting position. The reclining chair is returned to its upright sitting position illustrated in FIG. 1, as the chair occupant imposes a downward force of the leg-rest.

A latitude of modification, substitution and change is intended in the foregoing disclosure, and in some instances some features of the invention will be used without a corresponding use of other features. Accordingly, it is appropriate that the claims be construed broadly and in a manner consistent with the manner and scope of the contribution herein.

What I claim is:

1. In a reclining chair including a support, a body-supporting unit including a seat and back-rest mounted on said support for inclining and reclining movement, a leg-rest disposed in a stored position folded back beneath said seat, and a leg-rest supporting and controlling linkage operatively connected to and mounting said leg-rest for

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pivotal movement from said stored position through a downward arc to an intermediate position and then through an upward arc to various elevated leg-supporting positions, said leg-rest supporting and controlling linkage being operatively connected between said body-supporting unit and said leg-rest for effecting said pivotal movement and including a compensating link, means pivotally connecting said compensating link to said body-supporting unit, a first link pair having two links pivotally connected with each other, a second link pair having two links pivotally connected with each other, respective means pivotally connecting one link of said first and second link pairs to said compensating link at spaced points thereof, respective means pivotally connecting the other link of said first and second link pairs to said leg-rest at spaced points thereof, means pivotally connecting said first and second link pairs to each other for coordinating said link pairs, and means pivotally connecting one link of said link pairs to said support.

2. In a reclining chair including a support, a body-supporting unit including a seat and back-rest mounted on said support for inclining and reclining movement respectively, a leg-rest disposed in a stored position folded back beneath said seat, and a leg-rest supporting and controlling linkage operatively connected to and mounting said leg-rest for pivotal movement from said stored position through a downward arc to an intermediate position and then through an upward arc to various elevated leg-supporting positions, said leg-rest supporting and controlling linkage being operatively connected between said body-supporting unit and said leg-rest for effecting said pivotal movement and including a compensating link, means pivotally connecting said compensating link to said body-supporting unit, a first link pair having two links pivotally connected with each other, a second link pair having two links pivotally connected with each other, respective means pivotally connecting one link of said first and second link pairs to said compensating link at spaced points thereof, respective means pivotally connecting the other link of said first and second link pairs to said leg-rest at spaced points thereof, means pivotally connecting said first and second link pairs to each other for coordinating said link pairs, and means pivotally connecting one link of said link pairs to said support.

3. In a reclining chair including a support, a body-supporting unit including a seat and back-rest mounted on said support for inclining and reclining movement respectively, a leg-rest disposed in a stored position beneath said seat, seat control means operatively connected to said seat for inclining said seat in response to reclining movement of said back-rest, and a leg-rest supporting and controlling linkage operatively connected to and mounting said leg-rest for pivotal movement from said stored position to various elevated leg-supporting positions, said leg-rest supporting and controlling linkage being operatively connected between said body-supporting unit and said leg-rest for effecting said pivotal movement and including a compensating link, means pivotally connecting said compensating link to said body-supporting unit, a first link pair having two links pivotally connected with each other, a second link pair having two links pivotally connected with each other, respective means pivotally connecting one link of said first and second link pairs to said compensating link at spaced points thereof, respective means pivotally connecting the other link of said first and second link pairs to said leg-rest at spaced points thereof, means pivotally connecting said first and second link pairs to each other for coordinating said link pairs, and means pivotally connecting one link of said link pairs to said support.

4. A leg-rest control arrangement for a reclining chair including a support, body-supporting means including a seat and back-rest mounted on said support for movement relative to said support, and a leg-rest disposed in a stored position beneath said seat, said arrangement com-

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prising a leg-rest supporting and controlling linkage operatively connected to and mounting said leg-rest for pivotal movement from said stored position to various elevated leg-supporting positions, said leg-rest supporting and controlling linkage being operatively connected between said body-supporting means and said leg-rest for effecting said pivotal movement and including a compensating link, means pivotally connecting said compensating link to said body-supporting means, a first link pair having two links pivotally connected with each other, a second link pair having two links pivotally connected with each other, respective means pivotally connecting one link of said first and second link pairs to said compensating link at spaced points thereof, respective means pivotally connecting the other link of said first and second link pairs to said leg-rest at spaced points thereof, means pivotally connecting said first and second link pairs to each other for coordinating said link pairs, and means pivotally connecting one link of said link pairs to said support.

5. In a reclining chair including a support, body-supporting means including a seat and back-rest mounted on said support for movement relative thereto, a leg-rest disposed in a stored position beneath said seat and adapted to be moved to various elevated leg-supporting positions projecting forwardly of said seat, and a leg-rest mounting and controlling means operatively connected between said body-supporting means and said leg-rest for effective pivotal movement of said leg-rest about a fixed pivot into various elevated leg-supporting positions in response to reclining movement of said body-supporting means, said leg-rest mounting and controlling means including a supporting link having a pivotal connection to said seat, and a mounting linkage pivotally connected to said leg-rest and including at least one link pair having two links pivotally connected to each other, means pivotally connecting one link of said said link pair to said leg-rest, means pivotally connecting the other link of said link pair to said supporting link, and means pivotally mounting said other link of said link pair intermediate its ends on said support to provide said fixed pivot.

6. In a reclining chair including a support, a body-supporting means including a seat and back-rest mounted on said support for inclining and reclining movement respectively, a leg-rest disposed in a stored position beneath said seat, seat control means operatively connected to said seat for inclining said seat in response to reclining movement of said back-rest, and a leg-rest supporting and controlling linkage operatively connected to and mounting said leg-rest for pivotal movement from said stored position to various elevated leg-supporting positions, said leg-rest supporting and controlling linkage being operatively connected between said body-supporting means and said leg-rest for effecting said pivotal movement and including a compensating link pivotally connected to said body-supporting means, a first link pair having two links pivotally connected with each other, a second link pair having two links pivotally connected with each other, respective means pivotally connecting one link of said first and second link pairs to said compensating link at spaced points thereof, respective means pivotally connecting the other link of said first and second link pairs to said leg-rest at spaced points thereof, means connecting said first and second link pairs to each other for coordinating said link pairs, and means pivotally connecting one link of said link pairs to said support.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,999,719

September 12, 1961

Fridtjof F. Schliephacke

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.

In the heading to the drawings, Sheets 1 and 2, line 2, and in the heading to the printed specification, lines 2 and 3, title of invention, for "RECLINING CHAIR WITH FOLDED BACK-REST AND CONTROL", each occurrence, read -- RECLINING CHAIR WITH FOLDED LEG-REST AND CONTROL --.

Signed and sealed this 13th day of March 1962.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents