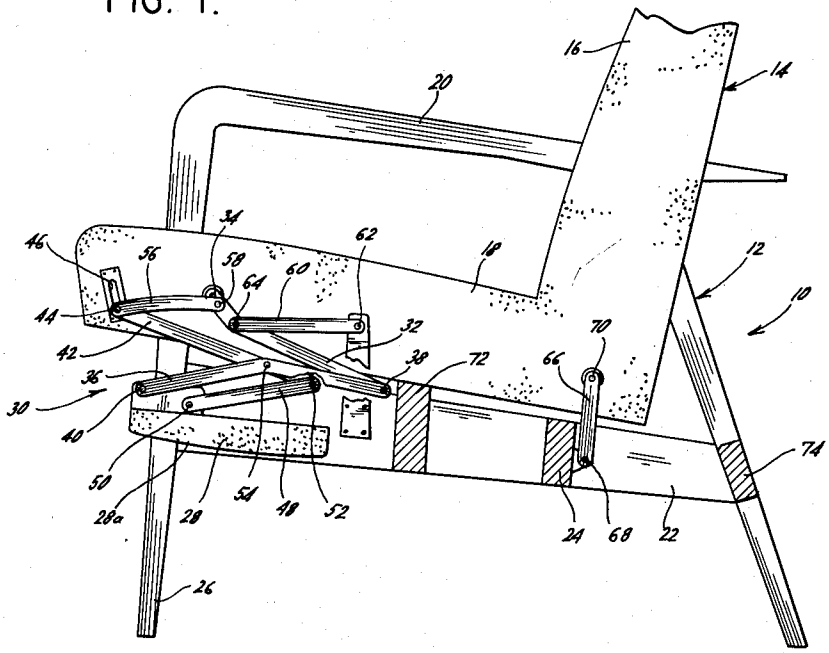
Nov. 27, 1962 F. F. SCHLIEPHACKE 3,065,990

RECLINING CHAIR AND LEG-REST CONTROL ARRANGEMENT

Filed July 9, 1959

FIG. 1.



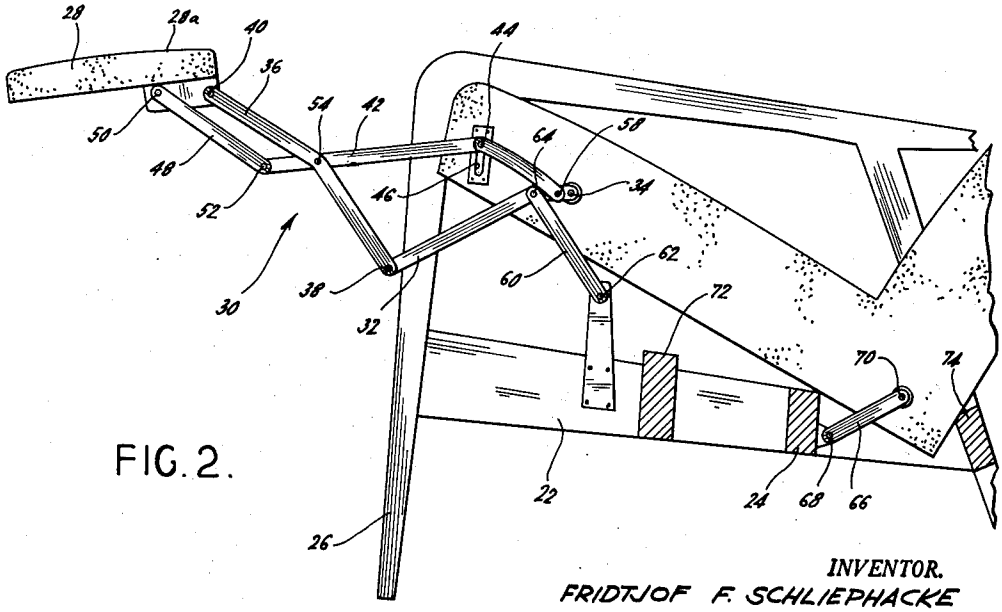


FIG. 2.

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RECLINING CHAIR AND LEG-REST CONTROL ARRANGEMENT

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The present invention relates generally to reclining chairs, and in particular to a novel and improved leg-rest mounting and control arrangement for a reclining chair.

The conventional reclining chair usually incorporates a support, body-supporting means having a back-rest and seat movably mounted on the support for rearward movement into various reclined positions and a leg-rest mounted for movement into various elevated leg-supporting positions as a function of the rearward movement of the body-supporting means. Recent styling developments in reclining chairs making it preferable that such chairs have relatively high legs and an open unobstructed region beneath the seat thereof have imposed certain problems, particularly with respect to the extension of the leg-rest in response to the rearward movement of the body-supporting means of the chair. In such chairs of modern styling, it is necessary to conceal the leg-rest in a retracted position such that the chair will have a well styled, modern appearance when in the upright or sitting position. To this end, the leg-rest must be mounted in its retracted position such that it is relatively close to the undersurface of the seat and in substantial parallelism to the seat. Not only is it necessary that the leg-rest be hidden from view, but the leg-rest mounting linkage must be folded or collapsed such that it is in very compact form, with the links thereof relatively close to each other and hidden from view by the framing of the chair such that the leg-rest and the leg-rest mounting linkage is not visible when the chair is viewed from the side in the upright or sitting position thereof.

Apart from the necessity of concealing the leg-rest and its mounting linkage in the upright or sitting position of the chair, a further problem is presented in achieving the movement of the leg-rest from its underslung, retracted position to the extended leg-supporting position in response to the rearward movement of the body-supporting means of the chair. In order to bring the leg-rest to such extended leg-supporting position from the retracted position, the leg-rest must first be swung downwardly and forwardly through an intermediate vertical position beneath the forward end of the seat, and then swung upwardly and outwardly to the final leg-supporting positions spaced forwardly of the front end of the seat. Such movement must be achieved within the required environment for proper chair design wherein the height of the seat above the floor surface must be within accepted standards. Difficulties are experienced in achieving the movement of the leg-rest from the retracted position through the intermediate vertical position within the limited vertical clearance space between the seat and floor surface, it of course being essential that the leg-rest not strike or scrape the floor surface. A practical structural requirement of the chair is that the lowest portion of the leg-rest during its travel to the extended leg-supporting position must have a clearance of at least one inch above the lower ends of the legs during such movement in order to insure that the leg-rest will not strike the floor surface or a rug beneath the chair.

Broadly, it is an object of the present invention to provide an improved leg-rest mounting and control arrangement for reclining chair which obviates one or more of the aforesaid difficulties. Specifically it is within the contemplation of the present invention to provide a leg-rest mounting and control linkage which is particularly suitable for an underslung leg-rest and which is effective to move the leg-rest to an extended leg-supporting position forwardly of the seat of the reclining chair and at the same time is so constructed and arranged as to provide sufficient clearance between the leg-rest and the floor during such movement.

It is a further and specific object of the present invention to provide a leg-rest mounting and control arrangement which enables the preferred styling of reclining chairs having modern appearance and including as a characteristic thereof open side frames having relatively high supporting legs, which, for all intents and purposes, have the appearance of a modern Danish type chair not incorporating the reclining feature.

In accordance with an illustrative embodiment demonstrating features and advantages of the present invention there is provided a reclining chair which comprises a support and body-supporting means including a back-rest and seat movably mounted on the support for rearward movement relative thereto. Disposed beneath the seat of the body-supporting unit is a leg-rest which is mounted for movement from a retracted position beneath the seat to an extended leg-supporting position forwardly of the seat in response to the rearward movement of the body-supporting means by a control arrangement which comprises a mounting linkage including a first link having a first pivotal mount on the seat, a second link, means including a lost motion connection between the seat and second link providing a second pivotal mount for the second link on the seat, and coordinating means operatively connected to the first and second links. The lost motion connection is effective during the initial phase of the rearward movement of the body-supporting means to retard the movement of the leg-rest to the extended leg-supporting position such that the forward end of the seat rises in a sufficient amount to provide the necessary clearance for the leg-rest to pass therebeneath. By the improved mounting linkage, the leg-rest may be moved from the stored or retracted position to the required leg-supporting position, passing through its requisite path of movement without striking or scraping the floor surface, with the leg-rest being initially stored in the hidden position well above the floor surface such that the chair may be styled to incorporate open side frames and high legs which are characteristic of modern Danish type furniture.

The above brief description as well as further objects features and advantages of the present invention will be more fully appreciated by reference to the following detailed description of an illustrative embodiment according to the present invention, when taken in conjunction with the accompanying drawings, wherein;

FIG. 1 is a side elevational view, with parts broken away and shown in section, of an improved reclining chair embodying the leg-rest mounting and control arrangement according to the present invention, the chair being shown in its upright or sitting position; and

FIG. 2 is a side elevational view similar to FIG. 1, but showing the chair in a tilted resting position, with the leg-rest moved to the extended leg-supporting position.

Referring now specifically to the drawings, there is shown a reclining chair demonstrating features of the present invention, generally designated by the reference numeral **10**, which comprises a support or frame **12** having mounted thereon a rigid or unitary body-supporting unit **14** including a back-rest **16**, and a seat **18**. The support or frame **12** includes open opposite side frames **20** each of which includes a side rail **22** interconnected by one or more cross braces **24** and supported on depending legs **26**. The legs **26** are tapered in accordance

with modern styling and are relatively high and narrow to provide a large unencumbered space beneath the seat **18** and the frame side rails **22**.

In accordance with the requirements for modern styling, a leg-rest **28** is disposed in a retracted or underslung position beneath the seat **18**. As seen in FIG. 1, the leg-rest is inverted with the leg-supporting surface **28** facing the floor surface. In the retracted or underslung position the leg-rest **28** is disposed a relatively short distance beneath the lower surface of the seat **18** and in substantial parallelism thereto, with the leg-supporting surface **28***a* above the level of the side rails **22** such that the leg-rest **28** and its operating linkage is substantially hidden from view. The vertical extent of the side rails and panels **22** are sufficient to hide the entire leg-rest and mounting linkage, or in the alternative the open side frames may be filled in or upholstered in accordance with techniques which are generally understood.

The leg-rest **28** is mounted for movement from the retracted, stored underslung position shown in FIG. 1 to an extended leg-supporting position shown in FIG. 2 by a leg-rest mounting linkage, generally designated by the reference numeral **30**. In the stored or retracted position for the leg-rest, the mounting linkage **30** is collapsed to a very compact condition in which the links thereof are closely folded adjacent the seat. In order to bring the leg-rest to the extended leg-supporting position illustrated in FIG. 2, the leg-rest **28** must move downwardly and forwardly along a prescribed path of movement through an intermediate position in which the leg-rest **28** extends vertically relative to the floor, with the lower end of the leg-rest closely approaching the floor surface but having a sufficient clearance relative thereto to preclude striking or scraping such floor surface. The leg-rest mounting linkage **30** includes a first or rear mounting link **32** having a relatively fixed first or rear pivotal mount **34** on the seat **18**. The mounting link **32** is coupled to the upper end of the leg-rest **28** by a first connecting link **36** which extends substantially horizontally in the stored or retracted position of the leg-rest **28** and has a pivotal connection **38** at its rearward end to the lower end of the first mounting link **32** and a pivotal connection **40** at its forward end to the leg-rest **28**. The leg-rest mounting linkage **30** further includes a second or front mounting link **42** having a relatively movable second or front pivotal mount **44** at is front end on the seat. The second pivotal mount **44** is confined within a slot **46** formed in the seat, as by an appropriate bracket or plate, the slot **46** extending upwardly and forwardly in relation to the relatively fixed pivotal mount **34**. The pin and slot interconnection **44**, **46** will be recognized as providing a lost motion interconnection between the seat **18** and the front mounting link **42** wherein the pivotal mount **44** is capable of translating from the lower seating end of the slot **46**, through a prescribed lost motion travel upwardly and forwardly to a further limit position at the upper end of the slot **46** as shown in FIG. 2. The second or front mounting link **42** is coupled to the leg-rest **28** by a connecting link **48** which has a pivotal connection **50** at its forward end to the leg-rest **28** at a point spaced rearwardly of the pivotal connection **40** and a pivotal connection **52** at its rearward end to the rearward end of the front mounting link **42**. The first and second link pairs **32**, **36**, and **42**, **48** are coordinated by the provision of a pivotal connection **54** between the links **36**, **42** at the cross over point between such links. The leg-rest mounting linkage **30** is completed by a coordinating link **56** which extends between the first and second mounting links **32**, **42**, with the coordinating link **56** having a pivotal connection **58** at its rearward end to the first mounting link **32** at a point spaced below the pivotal mount **34** and a pivotal connection at its forward end coaxially with the movable pivotal mount **44**.

Actuating means are operatively connected to the leg-rest mounting linkage **30** and operable in response to the rearward movement of the body supporting unit **14** for moving the leg-rest **28** from the retracted or stored position illustrated in FIG. 1 through an intermediate vertical position to the extended leg-supporting position shown in FIG. 2 wherein the leg-rest supporting surface **28***a* is spaced forwardly of the front end of the seat **18** and is substantially at the same level to comfortably accommodate the legs of the chair occupant when the chair moves to the tilted position illustrated herein appropriate for television viewing, reading and the like. In this illustrative embodiment the actuating link **60** has a pivotal mount **62** on the support and a pivotal connection **64** to the first or rear mounting link **32** at a point spaced below the pivotal mount **34**. In response to the rearward displacement of the body-supporting unit **14**, the direct actuating link **60** serves to exert a pushing force on the rear mounting link **32** which tends to turn the same about the pivotal connection **64**, with the portion of the link **32** intermediate the pivot **64**, **38** swinging through a downward and forward arc which swinging movement is effective to operate the leg-rest mounting linkage **30** and to move the leg-rest **28** to the extended leg-supporting position.

The rigid or unitary body-supporting unit **14** is mounted for rearward movement relative to the support by the direct actuating link **60** and the portion of the link **32** intermediate the pivotal connections **34**, **64** serving as a front guiding means or linkage and a rear guiding link **66** having a pivotal mount **68** on the cross brace **24** of the support or frame **12** and a pivotal connection **70** at its upper end to the body-supporting unit **14**. It will be appreciated that the rear guiding link **66** completes a main mounting or control linkage for the body-supporting unit **14** which includes as a stationary link thereof the portion of the support intermediate the pivotal mount **62**, **68** and as movable links thereof, the direct actuating link **60** the portion of the link **32** intermediate the pivotal connections **64**, **34**, the portion of the seat intermediate the pivotal mount **34** and the pivotal connection **70** and the rear guiding link **66**. By appropriate design of this main control or mounting linkage, the body-supporting unit **14** may be displaced relative to the support to the tilted resting position illustrated in FIG. 2.

Appropriate stops are arranged to establish the upright or sitting position for the chair **10** illustrated in FIG. 1 and the tilted relaxation position illustrated in FIG. 2. In this embodiment a first stop **72** is provided on the side panel **22** of the open side frame **20** in a position beneath the direct actuating link **60** to preclude movement thereof through a downward arc out of the initial position established for the link in the sitting position of the chair as shown in FIG. 1; and the rear cross brace **74** of the chair frame **12** serves as a second stop to abut against the rear guiding link **66** in the tilted back relaxation position of the chair shown in FIG. 2.

In order to facilitate a more thorough understanding of the present invention, reference will now be made to a typical sequence of operations:

When the chair occupant is seated in the chair in the sitting position illustrated in FIG. 1 and presses backwards against the back-rest **16**, the body-supporting unit **14** moves towards the tilted position illustrated in FIG. 2 which causes a rearward displacement of the pivotal mount **34** of the leg-rest mounting linkage **30** relative to the stationary pivotal mount **62** for the direct actuating link **60**. In response to such movement, the link **34** tends to move through a forward and downward arc on the pivotal mount **34** relative to the pivotal connection **64**, while the pivotal connection **38** moves through a similar arc causing an extending force to be imparted to the leg-rest mounting linkage **30**. Incident to the initial phase of the rearward movement of the body-supporting unit **14** and the extending or actuating force to the leg-rest mounting linkage **30**, the relatively movable pivotal mount **44** translates upwardly along the slot **46** through the lost

motion travel established by the length and direction of the slot which tends to delay the effectiveness of the second pair of links **42**, **48** of the leg-rest mounting linkage, delaying the extension of the leg-rest **28** until such time as the front end of the seat **18** of the body-supporting unit **14** has risen a sufficient distance to provide the requisite clearance for the leg-rest. The extension of the leg-rest is delayed until such time as the pivotal mount **44** has completed its lost motion travel whereupon the continued rearward movement of the body-supporting unit **14** is effective to move the leg-rest **28** through its intermediate substantially vertical position and then towards its final leg-supporting position illustrated in FIG. 2. Once the lost motion travel is completed the second pair of links **42**, **48** serve their normal function in causing the leg-rest to turn about the relatively fixed or terminated pivotal mount **44** seated at the upper end of the slot **46**.

Whenever the link **32** is pushed forwardly by the actuating link **60** around the pivotal mount **34** on the seat **18**, the pivotal connection **58** of the coordinating link **56** will move forwardly in an arc around the pivotal mount **34** and will push the forward pivotal mount **44** of the coordinating link **56** forwardly in the slot **46**, such that the distance between the relatively fixed pivotal mount **34** and the relatively movable pivotal mount **44** will be increased, as shown clearly in FIG. 2. This increased distance between the pivotal mounts **34** and **44** is determined by the distance between the pivotal mount **34** and the pivotal connection **58** and the length of the coordinating link **56**. In the stored or retracted position of FIG. 1, the link portion between the pivots **34** and **58** and the link **56** are in an acute angular relation to each other and during the forward movement of the link **32** this small angle will be increased and push the pin **44** forwardly and upwardly in the direction of the slot **46**. This provides the pin **46** with a higher and more forward mounting location on the seat **18** when the pin movement is terminated by contact with the upper end of the slot **46** wherein the pin **44** serves as a temporary fixed pivot for the leg-rest linkage as the leg-rest **28** is elevated to the leg-supporting position in front of and to the level of the seat **18**. The turning movement of the link **32** provides the pushing force for the coordinating link **56** which will move forwardly, pushing the pin **44** outwardly and upwardly away from the pivotal mount **34** until the pin **44** reaches the limit position at the upper and forward end of the slot **46**.

When the chair occupant desires to restore the chair from the rearwardly tilted relaxation position illustrated in FIG. 2, the occupant need only exert a slight downward pressure upon the extended leg-rest **28**, whereupon a reverse action of the leg-rest linkage **30** occurs with the leg-rest being restored to the underslung retracted or stored position illustrated in FIG. 2. During such reverse movement the leg-rest **28** will move towards the intermediate substantial vertical position, whereupon the pin **44** of the lost motion means will translate from its seated position at the upper limit of the slot **46** toward the seated position at the lower end of the slot **46** when the chair is restored to the upright or sitting position. The upward and forward inclination of the slot **46** of the lost motion means permits the forward displacement of the movable pivotal mount **44** in relation to the relatively fixed pivotal mount **34** on the seat, thus enabling a greater extension of the leg-rest relative to the seat. This of course is advantageous in that it is almost always a problem to obtain sufficient extension of the leg-rest, which problem is somewhat accentuated by the modern styling of the chair.

Although the illustrative embodiment according to the present invention shows a reclining chair of the rester-type having a unitary or rigid seat and back-rest, it will be appreciated that the improved leg-rest mounting and control arrangement herein finds application in reclining chairs of the type having a movable seat and movable back-rest. Still further, the means for actuating the leg-rest mounting linkage is subject to modification. For example, the pusher type of direct actuating link disclosed herein may be replaced by a pull type direct actuating link, as disclosed and described in U.S. Patent No. 2,880,785 of April 7, 1959. Still further, in lieu of employing a direct type of actuating means, it is also within the contemplation of the present invention to actuate the leg-rest mounting linkage by other means, for example, by coupling such mounting linkage to a depending extension of the back-rest such that the requisite actuating force is imparted to the leg-rest mounting linkage from the back-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 the claims should be interpreted in a manner consistent with the spirit and scope of the disclosure herein.

What I claim is:

1. In a reclining chair including a support, body-supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a stored position beneath said seat to an extended leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and slot interconnection between said seat and said second link providing a second pivotal mount for said second link on said seat, coordinating means operatively connected to said first and second links, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest to said extended leg-supporting position, and actuating means operatively connected to one of said first and second link and to said support and operable to move said leg-rest to said extended leg-supporting position in response to said rearward movement of said body-supporting means.

2. In a reclining chair including a support, body supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a retracted position beneath said seat to an extended leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and slot interconnection between said seat and said second link providing a second pivotal mount on said seat, a coordinating link pivotally connected to said first and second links, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest to said extended leg-supporting position, and a direct actuating link pivotally connected to said support and to one of said first and second links for actuating said mounting linkage in response to said rearward movement of said body-supporting means.

3. In a reclining chair including a support, body-supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto during which the forward end of said seat rises in relation to said support, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a retracted and inverted position beneath the forward end of said seat through a vertical position

and to an extended and upright leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and slot interconnection between said seat and said second link providing a second pivotal mount on said seat, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest through said vertical position and toward said leg-supporting position until the forward end of said seat has risen a sufficient distance to provide clearance for said leg-rest to pass therebeneath, coordinating means having a first coordinating connection to said first link and a second coordinating connection to said second link, and actuating means operatively connected to said mounting linkage and to said support and effective in response to said rearward movement to move said leg-rest into said leg-supporting position.

4. In a reclining chair including a support, body-supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto during which the forward end of said seat rises in relation to said support, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a retracted and inverted position beneath the forward end of said seat through a vertical position and to an extended and upright leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and slot interconnection between said seat and said second link providing a second pivotal mount on said seat, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest through said vertical position and toward said leg-supporting position until the forward end of said seat has risen a sufficient distance to provide clearance for said leg-rest to pass therebeneath, a co-ordinating link having a first pivotal connection to said first link and a second pivotal connection to said second link, and actuating means operatively connected to said mounting linkage and to said support and effective in response to said rearward movement to move said leg-rest into said leg-supporting position.

5. In a reclining chair including a support, body-supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto, during which the forward end of said seat rises in relation to said support, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a retracted and inverted position beneath the forward end of said seat through a vertical position and to an extended and upright leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and slot interconnection between said seat and said second link providing a second pivotal mount on said seat, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest through said vertical position and toward said leg-supporting position until the forward end of said seat has risen a sufficient distance to provide clearance for said leg-rest to pass therebeneath, coordinating means having a first coordinating connection to said first link and a second coordinating connection to said second link, and a direct actuating link pivotally connected to one of said first and second links of said mounting linkage and pivotally mounted on said support and effective in response to said rearward movement to move said leg-rest into said leg-supporting position.

6. In a reclining chair including a support, body-supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a stored position beneath said seat to an extended leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and slot interconnection between said seat and said second link providing a second pivotal mount for said second link on said seat, coordinating means operatively connected to said first and second links, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest to said extended leg-supporting position, said pin and slot interconnection being arranged in relation to said first pivotal mount such that said second pivotal mount is displaced forwardly and upwardly in relation to said seat and away from said first pivotal mount during said initial phase of said rearward movement, and means operatively connected to said mounting linkage and to said support and responsive to said rearward movement of said body-supporting means to move said leg-rest to said extended leg-supporting position.

7. In a reclining chair including a support, body-supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto during which the forward end of said seat rises in relation to said support, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a stored position beneath said seat to an extended and elevated leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and slot interconnection between said seat and said second link providing a second pivotal mount on said seat, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest into said elevated leg-supporting position until the forward end of said seat has risen a sufficient distance to provide clearance for said leg-rest to pass therebeneath, coordinating means having a first coordinating connection to said first link and a second coordinating connection to said second link, and an actuating and guiding link pivotally mounted on said support and pivotally connected to said first link and effective in response to said rearward movement to move said leg-rest into said leg-supporting position and to guide said seat in relation to said support.

8. In a reclining chair including a support, body-supporting means including a back-rest and seat, means movably mounting said body-supporting means on said support for rearward movement relative thereto, during which the forward end of said seat rises in relation to said support, a leg-rest, and a leg-rest control means operatively connected to said leg-rest and mounting the same for movement from a retracted and inverted position beneath the forward end of said seat through a vertical position and to an extended and upright leg-supporting position forwardly of said seat in response to said rearward movement, said control means comprising a mounting linkage including a first link having a first pivotal mount on said seat, a second link, means including a pin and

slot interconnection between said seat and said second link providing a second pivotal mount on said seat, said pin and slot interconnection serving as a lost motion means during an initial phase of said rearward movement for retarding the effectiveness of said mounting linkage in moving said leg-rest through said vertical position and toward said leg-supporting position until the forward end of said seat has risen a sufficient distance to provide clearance for said leg-rest to pass therebeneath, coordinating means having a first coordinating connection to said first link and a second coordinating connection to said second link, and a direct actuating link pivotally connected to said first link and pivotally mounted on said support

and effective in response to said rearward movement to move said leg-rest into said leg-supporting position and to guide said seat in its movement relative to said support.

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