EXTENSIBLE HEAD-REST AND CONTROL FOR DOUBLE MOVEMENT AND TWO POSITION TYPES OF CHAIRS

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The present invention relates generally to an improved reclining chair, and in particular to an improved head-rest and control arrangement for a reclining chair wherein the head-rest is automatically displaced to an extended position relative to the back-rest in response to movement of the reclining chair in response to a first phase or portion of the reclining movement. This application is a continuation-in-part of my copending United States Patent application Serial No. 777,656 filed December 2, 1958, and now abandoned.

It is generally known to construct a reclining chair comprising a support and body-supporting means having a back-rest movably mounted on the support such that the back-rest may be moved into various reclined positions undesired to be the chair occupant. It has been suggested that such reclining chairs incorporate a head-rest positioned adjacent the upper end of the back-rest, and preferably stored within the outline of the back-rest, such that the head-rest may be extended or elevated relative to the back-rest to provide a more comfortable and adequate support for the head of the user. With such extendable head-rest, the back-rest may be made somewhat shorter for esthetic reasons, but the user may be comfortably accommodated when moving into various reclined positions by the additional support afforded by the extended head-rest.

Broadly it is an object of the present invention to provide an improved actuating and control arrangement for elevating the head-rest of a reclining chair relative to the back-rest as a function of the reclining movement of the back-rest.

In my copending application Serial No. 601,885 filed August 3, 1956, and now abandoned, and entitled Movable Reclining Chair With Back-Rest, Seat and Leg-Rest there is disclosed a number of embodiments of reclining chairs of the double-movement type which comprise a support, a body-supporting means including a back-rest and seat adapted to be mounted on the support for reclining and inclining movement respectively, and means movably mounting the body-supporting means on the support for a first movement phase from an upright sitting position to an intermediate, tilted sitting position during which there is no appreciable relative angular displacement between the back-rest and seat and for a second movement phase from the tilted position to various reclining positions during which the back-rest is angularly displaced relative to the seat. The intermediate, tilted sitting position established at the end of the first motion phase is suitable for television viewing, reading, knitting and the like. The various reclining positions established during the second movement phase comfortably accommodate the chair occupant in a somewhat stretched out attitude, appropriate for total or complete relaxation. Further, in my copending application Serial No. 747,748 filed July 10, 1958, now Patent No. 2,940,509, and entitled Multiple Position Chair, there is disclosed a reclining chair of the two-position type in which the body-supporting means is in the form of a rigid seat and back-rest unit which is adapted to be brought first to an intermediate, tilted sitting position and then to a fully tilted position. In the intermediate or tilted sitting position, the body-supporting unit is disposed in an "active" attitude with the user's body being in a substantially upright position in which the eyes are directed forwardly such that the user may read, knit, view television and the like. In the fully tilted position the body-supporting unit is disposed in an "inactive" position in which the user's body is accommodated in a somewhat more rearwardly tilted position, appropriate for total or complete relaxation.

I have found that it may be to advantage to incorporate a head-rest into such double-movement and two-position types of chairs such that a more comfortable and adequate support is provided for the head of the chair occupant. An important criteria is that the head-rest be extended to the head-supporting position at least at the end of the first motion phase of the reclining chair such that in a chair of the double-movement type the head-rest is fully extended in the intermediate, tilted sitting position and in the chair of the two-position type the head-rest is also extended in the corresponding tilted sitting position. A further important criteria is that the head-rest throughout the second phase of the chair motion, whether in the double movement type of chair wherein the angle between the seat and back-rest increases incident to said second motion phase, or in the two-position type of chair wherein the seat and back-rest are rigid with each other but are tilted more rearwardly incident to said second motion phase.

Accordingly, it is a further object of the present invention to provide an improved head-rest and control arrangement suitable for incorporation into reclining chairs of the double-movement and two position types. Specifically, it is within the contemplation of the present invention to provide a head-rest and control arrangement for reclining chairs of the double-movement or two-position types wherein the head-rest is moved to an extended head-supporting position during a first phase or portion of the chair movement and remains substantially stationary in the extended head-supporting position throughout the second phase of the chair movement such that an adequate head support is provided for the chair occupant in the various useful positions of the chair.

In accordance with an illustrative embodiment demonstrating features and advantages of the present invention there is provided a reclining chair which comprises a support, body-supporting means including a seat and back-rest movably mounted on the support, coordinating means operatively connected to the body-supporting means and mounting said body-supporting means for movement through a first movement phase during which the seat and back-rest move to an intermediate, tilted sitting position and through a second movement phase during which the seat and back-rest move into various reclining positions, a head-rest, means operatively connected to and mounting the head-rest for movement to an extended head-supporting position relative to the back-rest, and actuating means cooperatively connected to the head-rest and support and operable under control of the body-supporting means for moving the head-rest to the extended head-supporting position in response to the first motion phase of the reclining chair.

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 demonstrating features and advantages of the present invention, wherein:

FIG. 1 is an elevational view, with parts broken away and sectioned, of a typical reclining chair of the double movement type incorporating my improved head-rest control, the chair being shown in the upright sitting position.

FIG. 2 is an elevational view similar to FIG. 1, but showing the reclining chair in the intermediate, tilted
sitting position, with the head rest displaced to the extended head-supporting position; the elevating arm similar to FIG. 1, but showing the reclining chair in a fully reclined position, with the head rest remaining in the extended head-supporting position; FIG. 4 is a sectional view, on an enlarged scale, taken substantially along the line 4—4 of FIG. 3 and looking in the direction of the arrows; FIG. 5 is an elevational view, with parts broken away and shown in section, of a reclining chair of the multiple-position type incorporating the head-rest control of the present invention, the chair being shown in its upright sitting position; FIG. 6 is an elevational view similar to FIG. 5 showing the chair thereof in its intermediate, tilting sitting portion, with the head-rest in extended, head-supporting position; and FIG. 7 is an elevational view, similar to FIG. 5, but showing the chair thereof in fully tilted position with the head-rest remaining in extended, head-supporting position.

Referring now specifically to the drawings, and in particular to the embodiment shown in FIGS. 1—4, there is shown a reclining chair 10 of the double-movement type which is of generally known construction and incorporating improved head-rest facilities whereby the reclining chair 10 comprises a support or chair frame including opposite side walls 12, 14 joined together by a number of cross braces 16a, 16b, 16c and 16d. A body-supporting means including a seat 18 and a back-rest 20 is movably supported on the chair frame, with the back-rest 20 being pivotally mounted on the chair frame by a rear guiding link 22 having a pivotable mount 24 on the support and a pivotable connection 26 to lower end of the back-rest 20. The seat 18 normally rests on the cross brace 16c serving as a stop and is mounted for inclining movement as a function of the reclining movement of the back-rest 20 at a seat pivot 28 on the forwardly extending rigid hanger 29 fixed to the back-rest 20. Below the forward end of the seat 18 is a leg-rest 30 which is mounted for movement from a stored position below the forward end of the seat, as shown in FIG. 1, to elevated positions as shown in FIGS. 2 and 3. Interconnected between the back-rest 20, the seat 18 and the leg-rest 30 is a main controlling and coordinating linkage for inclining the seat 18 and for elevating the leg-rest 30 during the first and second phases of the reclining movement of the chair. Specifically, during the first phase of the chair movement, the seat 18 is inclined such that the angular relationship between the seat and back-rest increases (that is, the included angle between the seat and back-rest opens up), with the leg-rest 30 remaining elevated, such that a fully reclined position is established suitable for complete relaxation (see FIG. 3). The main controlling and coordinating linkage is seen to include a carrier link 32 which is disposed in a forwardly inclined starting position resting against the cross brace 16b serving as a stop and having a pivotable mount 34 at its lower end on the chair frame or support. Pivoted mounted on the carrier link 32 is a double arm lever 36 which is adapted to turn about a pivot 38 on the upper and forward end of the carrier link 32. The double-arm lever 36 has an upwardly and forwardly inclined arm 36a which has a pivotable connection 40 at its upper end to the seat 18, which arm serves as a seat control link during the first phase of the chair movement. The rear end of the seat is supported by cross brace 16c. As may be appreciated by inspecting FIGS. 1 and 2, pivotal movement of the arm 36a causes the carrier link 32 remaining stationary and the rear end of the seat resting on cross brace 16c, causes a prescribed inclination to be imparted to the seat 18 as a function of the tilting movement of the back-rest 20 until such time as the arm 36a abuts the stop 32a provided on the adjacent end of the carrier link 32. During the first phase of the chair movement, the main controlling and coordinating linkage is in the form of a five bar linkage acting as a four bar linkage, which includes as the stationary link thereof the portion of the support intermediate the pivot 38, the arm 36a serving as a seat control link, the portion of the seat and back-rest intermediate the pivots 40, 26 (which may be considered as one movable link for the sake of convenience and by virtue of the supporting function of cross brace 16c), and the link 22. The other arm 36b of the double-arm lever 36 serves as a driving or connecting link to the leg-rest suspending linkage which is seen to include a hanger arm 42 having a pivotal connection 44 at its upper end to the seat 18. The leg-rest suspending linkage is swingable through a forward arc under control of a connecting link 46 which has a pivotal connection 48 at its rearward end and connects to the pivotable connection 50 at its forward end to the hanger arm 42 at a point spaced below the pivotal mount 44 on the seat 18. The leg-rest suspending linkage is completed by a further hanger arm or link 52 which has a pivotal connection 54 at its upper end to the connecting link 46 at a point spaced rearwardly of the pivotal connection 50, a connecting link 56 which has a pivotal connection 58 at its rearward end to the hanger link 52, a pivotal connection 60 at its forward end to the leg-rest 30 adjacent the upper end thereof and a pivotal connection 62 intermediate its end at a cross-over point to the hanger arm 42 at a point spaced behind the pivotal connection 50, and a further connecting link 64 which has a pivotal connection 66 at its rearward end to the lower end of the hanger arm 42 and a pivotal connection 68 at its forward end to the leg-rest 30 at a point spaced from the pivotal connection 60. A stop 70 is affixed to the seat 18 in position to abut the hanger arm 42 in the intermediate, tilted sitting position shown in FIG. 2 and a further stop 72 is affixed to the leg-rest 30 for abutting the connecting link 64 in the intermediate, tilted sitting position. The coordination of the chair components by the described linkage is such that the angular position and change and is merely illustrative of a typical double-movement type of reclining chair, is substantially as follows: When the chair occupant leans against the back-rest 20, the back-rest 20 is tilted as a function of the geometry of the linkage which is operative during the first phase of movement, with the seat rearwardly displaced and being inclined relative to the support. The rearward displacement of the seat 18 under control of the back-rest 20 causes the double arm lever 36 to turn about its pivotal mount 38 on the carrier link 32, with the upwardly extending arm 36a serving the seat control function and the downwardly extending arm 36b actuating the leg-rest suspending linkage. The double-arm lever 36 turns until such time as arm 36a abuts the stop 32a on the carrier link 32 which establishes the intermediate or tilted sitting position illustrated in FIG. 2 wherein the seat and back-rest are in the tilted position. When the leg-rest 30 elevated and projecting forwardly of the seat 18. Further, the rear guiding or control link 22 moves into relatively fixed position against cross-brace 16d, serving as a stop. It is noted that the stops 16d, 32a, and the leg-rest stops 70, 72 are all positioned to be effective at the same time to accurately establish the intermediate,
When the chair occupant further leans against the back-rest 20 to initiate the second phase of the chair movement, the back-rest turns about the pivot 26 at the upper end of the rear guiding or control link 22, which pivot then serves as the back-rest pivot and remains stationary through the initial phase of the reclining movement due to the blocking of the link 22. The blocked leg-rest suspending linkage maintains the leg-rest 30 substantially in the same elevated leg-supporting position, while the seat 18 and the arm 36 of the double arm lever 35 which is rigid therewith are guided by the chair back 20 and the pivot 24 on the chair frame. The fully reclined or completely relaxed position for the chair, illustrated in FIG. 3, is established when the carrier link 32 is blocked against further movement by coming into contact with the forward end of the cross-brace 16c which serves as a stop for limiting movement of the carrier link.

In accordance with an illustrative embodiment demonstrating features of the invention, a head-rest 74 is disposed in a stored or retracted position accommodated within the upper rear corner of the back-rest 20, as seen in FIG. 1. The head-rest 74 is mounted with its upper face substantially co-planar or facing face of the back-rest by a mounting linkage, which is seen to embody a primary mounting link 78 having a pivotal connection 84 at its upper end to a connecting link 82 which in turn has a pivotal connection 80 to a bracket 86 fixed to the head-rest 74, and a secondary mounting link 88 having a pivotal connection 90 at its upper end to one end of a connecting link 92 which has a pivotal connection 94 at its other end to the bracket 86 on the head-rest 74. The connecting link 92 crosses over the primary mounting link 78 and has a pivotal connection 96 thereto for positioning the links 82, 88, and 92 which provide a double-four bar extensible mounting linkage for the head-rest 74. The mounting linkage extends substantially lengthwise of the back-rest 20 and is engaged by a guide means which is operatively connected between one of the mounting links and the back-rest 20 such that the head-rest 74 is constrained to move along the prescribed path from the retracted or stored position, illustrated in FIG. 1, to the extended or head-supporting position illustrated in FIGS. 2 and 3. Preferably the guide means includes an elongated guide plate 98 having a guide slot 98a formed therein, which guide plate is affixed to the adjacent side frame of the back-rest, with the pivot 100 being carried by the primary mounting link 78 and being guidedly engaged within the slot 98a. The pin and slot interconnection is such associated that the pin 100 is at the lowermost end of the slot 98a to establish the stored position for the head-rest as illustrated in FIG. 1. The slot 98a extends substantially lengthwise and upwardly on the back-rest 20 and is of such a length and contour that it guides the head-rest 74 first upwardly to a clearance position relative to the upper end of the back-rest and then forwardly toward the extended or head-supporting position wherein the front surface of the head-rest 24 is properly oriented relative to the back-rest 20 (see FIGS. 2 and 3) for supporting the head of the chair occupant.

Operatively connected between the frame or support 12, 14, the back-rest 20, and the mounting linkage is an actuating mechanism or linkage which imparts a further subjective to the mounting linkage and the back-rest pivot to move the head-rest between the retracted and extended positions. The actuating mechanism or linkage includes an actuating link 102 which is disposed in a slightly forwardly inclined position and has a pivotal mount 104 on a bracket 106 fixed to the rear cross brace 16d of the chair frame. An actuating and guiding link 108 is operatively connected to the actuating link 102 by a toggle linkage, with the actuating and guiding link 108 having respective pivot connections 112, 114 adjacent one end thereof to the primary and secondary mounting links 78, 88 of the head-rest mounting linkage and a pivotal connection 116 at the other end thereof to the back-rest 20. The toggle linkage includes a driver plate 118 and a connecting link 120 having a pivotal connection 122 to the back-drive plate. The driver plate or link of the toggle linkage has a pivotal mount 124 on the back-rest 20 and a pivotal connection 126 to the back-drive plate. The link 120 has a pivotal mount 128 on the back-drive plate and a pivotal connection 129 to the actuating guiding link 108 intermediate its ends. The portion of the driver plate 118 intermediate the pivotal mount 124 and the pivotal connection 122 constitutes the driver of the toggle linkage which is constrained to move in a rotary path about the pivotal mount 124 and exerts an axial force on the connecting link 120 which is coupled to the actuating and guiding link 108. The rotary motion of the driver intermediate the pivots 124, 122 is such that the effective lever arm (which is the perpendicular distance from the line of action of the connecting link 120 to the center of rotation 124 of the driver) is less when the driver is in its final position (see FIG. 2) than in its initial position (see FIG. 1). The axial force produced in the connecting link 120 is transmitted to the head-rest 74 via the mounting linkage, with the toggle effect occurring between the head-rest 74 and the driver plate 118, which is pivotally connected to the back-drive plate by the connecting link 120. Wherein the toggle action begins to occur at some time prior to the arrival of the chair at the intermediate, tilted sitting position illustrated in FIG. 2. This may be appreciated by noting the relative position of the toggle links and the pivots 124, 122, 128 in the intermediate, tilted sitting position of FIG. 2 wherein the toggle links are shown as passing through the dead-center position, with the intermediate or knee pivot 122 having moved through the dead center position relative to the pivots 124, 128. This is indicative of the fact that the toggle action began to occur at some time prior to the arrival of the chair 118 at the intermediate, tilted seating position, for the chair occupant.

The head-rest and control arrangement is such that the head-rest remains in a substantially stationary extended head-supporting position relative to the back-rest during the second phase of the chair movement, as may be appreciated by progressively comparing FIGS. 2 and 3. This is achieved by mounting the actuating link 102 with the pivotal mount 104 located such that the pivotal connection 26 of the rear guiding link 22 to the back-rest (when the rear guiding link 22 is in the relatively stationary position which it assumes at the end of the first phase of the chair movement) is coaxial with the pivotal mount, it being recalled that the pivot 26 serves as a substantially stationary back-rest pivot during the second phase of the chair movement. As seen best in FIG. 4, the pivotal connection 26 to the adjacent side of the back-rest 20 moves into a position coaxially and outwardly of the pivotal mount 104 for the actuating link 102 at the end of the first phase of the chair movement. Analysis of the head-rest and control arrangement for this general type of double movement chair indicates that the actuating of the head-rest is produced by the relative motion between the back-rest pivot (e.g. pivot 26) and the pivotal mount (e.g. 104) of the head-rest container on the chair frame or support. Since there is no relative movement of these pivots during the second phase of the chair movement in that the pivot 26 moves into a coaxial position relative to the pivotal mount 104, the head-rest 74 remains substantially stationary relative to the back-rest during the second phase of the chair movement.

In actual use as the chair occupant leans against the back-rest to initiate the first phase of the reclining movement, the seat and back-rest are respectively guided to maintain the required angular relationship between the
seat and back-rest during the first phase of the chair movement, with the back-rest pivot 26 for the second motion phase. The pivot 104 of the head-rest 74, with the actuating link 102 turning in the clockwise direction about the pivotal mount 104 in the support and with the link 108 turning in the counterclockwise direction about the pivotal mount 116 on the back-rest 20. The toggle linkage is operated such that the effective lever arm of the driver is less in the intermediate, tilted sitting position of FIG. 2, with the knee pivot 122 moving through and past a dead center position relative to the pivots 124, 128. The actuating links 102, 108 and the toggle linkage achieve the extension of the head-rest mounting linkage, with the head-rest 74 moving upwardly relative to the back-rest and then forwardly to the extended position illustrated in FIG. 2. During the second phase of the chair movement, the head-rest control receives no actuating force and the head-rest 74 remains substantially stationary and in the required head-supporting position until such time as the chair is returned to the intermediate, tilted sitting position. At such time, and in response to a downward pressure on the leg-rest 30 and a corresponding return of the chair to the upright sitting position, the head-rest is again retracted to the stored position illustrated in FIG. 1.

The reclining chair 210 comprises a support or chair frame including opposite side walls 212 and 214 joined together by cross braces 216a, 216b and 216c. A body-supporting unit 217 including a rigidly-formed seat 218 and back-rest 220 is movably mounted on the chair frame by a pair of spaced guiding links 221 and 223 mounted on a support bar 225 which in turn is pivotally mounted at its rear end on the chair frame by a pivot 226. The rear guiding link 221 is mounted on the bottom of seat 218 by a pivot 227 and is connected intermediate its ends to the support bar 225 by a pivot 229. The front guiding link 223 is mounted on the bottom of the seat by a pivot 231 located forwardly of the pivot 227. The lower end of the link 223 is connected to the support bar 225 by a pivot 233.

The chair also includes a leg-rest 230 which is mounted for movement from a stored position beneath the forward end of the seat 218, as shown in FIG. 5, to the elevated positions shown in FIGS. 6 and 7. The leg-rest 230 is supported by the leg-rest linkage 235 which is carried by the forward end of the support bar 225. The leg-rest linkage 235 includes a pair of links 256 and 264 which are connected at spaced points to the leg-rest 230 by respective pivots 260 and 266. At its opposite end the link 256 is connected to a link 252 by a pivot 258. The support bar 225 extends forwardly from the pivot 226, and to this forwardly-extending portion the links 242 and 252 are connected at spaced points by respective pivots 244 and 254.

The rear guiding link 221 extends downwardly below the pivot 229 and at its free end is connected to a controlling link 237 by a pivot 239. The opposite end of the controlling link 237 is connected to an intermediate portion of the link 252 by a pivot 241. The links 242 and 256 cross each other and are connected at their crossing over point by a pivot 262.

As shown in FIG. 5, the support bar 225 is normally maintained in a horizontal position and rests upon the cross bar 216b at a point to the rear of the pivot 223. To bring the body-supporting unit 217 from its upright sitting position of FIG. 5 to the intermediate, tilted sitting position of FIG. 6, the user shifts his weight rearwardly and applies rearward pressure to the back-rest 225. This causes the body-supporting unit 217 to move rearwardly, the guiding links 221 and 223 pivoting rearwardly on the stationary support bar 225 for this purpose. The guiding links carry the body-supporting unit 217 in a compound rearward movement in which the forward end of the seat 218 the rear end of the seat is guided in a rearward and downward path by the rear guiding link 223 and the front end of the seat is guided in a rearward and downward path by the front guiding link 221. In the intermediate, tilted sitting position, the front guiding link 223 engages a stop member 243 which is rigidly fixed to the support bar 225, the stop member 243 preventing further pivoting movement of the front guiding link 223 and defining the limit of the intermediate, tilted sitting position.

As the upper portion of the rear guiding link 221 pivots rearwardly about pivot 229 in moving toward the intermediate position, the lower portion of said link 221 pivots forwardly, moving the controlling link 237 forwardly and causing said controlling link to raise the leg-rest linkage 235 until the leg-rest 230 has reached its extended position of FIG. 6.

If the occupant in the intermediate, tilted sitting position of the chair now wishes to move to a fully reclined position, he applies further rearward pressure upon the back-rest 220. However, the front guiding link 223 is now locked by further pivoting movement of support bar 225 by engagement with the stop 243, and the body-supporting unit 217 is thus prevented from moving rearwardly relative to said support bar 225. The body-supporting unit 217 is thus now required to pivot about the single pivot point 226. Thus, the body-supporting unit 217 maintains a fixed relationship to the support bar 225 and the entire unit and linkage structure pivots as a unit about the pivot 226. Since the rear guiding link 221 maintains its inclined position relative to the support bar 225, the leg-rest linkage is maintained in its extended position and the leg-rest continues to be positioned at a point forwardly and at the front edge of the front seat.

In accordance with the invention herein, a headrest 274 is disposed in a stored or retracted position within the upper rear corner of the back-rest 220, as shown in FIG. 5, with its upper face substantially flush with the upper surface of the back-rest. The head-rest 274 is mounted by a mounting linkage similar to that illustrated in connection with the embodiment of FIGS. 1-4, and including a primary link 278 connected at its upper end by pivot 284 to a connecting link 282 which in turn has a pivotal connection 280 to a bracket 286 fixed to the head-rest 274, and a secondary mounting link 296 connected at its upper end by pivot 290 to one end of a connecting link 292 which has a pivotal connection 294 at its other end to the bracket 286. The connecting link 292 crosses over the primary mounting link 278 and has a pivot connection 296 thereon, providing an extensible mounting linkage to the head-rest 274 consisting of links 278, 282, 284 and 292.

The mounting linkage for the head-rest 274 is engaged by a guide means in the form of an elongated guide plate 298 formed with a guide slot 298a affixed to the back-rest 220, with a pin 300 carried by the primary mounting link 278 and extending into the slot 298a.

The head-rest mounting linkage is operated by an actuating mechanism or linkage which includes an actuating and guiding link 308 which is pivotally connected by pivots 312, 314 to the respective primary and secondary mounting links 278, 284 and is connected by pivot 316 to the back-rest 220. The actuating mechanism also includes an actuating link 320 which has a pivot mount 326 concentric with the pivot mount of the support bar 225 and is connected to the guiding link 308 by pivot 328.

When the chair 210 is brought to its intermediate, tilted sitting position of FIG. 6, the rear portion of the body-supporting unit 217 is moved rearwardly and downwardly in the compound movement previously described, as determined by the guiding links 221 and 223. This movement carries the link 308 downwardly relative to the acting link 320 which is mounted on the fixed pivot 226,
The actuating link 320 turns rearwardly about pivot 226 to accommodate the rearward movement of link 308, but opposes the downward movement thereof at point 328 and in effect pushes upwardly on the link 308 at this point. This causes the link 308 to turn upward or in a counterclockwise direction as viewed in FIGS. 5 and 6, about its pivotal connection on the back-rest 220. The upward movement of link 308 brings the head-rest to the extended head-supporting position relative to the back-rest 220 in the intermediate position of the body-supporting unit 217 shown in FIG. 6, through the extensible head-supporting linkage 278, 282, 288 and 292.

The head-rest 274 remains in a substantially stationary extended head-supporting position relative to the back-rest during the second phase of reclining movement, as shown in FIG. 7. This is achieved by mounting the actuating link 320 concentrically with the support bar 225 at fixed pivot 226. Since the fixed pivot 226 serves as a stationary pivot for the support bar 225 and the body-supporting unit 217 carried thereby, during the second motion phase, as well as the pivot for the actuating link 320 and the connected head-rest linkage mounted on the back-rest 220, it will be appreciated that the actuating link 320 will exert no further turning force on the link 308. That is to say, the link 308 carried by the back-rest 220, and the actuating link 320 both turn about the same point defined by the common pivot 226 as the body-supporting unit moves from the intermediate position of FIG. 6 to the fully tilted position of FIG. 7. During this second motion phase, therefore, the head-rest 274 remains stationary in its extended position relative to the back-rest 220 without further actuation and merely follows the rearward and downward movement of the back-rest as a rigid extension thereof.

Although the head-rest actuating and mounting linkage of the invention has been shown, by way of example, incorporated in representative chairs of the double-motion and multiple-position types, it will be appreciated that the invention is intended and devised to be incorporated in any double-motion or multiple-position chair having two distinct paths of movement, the second of which constitutes a pivotal movement of the back-rest around a relatively stationary point. The invention can thus be applied to many different chair structures of this type, for example, those disclosed in the issued patents and pending applications of applicant.

A suitable modification, change and substitution is intended in the invention, for instance, in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

I claim:

1. In a reclining chair of the type comprising a support, body-supporting means including a seat and a back-rest adapted to be movably mounted on said support for inclining and reclining movement respectively, and coordinating means operatively connected to said body-supporting means and to said support and mounting said body-supporting means for movement through a first motion phase into an intermediate reclining position and through a second motion phase into a further reclining position, said coordinating means including first guiding means for guiding the rear part of said back-rest in said first motion phase, second guiding means providing a stationary pivotal mount for the back-rest in the second motion phase for movement of the back-rest in a second, different path of motion, and means for blocking movement of said first guiding means at the end of said first motion phase such that guiding means comprises a pair of links mounted at spaced points on said support bar and pivotally connected to spaced points on said body-supporting unit.

2. A reclining chair comprising a support, body-supporting means including a seat and a back-rest mounted on said support, a head-rest, means mounting the head-rest on said back-rest for movement between a retracted and extended position, actuating means for said head-rest having a fixed pivotal mount on said support and operatively connected to said head-rest mounting means, first guide means guiding said back-rest and the head-rest and head-rest mounting means carried thereby in a first path of movement relative to the fixed pivotal mount of said head-rest actuating means in a first motion phase, whereby the actuating means moves the head-rest to its extended position, blocking means for halting movement of said back-rest at the end of said first motion phase with the body-supporting means in an intermediate reclining position and the head-rest in extended position, and second guide means providing a stationary pivotal center for said back-rest in a second motion phase, stationary pivotal center being coaxial with said fixed pivotal mount of the head-rest actuating means, the body-supporting means moving to a fully reclined position in said second motion phase with the back-rest, head-rest, head-rest mounting means and head-rest actuating means all turning in unison about the coaxial stationary pivotal center and fixed pivotal mount, and the head-rest thus remaining in said extended position relative to the back-rest as the latter moves to a further reclining position.

3. A reclining chair comprising a support, a body-supporting unit including a rigidly-formed seat and a back-rest mounted on said support, a head-rest, a linkage mounting the head-rest on said back-rest for movement between retracted and extended positions, an actuating link for said head-rest having a fixed pivotal mount on said support and operatively connected to said head-rest mounting linkage, a support bar having a stationary pivotal mount on the support, means holding said support bar in a stationary position, guiding means mounting the body-supporting unit on said support bar for movement in a downward and rearward path toward the fixed pivotal mount of said head-rest actuating link in a first motion phase, whereby the actuating link moves the head-rest to its extended position, blocking means for halting movement of said guide means at the end of said first motion phase with the body-supporting unit in an intermediate, tilted sitting position and the head-rest in extended position, said support bar turning about its stationary pivotal mount in a second motion phase to carry the body-supporting unit and the head-rest and mounting linkage carried thereby in a pivotal movement about said stationary pivotal mount, said fixed pivotal mount of the actuating linkage being coaxial with said stationary pivotal mount of the support bar, whereby the body-supporting unit moves to a fully reclined position in said second motion phase with the head-rest remaining in said extended position relative to the back-rest.

4. In a reclining chair comprising a support, body-supporting means including a seat and back-rest...
adapted to bemovably mounted on said support for inclining and reclining movement respectively, and coordinating means operatively connected to said body-supporting means and to said support and mounting said body-supporting means for movement through a first motion phase into an intermediate reclining position and through a second motion phase into a further reclining position, said coordinating means including a movable pivotal connection to said back-rest, means mounting said pivotal connection for movement relative to said support during said first motion phase, and means for blocking movement of said pivotal connection during said second motion phase and providing a stationary back-rest pivot about which said back-rest is reclined during said second motion phase, whereby said back-rest, said guiding means, said head-rest and said actuating means turn about a common center of rotation during the second motion phase without further actuation of said head-rest.

A reclining chair of the double movement type comprising a support, body-supporting means including a seat and back-rest adapted to be movably mounted on said support for inclining and reclining movement respectively, coordinating means operatively connected to said body-supporting means and to said support and mounting said body-supporting means for movement through a first motion phase into an intermediate, tilted sitting position during which there is substantially no angular displacement between said seat and back-rest and through a second motion phase into a full reclining position during which the angle between said seat and back-rest increases, said coordinating means including a movable pivotal connection to said back-rest, means mounting said pivotal connection for movement relative to said support during said first motion phase, and means for blocking movement of said pivotal connection during said second motion phase wherein said pivotal connection serves as a stationary back-rest pivot about which said back-rest is reclined during said second motion phase, a head-rest, means operatively connected to and mounting said head-rest for movement from a retracted position to an extended head-supporting position relative to said back-rest, and actuating means operatively connected to said head-rest and having a fixed pivotal mount on said support and operable in response to movement of said movable pivotal mount for moving said head-rest to said extended head-supporting position in response to said first motion phase, said movable pivotal connection being positioned to move into coaxial alignment with said fixed pivotal mount when the latter serves as said back-rest pivot during said second motion phase, whereby said back-rest, said guiding means, said head-rest and said actuating means turn about a common center of rotation during the second motion phase without further actuation of said head-rest.

A chair according to claim 8 in which said back-rest mounting means comprises an actuating link pivotally mounted on said support frame at said fixed pivot and pivotally connected to said head-rest guiding means.

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