

1

3,057,657 RAPIDLY EXTENSIBLE HEAD-REST AND CONTROL

Peter S. Fletcher, Delray Beach, Fla., assignor to
Anton Lorenz, Boynton Beach, Fla.
Filed Dec. 2, 1958, Ser. No. 777,655
5 Claims. (Cl. 297—61)

The present invention relates generally to an improved reclining chair, and in particular to an improved head-rest and control arrangement for such reclining chair wherein the head-rest is automatically displaced to an extended head-supporting position relative to the back-rest in response to the reclining movement of the chair.

It is generally known to construct a reclining chair which comprises 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 under control of 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 or frame of the back-rest, such that the head-rest may be extended or lifted relative to the back-rest to provide a more comfortable and adequate support for the head of the chair occupant when seated therein. With such extensible head-rest, the back-rest may be made somewhat shorter for design and esthetic purposes, yet the chair occupant may be comfortably accommodated in the various reclining positions of the chair 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 or in response to the reclining movement of the chair.

Usually in such reclining chairs, the relative movement of the back-rest with respect to the support extends the head-rest relative to the back-rest. Control arrangements heretofore employed have brought about a displacement of the head-rest relative to the back-rest in response to the movement of the back-rest relative to the support, with the rate of extension of the head-rest relative to the back-rest being substantially uniform throughout the extent of the reclining movement of the chair. Accordingly, when the reclining chair is only partially reclined, the head-rest is still in a somewhat retracted position relative to the requisite extended head-supporting position and for all intents and purposes does not function to provide the necessary support for the head of the chair occupant. The full extension of the head-rest was brought about only when the reclining chair was substantially at its fully reclined position, thereby affording less than optimum comfort for the chair occupant and support for the occupant's head in the various intermediate reclining positions which are also useful in such reclining chairs. In the absence of an adequate head-rest support in the various intermediate reclining positions, there is a tendency for the chair occupant to be limited in reclining positions which may be comfortably assumed; and as a practical matter the only useful position for the chair is the fully reclining position wherein the head-rest is fully extended. The problem is somewhat complicated by the recent development of "double-movement" type of reclining chairs wherein the chair includes first and second motion phases. During the first motion phase, the seat and back-rest are tilted rearwardly as a unit to an intermediate, tilted sitting position with substantially no angular change between the seat and back-rest; and during the second motion phase, the seat and the back-rest are moved into progressive reclined positions with an increase in the in-

2

cluded angle between the seat and the back-rest. For such double-movement types of reclining chairs the head-rest and its control arrangement preferably should be designed to bring about the extension of the head-rest during the first phase of the reclining movement such that the head-rest is positioned to support the head of the chair occupant when the chair is moved into the intermediate, tilted sitting position appropriate for television viewing, reading and the like. An optimum head-rest control is one which achieves the rapid extension of the head-rest to the extended head-supporting position during the first phase of the reclining movement, preferably during an early portion of such first phase, with the head-rest remaining substantially stationary in the extended head-supporting position during the second phase of the reclining movement. With such control, an adequate head-rest support is provided for the chair occupant in the intermediate, tilted sitting position of the chair at the end of the first phase of chair movement and throughout the second phase of the chair movement. Accordingly, there will be a number of different chair positions in which the requisite head-rest support is provided for the chair occupant.

It is a further object of the present invention to provide an improved head-rest and control for reclining chairs which brings about the rapid extension of the head-rest relative to the back-rest in response to a first phase or portion of the chair movement. Specifically, it is within the contemplation of the present invention to provide an improved head-rest and control arrangement which is effective in response to an initial portion or first phase of chair movement to rapidly translate the head-rest from its stored position to its extended position such that the head-rest will provide an adequate and substantially stationary support for the head of the chair occupant during the remaining portion of chair movement.

It is a still further object of the present invention to provide a head-rest and control arrangement which is useful in a double-movement type of reclining chair, and other similar types of reclining chairs, wherein the head-rest movement to its fully extended head-supporting position is attained in response to a first portion of chair movement.

In accordance with an illustrative embodiment demonstrating features and advantages of the present invention, there is provided a reclining chair which includes a support, body-supporting means having a back-rest which is movably mounted on the support, head-rest, and control means operatively connected to the head-rest and controlled from the body-supporting means for moving the head-rest from a retracted position relative to the back-rest to an extended head-supporting position relative to said back-rest. The control means incorporates an appropriate mounting and guiding arrangement for the head-rest and actuating means including a toggle linkage which is operatively connected between the support and the head-rest for moving the head-rest from the retracted position to the extended head-supporting position in response to a first portion or phase of the relative movement of the body-supporting means in relation to the support, such that the head-rest is positioned throughout a substantial portion of the reclining movement of the chair to provide an adequate support for the head of the chair occupant.

Advantageously, my improved head-rest control may be employed in reclining chairs of the type incorporating a body-supporting means having a rigid seat and back-rest, and chairs of the type incorporating a movable seat and movable back-rest. Still further, the invention herein finds useful application in chairs of the double-movement type which incorporate a movable seat and movable

back-rest, and chairs of the two-position type which incorporate a rigid seat and back-rest.

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

FIG. 1 is an elevational view with parts broken away for clarity, of a reclining chair incorporating my improved head-rest and control arrangement shown in the upright or sitting position; and

FIG. 2 is an elevational view similar to FIG. 1 but showing the chair in the rearwardly tilted or reclined position, with the head-rest in the extended head-supporting position relative to the back-rest.

Referring now specifically to the drawings, there is shown a reclining chair 10 of generally known construction which incorporates my improved head-rest and control and comprises a support or chair frame including opposite side walls 12, 14 joined by one or more cross-braces 16 and supported above the floor level by depending legs. A rigid body-supporting unit including a seat 18 and a back-rest 20 is movably supported on the chair frame, with the rigid body-supporting unit being pivoted on the chair frame at the main pivot 22 by means of the depending hanger or extension 23. Positioned below the forward end of the seat 18 is a leg-rest 24 which is mounted for movement from a stored position below the forward end of the seat, as shown in FIG. 1, to an elevated position extending forwardly thereof the seat as shown in FIG. 2. Interconnected between the body-supporting unit and the leg-rest 24 and the support 12, 14 is a leg-rest suspending and control linkage which elevates the leg-rest 24 as a function of and in response to reclining movement of the back-rest. This linkage, which is of generally known construction and is shown for illustrative purposes, is seen to include a double-arm lever 26 which is pivotally mounted on the support at a pivot 28. The upwardly extending arm 26a of the double-arm lever 26 is connected to the body-supporting unit 18, 20 via a connecting link 30 which has a pivotal connection 32 at its forward end to the arm 26a and a pivotal connection 34 at its rearward end to the extension 23 at a point spaced above the main pivot 22. Thus in response to rearward rocking movement of the body-supporting unit about the pivot 22, a rearwardly directed thrust is imparted via the connecting link 30 to the arm 26a of the lever 26 which imparts a forwardly directed turning movement to the arm 26b. The leg-rest 24 is mounted beneath the forward end of the seat 18 by a double four-bar leg-rest suspending linkage which includes a first pair of links 36, 38 having their adjacent ends pivotally connected at the pivot 40, and a second pair of links 42, 44 having their adjacent ends pivotally connected at a pivot 46. The links 36, 42 are suspended from a support at respective pivots 48, 50, while the links 38, 44 have pivotal connections 52, 54 to the leg-rest 24, with the respective pairs of links being coordinated by a pivotal connection 56 at the cross-over point between the links 38, 42. The double four-bar leg-rest suspending linkage is operatively connected to the arm 26b of the double-arm lever 26 which serves as an actuating means via a connecting link 58 which has a pivotal connection 60 at its rearward end to the arm 26b and a pivotal connection 61 at its forward end to the link 36.

The coordination of the chair components by the described linkage, which is subject to a latitude of variation and change and is merely illustrative of this type of reclining chair, is substantially as follows:

When the chair occupant leans against the back-rest 20, the body-supporting unit 18, 20 turns about the main pivot 22 which imparts a rearwardly directed pull to the connecting link 30 which turns the double-arm lever 26 about the pivot 28 such that the driving arm 26b thereof

is swung through a forwardly and upwardly directed arc. This in turn imparts a forwardly directed thrust to the connecting link 58 which actuates the double four-bar suspending linkage to bring the leg-rest 24 to an elevated leg-supporting position, as shown in FIG. 2.

In this illustrative embodiment demonstrating features of the present invention, a head-rest 62 is disposed in a stored or retracted position accommodated between the opposite sides 20a, 20b of the back-rest 20 and intermediate the forward and rearward cross braces 20c, 20d. The head-rest 62 is mounted with its upper face substantially coplanar or flush with the upper face of the back-rest 20. The upper face of the head-rest 62 bridges the slot or opening defined in the upper face of the back-rest by the opposite sides 20a, 20b and the cross-braces 20c, 20d of the back-rest 20 and is mounted in such bridging position and stored within the back-rest 20 by the mounting member or link 64 which has its upper end rigidly connected thereto. The mounting member or link 64 extends substantially lengthwise of the back-rest 20 and is engaged by appropriate guide means which is operatively connected between the mounting member or link and the back-rest such that the head-rest 62 is constrained to move along a prescribed path from the retracted or stored position, illustrated in FIG. 1, to the extended or head-supporting position illustrated in FIG. 2. The illustrative guide means includes an elongated guide plate 66 having an elongated guide slot 66a formed therein, which guide plate is fixed to the adjacent frame side of the back-rest, with a pin 68 being carried by the mounting member 64 and guidingly engaged within the slot 66a. The pin and slot interconnection is arranged such that the pin 68 is at the lowermost end of the slot 66a to establish the stored position for the head-rest, illustrated in FIG. 1. The slot 66a extends substantially lengthwise and upwardly of the back-rest 20 and is of a length and contour to guide the head-rest 62 first upwardly to a clearance position relative to the upper end of the back-rest 20 and then forwardly to the extended or head-supporting position wherein the front or supporting surface of the head-rest 62 is properly oriented relative to the back-rest (see FIG. 2) for supporting the head of the chair occupant.

Operatively connected between the frame or support 12, 14 of the chair, the back-rest 20 and the mounting member 64 is an actuating mechanism or means which completes the guide arrangement such that the mounting member cannot freely turn on the pivot 68 during its translation along the slot 66a. The actuating mechanism or means includes an actuating link 70 which is disposed in a forwardly inclined position and has a pivotal mount 72 on the support at a point spaced rearwardly of and substantially at the same level as the main pivot 22. An actuating and guiding link 74 is operatively connected to the first actuating and constraining link 70 by a toggle linkage, as will be described hereinafter, with the link 74 having a pivotal connection 78 at one end thereof to the mounting member 64 and a pivotal connection 80 at the other end thereof to the back-rest 20. The described guiding and actuating arrangement is merely illustrative of a typical environment for the instant invention and is described and claimed in my copending application, Serial No. 777,657, filed concurrently herewith and entitled "Improved Extensible Head-Rest and Control."

In accordance with the present invention, the head-rest control incorporates a toggle linkage 82 which includes a driver plate or link 84 and a connecting link 86 connected to the driver plate at a pivot 88. The driver link or plate 84 has a pivotal mount 90 on the back-rest and a pivotal connection 92 intermediate its ends to the actuating link 70, with the connecting link 86 having the pivotal connection 76 to the further actuating and guiding link 74 intermediate the opposite ends thereof. As is generally understood, a toggle linkage or mechanism comprises a pair of links joined together at a pivot, with one of the links constituting a driver and being constrained to move

in a rotary path to exert an axial force on the other of the links, and with the other of the links constituting a connecting link. The rotary motion of the driver is such that the effective lever arm (which is the perpendicular distance from the line of action of a connecting link to the center of rotation of a driver) is less when the driver is in its final position than in its initial position. The axial force produced in the connecting link is transmitted to the component which is subjected to the toggle effect (e.g. the head-rest) and the toggle action occurs between the limit positions of travel of the toggle, which in this instance is the sitting position illustrated in FIG. 1 and an intermediate reclining or tilted position in advance of the final reclining or tilted position illustrated in FIG. 2. Stated somewhat differently, the effective lever arm of the driver when in such intermediate reclining position is less than the effective lever arm of the driver in the sitting position. By employing such a toggle mechanism in the head-rest control, the head-rest may be brought to the extended or head-supporting position relative to the back-rest during a first portion of the chair movement such that over a substantial remaining portion of the chair movement the head-rest is in the proper position to serve as an adequate head-support. As is further understood, the uniform motion imparted to the driver of a toggle linkage causes rapid turning of the follower until the toggle linkage approaches an in-line or dead-center position. As this in-line or dead-center position is approached, the uniform motion imparted to the driver manifests itself as a rapidly decreasing movement of the follower. In the dead center position and for a substantial degree of movement past the dead center position there is little thrust movement of the follower despite the continued uniform motion imparted to the driver. This principle of operation is employed to advantage in accordance with the present invention wherein the head-rest actuating linkage embodies the toggle linkage 82 which brings the head-rest 62 into the extended head-supporting position relative to the back-rest 20 quickly and in response to a first portion of the reclining movement of the chair; and when once brought to the extended position, maintains the head-rest 62 in the extended head-supporting position despite continued reclining movement of the chair and the continued uniform motion imparted to the driver of the toggle linkage. As shown herein, the portion of the driver plate 84 intermediate the pivots 88, 90 constitutes a driver which is constrained to move in a rotary path about the pivot 90 and to exert an axial force on the connecting link 86 which is coupled to the actuating and guiding link 74. The rotary motion of the driver intermediate the pivots 88, 90 is such that the effective lever arm (which is the perpendicular distance from the line of action of the connecting link 86 to the center of rotation 90 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 86 is transmitted to the head-rest 62 via the links 74, 64 with the toggle action coming into effect between the sitting position illustrated in FIG. 1 and a reclining or tilted position in advance of the position illustrated in FIG. 2. By employing this toggle effect, the head-rest 62 is brought to the extended head-supporting position relative to the back-rest 20 during a first portion of the chair movement and in advance of the arrival of the chair in the fully reclined or tilted position illustrated in FIG. 2 and is maintained in this head-supporting position during the remaining reclining movement of the chair. Although the toggle linkage has been described in the environment of a reclining chair of the type including a rigid seat and back-rest, from the foregoing description it will be appreciated that such toggle linkage in the head-rest control may be used to advantage in other chair types, for example, in the embodiment illustrated in the aforementioned copending application wherein the seat and back-rest move relative to each other, or in the double-movement

type of chair as disclosed and described in my copending application, Serial No. 777,656 filed concurrently herewith and entitled "Improved Head-Rest and Control for Double-Movement and Two Position Types of Chairs."

In actual use, as the chair occupant leans against the back-rest 20, the reclining or turning movement of the back-rest about the pivot 22 is effective via the pivotal connections 72, 80 to cause the link 74 to turn in the counter-clockwise direction about the pivot 80 which causes a generally upward thrust to be imparted to the mounting member or link 64 such that the head-rest 62 is moved along the path established by the slot 66a to the extended position illustrated in FIG. 2. In response to the operation of the head-rest control linkage, the toggle linkage 82 is operated such that the pivots 90, 88 and 76 approach a substantially in-line position relative to each other in advance of the fully reclined or tilted position for the chair (as illustrated in FIG. 2) such that there is a substantial portion of the reclining movement in which the head-rest 62 is in the extended head-supporting position, with substantially no translation being imparted to the head-rest 62 incident to the continued uniform rotary motion of the driver link of the toggle linkage in response to the reclining movement of the chair.

Although the illustrative form of the invention shows a reclining chair including a rigid seat and back-rest, it should be apparent to those skilled in the art that the improved toggle type head-rest control finds application in other types of chair, including those incorporating a movable seat and movable back-rest and chairs capable of assuming multiple positions. My improved head-rest control brings about a rapid extension of the head-rest relative to the back-rest in response to the first portion of phase of chair movement such that the head-rest is brought to its operative or head-supporting position, with the head-rest remaining in a substantially stationary position to achieve the supporting function.

A latitude of modification, change and substitution is intended in the foregoing disclosure and 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.

What I claim is:

1. In a reclining chair including a support, body-supporting means having a back-rest, means movably mounting said body-supporting means on said support, a head-rest, and actuating means operatively connected to said head-rest and controlled from said body-supporting means for moving said head-rest between retracted and extended positions relative to said back-rest, said actuating means including a toggle linkage operatively connected between said support and said head-rest for moving said head-rest from said retracted position to said extended position in response to a first portion of the movement of said body-supporting means relative to said support, said toggle linkage including a driver link pivotally mounted on said back-rest for rotary movement and a connecting link pivotally connected to said driver link and operatively connected to said head-rest, said driver and connecting links moving into a substantially aligned position in response to the first portion of the movement of said body-supporting means and as said head-rest moves into said extended position, said driver and connecting links remaining substantially in said aligned position in response to continued movement of said body-supporting means to maintain said head-rest substantially in said extended position and substantially stationary relative to said back-rest.

2. In a reclining chair including a support, body-supporting means having a back-rest, and means movably mounting said body-supporting means on said support, the improvement comprising a head-rest, and control means operatively connected to said head-rest and controlled from said body-supporting means for moving

said head-rest between retracted and extended positions relative to said back-rest, said control means including a mounting member connected to said head-rest and normally supporting said head-rest in said retracted position, guiding means operatively connected between said mounting member and said back-rest and constraining said head-rest to move along a prescribed path from said retracted position to said extended position, and actuating means including a toggle linkage operatively connected between said support and said guiding means for moving said head-rest from said retracted position to said extended position in response to a first portion of the movement of said body-supporting means relative to said support, said toggle linkage including a driver link pivotally mounted on said back-rest for rotary movement and a connecting link pivotally connected to said driver link and operatively connected to said head-rest, said driver and connecting links moving into a substantially aligned position in response to said first portion of the movement of said body-supporting means and as said head-rest moves into said extended position, said driver and connecting links remaining substantially in said aligned position in response to continued movement of said body-supporting means to maintain said head-rest substantially in said extended position and substantially stationary relative to said back-rest.

3. In a reclining chair, a support, body-supporting means having a back-rest, means movably mounting said body-supporting means on said support, a head-rest, and control means operatively connected to said head-rest and controlled from said body-supporting means for moving said head-rest between retracted and extended positions relative to said back-rest, said control means including a mounting member connected to said head-rest and normally supporting said head-rest in said retracted position, guiding means operatively connected between said mounting member and said back-rest and constraining said head-rest to move along a prescribed path from said retracted position to said extended position, and means including a toggle mechanism connected between said support and said guiding means such that said head-rest moves from said retracted position to said extended position in response to a first portion of the movement of said body-supporting means relative to said support, said toggle mechanism including a driver link pivotally mounted on said back-rest for rotary movement and a connecting link pivotally connected to said driver link and operatively connected to said head-rest, said driver and connecting links moving into a substantially aligned position in response to the first portion of the movement of said body-supporting means and as said head-rest moves into said extended position, said driver and connecting links remaining substantially in said aligned position in response to continued movement of said body-supporting means to maintain said head-rest substantially in said extended position and substantially stationary relative to said back-rest.

4. In a reclining chair, a support, body-supporting means having a back-rest, means movably mounting said body-supporting means on said support for reclining move-

ment of said back-rest, a head-rest, and control means operatively connected to said head-rest and controlled from said body-supporting means for moving said head-rest between retracted and extended positions relative to said back-rest, said control means constraining said head-rest to move along a prescribed path from said retracted position to said extended position, said control means including a toggle linkage having a driver link mounted on said back-rest for rotary movement and a connecting link pivotally connected to said driver link and operatively connected to said headrest, and a further link pivotally connected to said support and said driver link for moving said head-rest from said retracted position to said extended position in response to a first portion of said reclining movement, rotary movement of said driver link in response to said first portion of said reclining movement causing a decrease in the perpendicular distance from the line of action of said connecting link to the center of rotation of said driver link when said driver link is in its final position corresponding to the extended position of said head-rest, said driver link when in said final position being disposed substantially in alignment with said connecting link.

5. In a reclining chair including a support, body-supporting means having a back-rest, and means movably mounting said body-supporting means on said support for reclining movement of said back-rest, the improvement comprising a head-rest, and control means operatively connected to said head-rest and controlled from said body-supporting means for moving said head-rest between retracted and extended positions relative to said back-rest, said control means including a mounting member connected to said head-rest and normally supporting said head-rest in said retracted position, a guiding member operatively connected between said mounting member and said back-rest and constraining said head-rest to move along a prescribed path from said retracted position to said extended position, a toggle linkage having a driver link mounted on said back-rest for rotary movement and a connecting link pivotally connected to said driver link and to said mounting member, and a further link pivotally connected to said support and said driver link for moving said head-rest from said retracted position to said extended position in response to a first portion of said reclining movement, rotary movement of said driver link in response to said first portion of said reclining movement causing a decrease in the perpendicular distance from the line of action of said connecting link to the center of rotation of said driver link when said driver link is in its final position corresponding to the extended position of said head-rest, said driver link when in said final position being disposed substantially in alignment with said connecting link.

References Cited in the file of this patent

UNITED STATES PATENTS

2,843,184	Lorenz	July 15, 1958
2,884,992	Spound et al.	May 5, 1959