

Dec. 13, 1960

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2,964,095

RECLINING CHAIR

Filed Sept. 21, 1959

3 Sheets-Sheet 1

Fig. 1

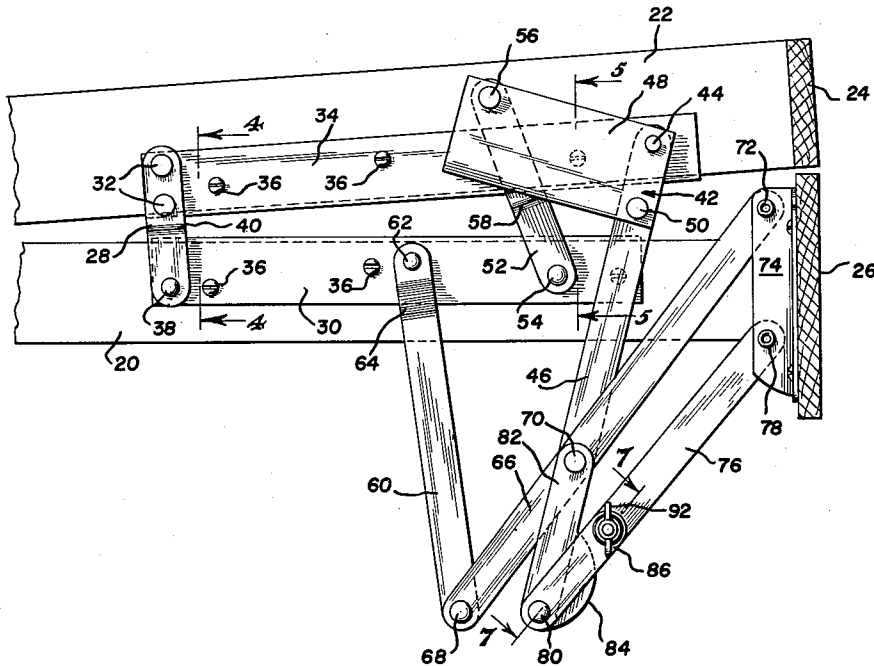


Fig. 2

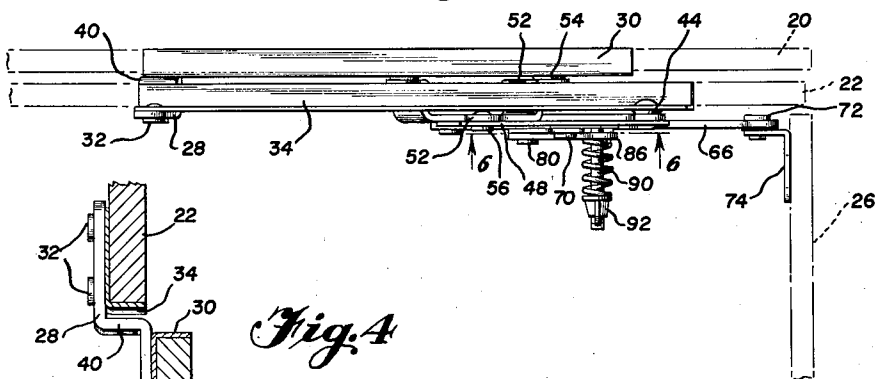
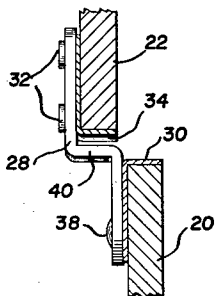


Fig. 4



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Fig. 3

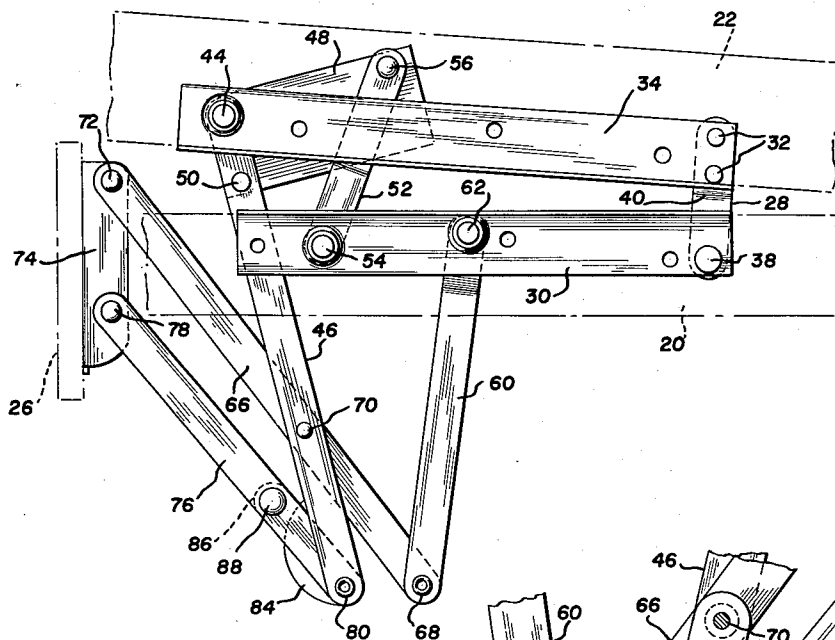


Fig. 6

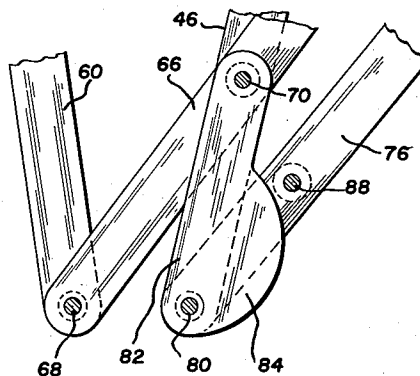


Fig. 5

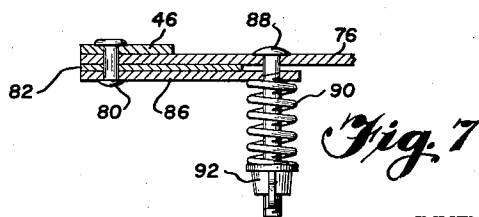
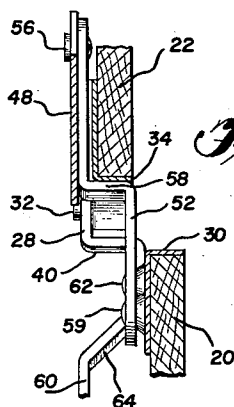


Fig. 7

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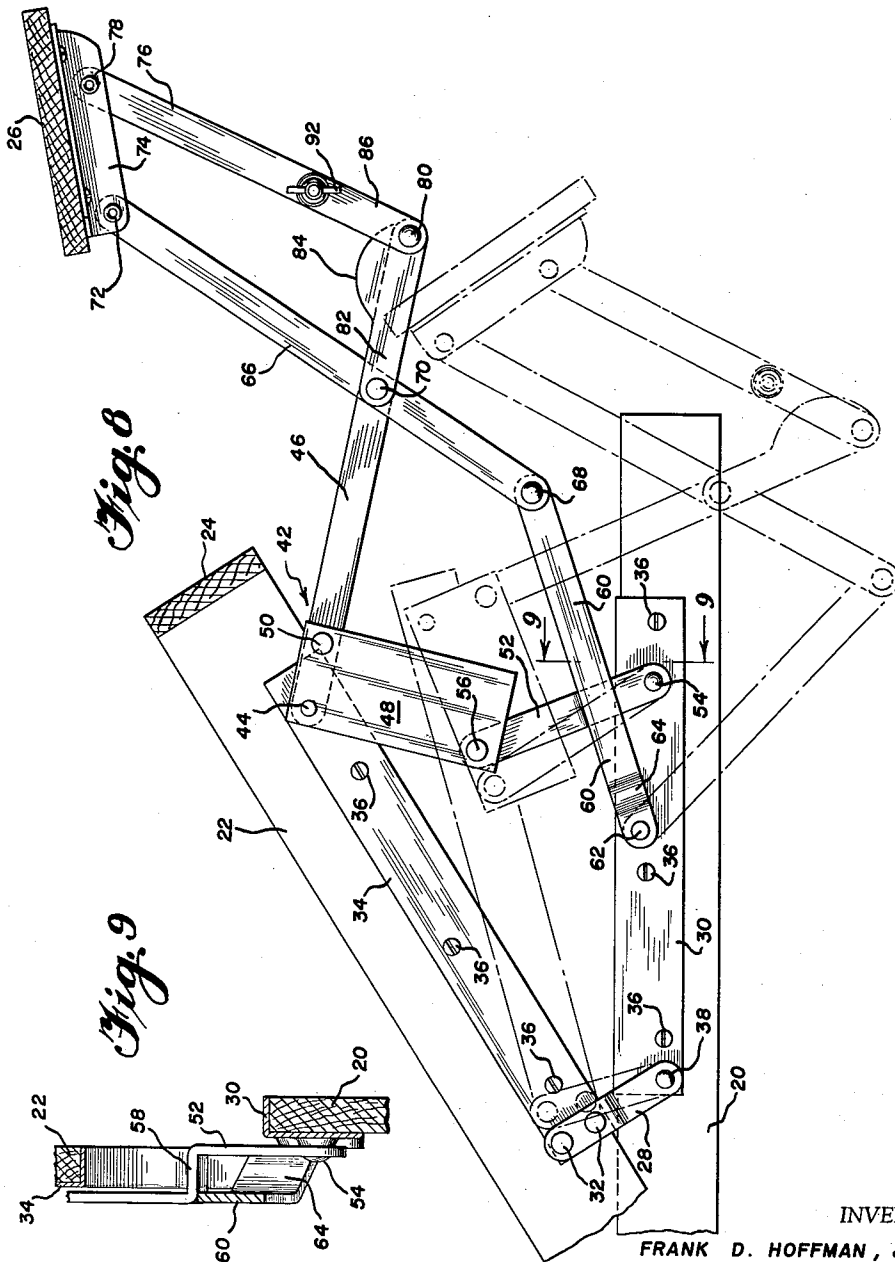
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3 Sheets-Sheet 3



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RECLINING CHAIR

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7 Claims. (Cl. 155—105)

This invention relates to reclining chairs and more particularly to reclining chairs which include a movable footrest interconnected with the stationary and reclining elements of the chair for manipulation between retracted and extended positions coordinated with the movement of the reclining elements relative to the stationary elements of the chair.

Reclining chairs of the general type with which the present invention is concerned are usually constructed with a stationary base upon which the chair seat is supported for pivotal movement between a normal or generally horizontal position and a reclining position in which the chair seat is tilted toward the back of the chair. In the usual case, a footrest is connected by a linkage system between the base and seat of the chair to be moved from a retracted position which the footrest assumes when the chair seat is in its normal position to an extended position in which the footrest is projected outwardly from the front of the chair when the chair is located in its reclining position.

It is a primary object of the invention to provide a reclining chair assembly in which a chair seat and footrest support are mounted upon a stationary base for coordinated movement relative to the base by a constrained linkage system in which interference between a single link and other elements of the linkage system positively establishes opposite end limits of relative movement between the footrest, seat and stationary base.

It is another object of the invention to provide a linkage system for a reclining chair assembly in which active elements of the linkage system are employed to control both the rate and range of movement of the linkage.

Still another object of the invention is to provide a reclining chair linkage system in which the lateral displacement of the various individual links from each other permits smooth, non-interfering movement of the linkage between end limits of relative movement and in which interference between a single link and other elements of the linkage system positively establishes respective end limits of relative movement of the linkage.

Still another object of the invention is to provide a closed linkage system for coordinating relative movement between a reclining chair seat and a footrest relative to a stationary base.

The foregoing and other objects are achieved in a reclining chair which includes a first frame link mounted upon the side of a stationary base and a second frame link which is fixedly secured to a side frame member of a reclining seat. These two frame links are coupled to each other near their rearward ends for pivotal movement in which the second frame link swings in a vertical general plane offset laterally inwardly of the chair from the first frame link. A first order bell crank is pivotally mounted on the second frame link near its forward end and one arm of the bell crank is connected to the forward end of the base frame link by an actuating link which is laterally offset at a central location. The offset portion of the actuating link is in vertical alignment with the path of

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movement of the reclining frame link so that engagement between the reclining frame link and the offset portion of the actuating link establishes an end limit of approach of the second or reclining frame link toward the stationary base frame link.

A control link is mounted upon the stationary base frame link at a location rearwardly of the actuating link and a footrest support linkage is interconnected between the distal end of the control link and the other arm of the bell crank. This linkage supports a footrest which is normally located in a retracted vertical position extending across the front of the chair when the second frame link rests upon the laterally offset portion of the actuating link. When the chair seat is tilted toward its reclining position, the second frame link is pivoted upwardly away from the base and this action causes the bell crank to be rotated to project the footrest forwardly away from the front of the chair and to swing it upwardly toward a generally horizontal position as the chair seat is tilted toward the reclining position. When the chair seat reaches its fully reclined position, the control link engages the laterally offset portion of the actuating link, and since the linkage system is a completely closed or constrained system, engagement between the control link and laterally offset portion of the actuating link establishes both the reclined position of the chair seat and the extended position of the footrest.

To control the rate of movement of the linkage, an adjustable frictional resistance is included in the linkage system. The frictional control includes a pair of plates which are located in face to face relationship to partially overlap each other at the point of pivotal connection between a pair of links. Each plate is elongated to extend along one of the pair of links. The pivot pin which couples the pair of links to each other is also employed to connect the plates to the links for pivotal movement relative to each other with one plate in face to face engagement with the side of one of the links. The plate which is in face to face engagement with one of the links extends along the other of the pair of links to the next pivot pin on the link which passes through the plate to secure it against rotation relative to the link along which it extends. The outermost plate of the assembly is connected against rotation relative to the link along which it extends by a resilient clamp which may be adjusted to regulate the frictional grip exerted upon the intermediate plate by the outer plate and the side surface of the link to which the outer plate is resiliently clamped.

Other objects and features will become apparent by reference to the following specification and to the drawings.

In the drawings:

Fig. 1 is a side elevational view of a reclining chair assembly partially in section and showing details of the linkage;

Fig. 2 is a top plan view of the structure shown in Fig. 1;

Fig. 3 is a side elevational view of the linkage of Fig. 1 taken from the side opposite the side shown in Fig. 1;

Fig. 4 is a cross-sectional view of the linkage of Fig. 1 taken on the line 4—4 of Fig. 1;

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 1;

Fig. 6 is a cross-sectional view taken on the line 6—6 of Fig. 2;

Fig. 7 is a cross-sectional view taken on the line 7—7 of Fig. 1;

Fig. 8 is a side elevational view of the structure of Fig. 1 showing the linkage in its fully extended position; and

Fig. 9 is a cross-sectional view taken on the line 9—9 of Fig. 8.

Since the invention is adaptable to reclining chairs of widely varying styles, only those frame members of the chair necessary to an understanding of the invention have been indicated in the drawings. These members include a fixed side frame member 20 which is incorporated in a stationary base and supported by other suitably located frame members, not shown. The reclining frame of the chair includes a side frame member 22 which, in the form shown in the drawings, extends along one side of the chair seat generally above base frame member 20. In the usual case, the side frame members of the reclining frame are interconnected between their forward ends by a front frame piece 24. It will be appreciated that only that linkage associated with one side of the chair has been shown in the drawings and that a similar linkage of the opposite hand will be employed upon the opposite side of the chair. In addition to the stationary base, which includes frame member 20, and the reclining frame, which includes members 22 and 24, a foot rest frame member 26 extends across the front of the chair, when the reclining frame is in the normal position shown in Fig. 1. Foot rest 26 is supported from the side frame members 20 and 22 by the linkage shown in the drawings and described in greater detail below.

The reclining frame is supported from the stationary base by a support link 22 which is pivotally connected at one end to the rearward end of a base frame link 30 and fixedly connected at its other end as by rivets 32 to a reclining frame link 34. Base frame link 30 and reclining frame link 34 are respectively fixedly secured to base frame member 20 and reclining frame member 22 by any suitable means such as screws 36. The pivotal connection between support link 28 and base frame link 30 is a conventional pivot pin 38. As best seen in Fig. 4, support link 28 is laterally offset as at 40 so that reclining frame member 22 is located laterally inward of the chair from base frame member 20.

The foot rest supporting and operating linkage includes a first order bell crank designated generally 42 which is supported at the forward end of reclining frame link 34 by pivot pin 44. The longer arm of bell crank 42 consists of a link 46 while the shorter arm is formed by a flat plate 48 coupled to link 46 by pivot pin 44 and by a rivet 50. An actuating link 52 is pivotally connected by pin 54 to base frame link 30 near the front end of the link and is pivotally connected at its upper end by a pin 56 to plate 48 of bell crank 42. As is apparent from a comparison of Figs. 1 and 8, when the reclining frame is moved from the normal position of Fig. 1 to the reclining position of Fig. 8, actuating link 52 causes bell crank 42 to be pivoted about pin 44 to drive link 46 of the bell crank from the downwardly and somewhat rearwardly inclined position beneath the chair seat (Fig. 1) into the forwardly projecting position shown in Fig. 8.

As best seen in Figs. 5 and 9, actuating link 52 is formed with a lateral offset 58 which is engaged (Fig. 5) when the chair is in its normal position by the lower surface of reclining frame link 34 to act as a stop defining the contracted position of the linkage and also the normal position of the reclining frame. When the chair is moved to its reclining position, offset 58 is engaged as shown in Fig. 9 by the upper edge of a control link 60 which is pivotally connected to base frame link 30 by a pin 62 at a location spaced rearwardly from pin 54. The engagement between offset 58 and link 60 establishes the extended position of the linkage and the reclining position of the reclining frame. Because of the lateral offset between base frame link 30 and reclining frame link 34, link 60 is offset as at 64 so that the outer end of the link may be in alignment with other members of the linkage.

A cross link 66 is connected by pivot pin 68 to the outer end of link 60 and is pivotally coupled by a second pin 70 to link 46 of bell crank 42. At its outer end, cross link 66 is connected by pivot pin 72 to one end of foot

rest support plate 74. A second control link 76 is connected by pivot pin 78 to the other end of the foot rest support plate and pivotally connected to the outer end of link 46 by pivot pin 80.

In order to accommodate the desired movement of the various links relative to each other, the lateral location or vertical planes within which the links move relative to each other must be considered. In the following description references to various links or planes as being spaced laterally or inwardly from the side of the chair may be somewhat clearer by noting that all views in the drawings show a linkage mounted at the left-hand side of the chair—i.e. that side of the chair which would be on the left side of a person seated in the chair.

As is apparent from a comparison of Figs. 2, 4, 5 and 9 reclining frame link 34 pivots in a vertical general plane located laterally inwardly of the chair from base frame link 30. The location of the vertical general plane within which frame link 34 moves is established by offset portion 40 of support link 28 (Fig. 4). Bell crank 42 is supported for pivotal movement at the inner side of reclining frame link 34 and thus sufficient lateral clearance is provided so that arm 46 of the bell crank may pass inside the forward end of base frame link 30 when the chair is in its reclining position (Figs. 1 and 3). Bell crank 42 is preferably spaced laterally from the inner side of frame link 34 as by a washer or other suitable means so that lateral clearance is obtained between the facing sides of frame link 34 and bell crank arm 48 to permit the upper end of actuating link 52 to pass between arm 48 and link 34. This clearance is best shown in Fig. 5 from which it is also apparent that offset portion 58 of actuating link 52 passes transversely across the general plane of movement of frame link 34 to define the end limit of approach of the forward end of frame link 34 to base frame link 30.

Referring now to Figs. 1 and 3, the relationship of pivots 44, 54, and 56 is such that downward forces exerted on frame link 34, as by a person seated in the chair when the chair is in its normal position, exert both compressive tensile forces on actuating link 52. Assuming that abutment 58 were not present, a force tending to rotate link 34 downwardly toward link 30 would result in pivotal movement of bell crank 42 about pivot 44 in a clockwise direction as viewed in Fig. 1. This rotation of bell crank 42 would likewise tend to rotate link 52 in a clockwise direction about pivot 54. However, the presence of offset portion 58 and its engagement with link 34 would prevent the aforementioned clockwise movement and likewise a downward force would be transmitted through offset portion 58 tending to rotate link 52 in the opposite direction about pivot 54. This latter force would be a compressive force on link 52, however that force developed by the tendency of bell crank 42 to rotate in a clockwise direction as viewed in Fig. 1 applies a tensile force to link 52.

As described above, the major portion of control link 60 is laterally offset from the inner side of base link 30 which not only permits link 60 to clear the lower portion of actuating link 52 as the chair moves into its fully reclined position (Fig. 8) but also locates link 60 in the desired lateral alignment with cross link 66 which is carried on bell crank arm 46 and thus must be located closely adjacent the general plane of movement of reclining frame link 34. The lateral location of the major portion of frame link 60 is thus vertically aligned with offset portion 58 as best seen in Fig. 9.

By reason of the foregoing relative lateral locations of the links described above, an extremely convenient arrangement is provided to define the normal position of the chair seat and its reclined position with respect to the stationary base of the chair. Since the footrest support linkage including links 66, 74 and 76 combine with the bell crank, actuating link, control link 60 and frame links to define a completely closed linkage system, the extended

and retracted positions of the footrest are likewise established by offset portion 58 of the actuating link.

To control the rate of movement of the chair seat between its normal and reclined position or to alternatively provide a method for frictionally maintaining the elements at some position intermediate the normal and reclined positions, a frictional control device is incorporated in the linkage. The structure of the frictional control device is best shown in Figs. 6 and 7 and includes a first plate 82 having an arcuate enlarged section 84 at one end. One side of plate 82 rests upon the flat side surfaces of links 66 and 76, plate 82 extending generally along link 46 which passes on the opposite sides of links 66 and 76. Pivot pin 70 which pivotally interconnects links 66 and 46 is also employed to connect the upper end of plate 82 to link 46 so that link 66 may pivot relative to both link 46 and plate 82. The lower end of plate 82 is likewise connected to link 46 by the same pivot pin 80 which pivotally interconnects link 46 and 76.

Pivot pin 80 also passes through a second plate 86 which is disposed in face to face relationship with the outer side of plate 82 and, as best seen in Fig. 1, extends along link 76 to a location beyond the edge of arcuate enlargement 84. At the upper end of plate 86, a clamping screw 88 passes through link 76 and plate 86 to support a compression spring 90 between the outer side of plate 86 and a wing nut 92 threaded onto screw 88. From Fig. 7, it is seen that by adjusting nut 92 along screw 88 an adjustable resilient clamping force is exerted against plate 86 tending to frictionally grip enlarged portion 84 between the inner side of plate 86 and the side of link 76.

Clamping screw 88 also serves to prevent relative rotation between plate 86 and link 76. Thus, plate 86 and link 76 may pivot as a unit about pin 80 relative to link 46 and plate 82 which in turn do not pivot to each other.

While one exemplary structure has been disclosed and described, it will be apparent to those skilled in the art that the disclosed structure may be modified. Therefore, the foregoing description is to be considered exemplary rather than limiting and the true scope of the invention is that defined in the following claims.

We claim:

1. A reclining chair comprising a stationary base having a base frame member extending along one side of said chair, a chair seat including a seat frame member extending along said one side of said chair at a location laterally offset from said base frame member, means supporting said seat upon said base for pivotal movement between a normal position and a reclining position, a footrest linkage interconnected between said frame members and constrained thereby to be located in a contracted position when said seat is in said normal position and to be located in an extended position projecting forwardly from said chair when said seat is in said reclining position, said linkage including a first link pivotally connected to one of said frame members adjacent the forward end thereof, a second link pivotally connected to the other of said frame members at a location intermediate the ends thereof, an actuating link pivotally connected between said first link and the forward end of said other of said frame members for actuating said linkage upon movement of said seat relative to said base, and a laterally offset portion on said actuating link engageable with said one of said frame members to establish the normal position of said seat and the contracted position of said linkage and engageable with said second link to establish the reclining position of said seat and the extended position of said linkage.

2. A reclining chair comprising a stationary base having a base frame member extending along one side of said chair, a chair seat including a seat frame member extending along said one side of said chair at a location laterally offset inwardly of said chair from said base frame member, means supporting said seat upon said

base for pivotal movement between a normal position and a reclining position, a footrest linkage interconnected between said frame members and constrained thereby to be located in contracted position when said seat is in said normal position and to be located in an extended position projecting forwardly from said chair when said seat is in said reclining position, said linkage including a first link pivotally connected to the inner side of said base frame member at a location rearwardly of the forward end of said base frame member, said first link including a laterally offset portion located below said base frame member when said linkage is in said contracted position and located above said base frame member forwardly from the point of pivotal interconnection between said first link and said base frame member when said linkage is in said extended position, and an actuating link pivotally connected at one end to the forward end of said base frame member and pivotally connected at its other end to the inner side of said seat frame member, said actuating link having a laterally offset portion thereon engageable by said seat frame member to establish the normal position of said seat and the contracted position of said linkage and engageable by said portion of said first link to establish the reclining position of said seat and the extended position of said linkage.

3. A reclining chair comprising a stationary base having a side frame member lying in a generally vertical plane, a reclining frame having a side frame member lying in a vertical general plane, a support link pivotally mounted upon one of said side frame members and fixedly connected to the other of said side frame members to support said reclining frame upon said base frame for movement between a normal position and a reclining position with the vertical plane of the side frame member of said reclining frame being offset inwardly of said chair from the plane of the side frame member of the base frame, a footrest linkage connected between said side frame members and constrained thereby to be located in a contracted position within said base frame when said reclining frame is in said normal position and to be located in an extended position to be located forwardly from said base frame when said reclining frame is in said reclining position, said linkage comprising a first link connected to one of said side frame members for pivotal movement in a first vertical plane spaced from said one side of said one of said members, an actuating link mounted on said one of said side frame members for pivotal movement at said one side thereof, and an offset portion on said actuating link extending transversely across said first vertical plane and the general vertical plane of the other of said side frame members and located to engage said other of said side frame members when said reclining frame is in said normal position to thereby establish said normal position and the contracted position of said linkage, said offset portion being engageable with said first link when said reclining frame is in said reclining position to thereby establish the extended position of said linkage and the reclining position of said reclining frame.

4. A reclining chair linkage assembly comprising a first frame link, a second frame link, a support link connecting one end of said first frame link to one end of said second frame link to support said second frame link for pivotal movement relative to said first frame link in a general plane spaced from one side of said first frame link, a crank mounted at the other end of said second frame link for pivotal movement in a plane parallel to said general plane and spaced outwardly from the side of said second frame link remote from said one side of said first frame link, a control link pivotally connected at one end to said first frame link at a location intermediate the ends of said first frame link for pivotal movement in a plane parallel to said general plane and spaced from said one side of said first frame link, footrest support linkage coupled between the other

end of said control link and said crank for constrained movement in accordance with the relative movement between said control link and said crank, and an actuating link pivotally coupled at one end to said first frame link adjacent the other end thereof and pivotally coupled at its other end to said crank, said one end of said actuating link being located at said one side of said first frame link and lying in a plane parallel to the plane of movement of said control link located between said control link and said one side of said first frame link, said other end of said actuating link being located in a plane spaced from said one side of said first frame link beyond said general plane and said plane of movement of said control link, and an offset portion on said actuating link engageable with said second frame link to establish one end limit of relative pivotal movement between said first and said second frame links and engageable with said control link to establish an opposite end limit of relative pivotal movement between said frame links.

5. A reclining chair linkage assembly comprising a first frame link, an actuating link having a lower portion connected to said first frame link adjacent the forward end thereof for pivotal movement at one side of said first frame link, an upper portion on said actuating link parallel to said lower portion and connected thereto by an offset portion projecting from said lower portion laterally away from said first frame link, a second frame link, means supporting the rearward end of said second frame link upon the rearward end of said first frame link for pivotal movement relative to said first frame link above said offset portion of said actuating link in vertical alignment therewith, said second frame link being engageable with said offset portion of said actuating link to define one end limit of pivotal movement of said second frame link relative to said first frame link, a crank pivotally connected to the upper portion of said actuating link and to the forward end of said second frame link, a control link connected at one end to said first frame link at a location rearwardly of said actuating link for pivotal movement below said offset portion of said actuating link in vertical alignment therewith, and footrest support linkage coupled between said crank and said control link to be located in a contracted position when said second frame link is at said one end limit of pivotal movement and to be extended forwardly from said frame links upon pivotal movement of said second frame link away from said one end limit until said control link engages said offset portion of said actuating link.

6. A reclining chair linkage comprising a base link, a seat link supported at its rearward end upon said base link for pivotal movement between a normal position and a reclined position in a plane of movement parallel to and laterally offset from the general plane of said base link, a foot rest linkage interconnected between said base link and said seat link and constrained thereby to be located in a contracted position when said seat link is in said normal position and to be located in an extended position projecting forwardly from said seat and base links when said seat link is in said reclined position, said linkage including a first link pivotally connected to the forward

end of said seat link, a second link pivotally connected to said base link at a location intermediate the ends of said base link, an actuating link pivotally mounted upon the forward end of said base link and pivotally connected to said first link to actuate said linkage upon movement of said seat link relative to said base link, and a laterally offset portion on said actuating link extending across the plane of movement of said seat link to permit one end of said actuating link to pass upwardly at one side of said seat link when said seat link is in said normal position with said offset portion disposed beneath said seat link, said laterally offset portion of said actuating link also extending across the path of movement of said second link and being engageable therewith to establish said reclined position of said seat link.

7. A reclining chair linkage comprising a base link, a seat link supported at its rearward end upon said base link for pivotal movement between a normal position and a reclined position in a plane of movement parallel to and laterally offset from the general plane of said base link, a foot rest linkage interconnected between said base link and said seat link and constrained thereby to be located in a contracted position when said seat link is in said normal position and to be located in an extended position projecting forwardly from said seat and base links when said seat link is in said reclined position, said foot rest linkage comprising a first link pivotally connected at one end to the forward end of said seat link, a cross link pivotally connected at a location intermediate its ends to an intermediate location upon said first link, a leg rest link pivotally connected at one end to one end of said cross link, a control link pivotally connected at one end to the other end of said first link and pivotally connected at its other end to the other end of said leg rest link, a guide link pivotally connected at one end to the other end of said cross link and pivotally connected at its other end to said base link at a location intermediate the ends of said base link, an actuating link pivotally mounted on the forward end of said base link and pivotally connected at one end to said first link to actuate said foot rest linkage upon pivotal movement of said seat link relative to said base link, and a laterally offset portion on said actuating link extending across the plane of movement of said seat link to permit said actuating link to extend upwardly at one side of said seat link when said seat link is in said normal position with said offset portion disposed beneath said seat link, said laterally offset portion of said actuating link also extending across the path of movement of said guide link and being engageable therewith to establish the reclined position of said seat link.

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