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CHAIR CONSTRUCTION

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FIG. 1

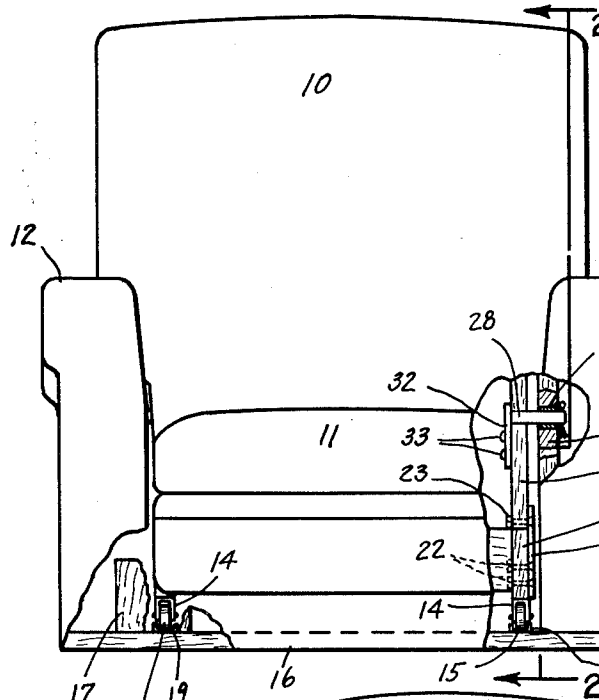


FIG. 2

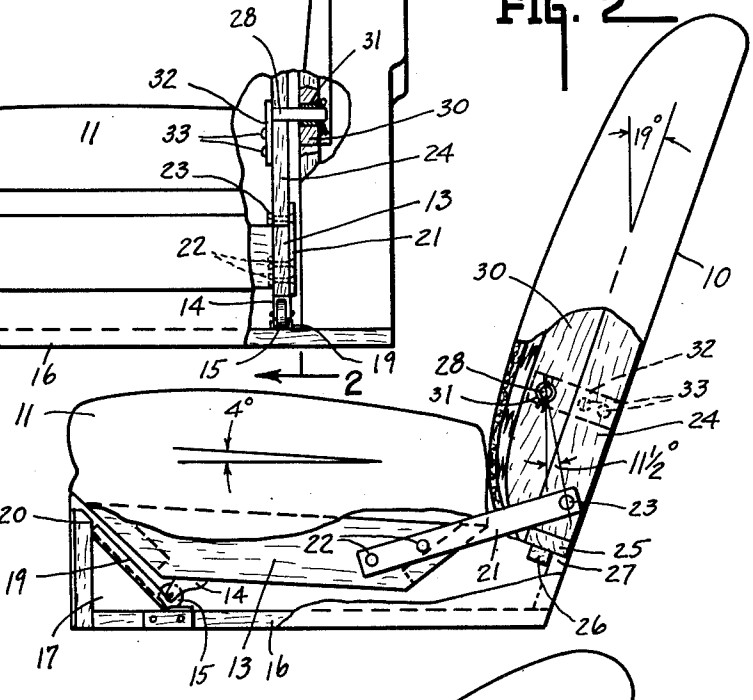
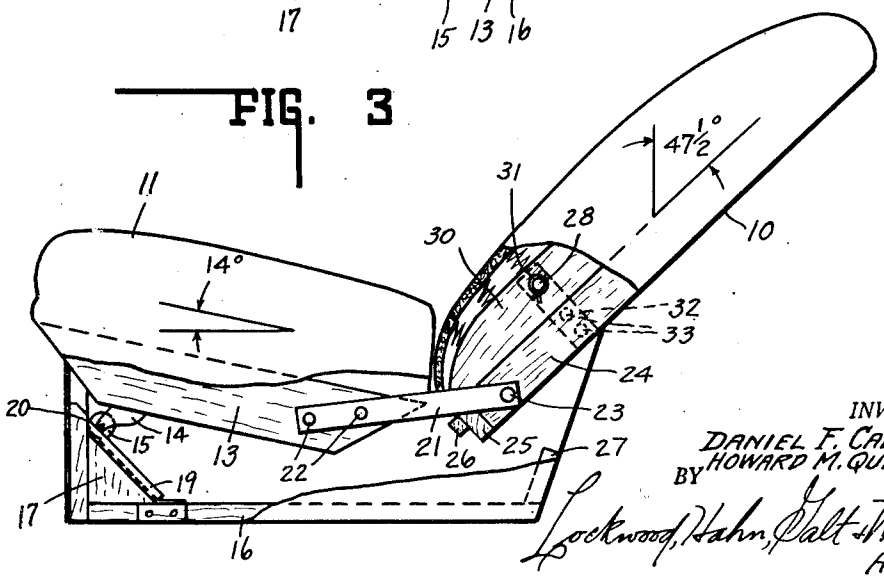


FIG. 3



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CHAIR CONSTRUCTION

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5 Claims. (Cl. 155—116)

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This invention relates to a chair construction of reclining character.

It is the primary object of this invention to provide a chair construction of such character that regardless of the angular disposition of the seat relative to the horizontal, the degree of inclination of the back relative to the vertical will automatically be coordinated therewith to afford an extremely comfortable sitting or reclining angle for the user. In short, a completely coordinated seat angle will automatically be provided at all different chair positions. This is accomplished through the provision of cooperating members which operate according to friction and balance control principles as will hereinafter be pointed out in detail.

It is a further object of the present invention to provide a chair construction of such character that regardless of the angle formed by the seat and back, the chair will always approximate if not achieve a state of equilibrium or balance so that the relative positions of the seat and back may be maintained by the weight of the user without resorting to latching mechanisms or the like.

It is a still further object of the present invention to provide a chair which embodies the features of simplicity of operation and of construction. As a result there is a substantial reduction of labor and parts costs in connection with its fabrication as compared with the manufacture of other types of reclining chairs.

It is a still further object of the present invention to provide a chair which serves as a posture chair and which is designed in accordance with good medical practice and fully relaxes the body in all positions.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings Fig. 1 is a front elevation view of the invention with parts thereof broken away.

Fig. 2 is a vertical section view thereof with parts broken away taken on line 2—2 of Fig. 1 in the direction of the arrows.

Fig. 3 is a view similar to Fig. 2 with the exception that the chair is shown in reclining position.

In the drawings the back of the chair is shown at 10, the seat at 11 and the side arms thereof at 12.

Supporting the seat is the seat frame 13 having inwardly converging ends which in cross section are of inverted trapezoidal configuration.

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Depending from the bottom of the frame adjacent its two front corners are the caster horns or yokes 14 which carry the caster rollers 15.

Secured to the bottom frame 16 of the chair inwardly of its opposite front corners are a pair of upstanding substantially triangular blocks 17. As shown in the drawings, the face constituting the hypotenuse of each triangular block has a roller guide 19 secured thereto which comprises a piece of channel iron or any other suitable guide having flanges formed adjacent the side edges thereof. While the hypotenuse of each block and the guide secured thereon are shown in the drawings to have a straight surface, it is to be understood that the surface may be curved or arcuate, if desired. At the upper terminus of each guide is the stop shoulder 20 which serves to limit the rollers in their upward and forward travel.

When the rollers are at the bottom of the inclined guides (see Fig. 2) the seat of the chair will be in its normal position, which is preferably at a 4 degree angle relative to the horizontal. Connecting the back of the chair with the seat are the two elongated support arms 21. These arms are preferably metallic and are rigidly secured to the side portions respectively of the seat frame 13 adjacent the rear ends thereof by any suitable media such as the screws 22. The opposite end of each support arm is pivotally secured by a suitable member 23 such as a screw, bolt or the like to the side frame portions 24 of the back of the chair. This member serves as a fulcrum point of the seat unit on the back unit of the chair. It will be observed that the seat support arms are inclined upwardly from their point of connection to the seat frame 13 to their point of connection to the back frame 24. This angle of inclination is such that when the chair is in its substantially "upright" position as shown in Fig. 2, the chair back will be disposed at an angle of approximately 19 degrees relative to the vertical while the chair seat is, as aforesaid, inclined at approximately 4 degrees relative to the horizontal.

Depending from the bottom 25 of the back frame 24 is a member 26 of wood or the like which will engage with a stop shoulder formed by a member 27 disposed at the rearward end of the bottom frame 16 to prevent the back of the chair from being moved to an upright position less than substantially 19 degrees relative to the vertical. In addition, the stop shoulder will prevent the rollers from rearward movement to a

point out of engagement with their respective guides.

The fulcrum point of the chair back is located at 28, it comprising a bolt or other suitable securing means of substantial length which pivotally connects back frame member 24 to the frame member 30 secured to each side arm. The outer end of the securing means may be encased, if desired, in the bushing or bearing 31 with the inner end thereof passed through an aperture formed in the bracing plate 32 which is secured to the back support frame by the screw 33. It will be observed that the aforementioned seat unit fulcrum point is located rearwardly approximately 11½ degrees of a perpendicular line extended through the chair back fulcrum point for a purpose hereinafter commented upon in detail.

When a person sits down in the chair while it is in its substantially upright position as shown in Fig. 2, his or her weight will automatically be distributed in such manner that approximately one-half will bear on the rollers, while the remaining half will bear upon the seat and back unit fulcrum points respectively. The distance between said fulcrum points is always constant, and as the back is pivoted backwardly about fulcrum point 28 it naturally follows that the fulcrum point 23 will first move downwardly and forwardly in an arcuate path. By reason of this construction it inevitably follows that when the back of the chair is pivoted backwardly from such substantially upright position the force necessary to move it will be less than otherwise by reason of the clockwise applied torque which is available on account of the relative location of the fulcrum point 23 and the fulcrum point 28. While this clockwise applied torque is always present so long as the fulcrum point 23 is disposed rearwardly of a vertical line drawn through fulcrum point 28, and consequently is always urging the chair back to reclining position, it is nonetheless true that the gravity force applied to both fulcrum points by the weight of the user upon sitting down in the chair, as aforesaid, will not be sufficient in and of itself to result in the back of the chair being pivoted backwardly. This is true for the reason that the gravity force is exerted against the rollers and is not sufficient to overcome the horizontal vector force exerted against them. Not until additional force is exerted against the upper portion of the back of the chair will the combination of that additional force and the existent applied force be sufficient to produce any chair seat and back movement. To state it in another way: the forces exerted by the user of the chair against the fulcrum points and against the rollers are, by reason of applicant's construction, in approximate balance or equilibrium. The applied force described above is not in and by itself sufficient to overcome that balance. Additional force is necessary.

In order to apply the additional force and move the back of the chair backwardly about its fulcrum point 28, it is necessary only for the user to lean backwards or to rest his hands upon the side arms of the chair and push backwards. As soon as enough force is thus exerted to overcome the aforementioned downward force exerted upon the rollers, the back will be pivoted to the reclining position desired. When the user stops exerting force upon the upper portion of the chair back, both the seat and the back units will maintain their relative position due to the

opposing forces being equal and in opposite directions. If the user is resting just slightly off the natural position of the chair, say for example at an angle of 24 degrees from the vertical, the balanced force from the back of the chair is made up by a clockwise torque produced by reason of the fact that approximately one-half the body weight on the seat is transmitted to the seat unit fulcrum together with the clockwise force of the upper portion of the body of the user being applied around the chair back fulcrum point which is held from moving by the opposing force at the seat unit fulcrum. The opposing force from the seat unit is obtained from a horizontal vector component force of approximately one-half the body weight of the operator applied to the seat. This horizontal vector component force is derived from the inclined plane of the blocks and is transmitted from the blocks through the rollers and frame of the seat and seat hinges to the chair back at the seat unit fulcrum point.

If resting just slightly from the fully reclined position, for example 40 degrees back from the vertical, the balanced forces from the back are derived from a counterclockwise torque produced by approximately one-half the body weight of the seat unit being transmitted to the seat unit fulcrum together with the clockwise force of the user's upper body weight being applied around the back fulcrum at the seat unit fulcrum. The greatly increased clockwise torque produced by the user's upper body on the back in that position is offset by the counterclockwise torque produced by the user's lower body weight on the lower back and on the seat unit, together with the vector component force from the blocks' inclined planes. The vector component force remains in the same direction and through all positions of rest. In the event the opposing forces should, for any reason, be slightly off balance, they may be equalized through the user placing his feet on a footstool or ottoman, or a friction spring against the back side frame at the seat unit fulcrum point may be used to give a neutral direction static force.

While the invention has been illustrated and described in great detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The invention claimed is:

1. A chair construction of the character described, comprising a chair frame including bottom and side arm portions, a seat unit disposed within said frame and movable to and fro relative thereto, a back unit pivotally connected to said side arms, an elongated element rigidly connected adjacent one end to said seat unit and pivotally connected adjacent its other end to said back unit above said rigid connection and at a point normally rearwardly of and below said first mentioned pivotal connection, and an upwardly inclined member secured to said frame adjacent the front end of the bottom portion thereof, the front portion of said seat unit being movable upwardly and downwardly upon said member.

2. A chair construction of the character described comprising a chair frame including bottom and side arm portions, a seat unit disposed within said frame and movable to and fro relative thereto, a back unit pivotally connected to said side arms, an elongated element rigidly connected adjacent one end to said seat unit and pivotally connected adjacent its other end to said

back unit above said rigid connection and at a point normally rearwardly of and below said first mentioned pivotal connection, an upwardly inclined member secured to said frame adjacent the front end of the bottom portion thereof, the front portion of said seat unit being movable upwardly and downwardly upon said member, and stop means limiting the forward and rearward movements respectively of said back unit beyond predetermined points.

3. A chair construction of the character described comprising a chair frame including bottom and side arm portions, a seat unit normally inclined upwardly from back to front at an angle of approximately 4 degrees relative to the horizontal, said unit being supported within said frame and movable to and fro relative thereto, a back unit pivotally connected to the side arms of said frame and normally disposed rearwardly of the vertical at an angle of approximately 19 degrees, an elongated element rigidly connected adjacent one end to said seat unit and pivotally connected adjacent its other end in a plane above said rigid connection to said back unit at a point normally rearwardly of and below said first mentioned pivotal connection, and a pair of upwardly inclined members secured to said frame adjacent the front end of the bottom portion thereof, said seat unit having lower forward portions thereof inwardly inclined substantially complementary to the inclined surfaces of said members, said inclined portions being freely movable upwardly and downwardly thereupon.

4. A chair construction of the character described comprising a chair frame including bottom and side arm portions, a seat unit supported within said frame and normally being inclined upwardly from back to front at an angle of approximately 4 degrees relative to the horizontal, a back unit pivotally connected to the side arms of said frame and normally disposed rearwardly of the vertical at an angle of approximately 19 degrees, an elongated element rigidly connected adjacent one end to said seat unit and pivotally connected adjacent its other end to said back unit above said rigid connection, the point of pivotal connection of said element being substantially below and normally approximately 11½ degrees rearwardly of a vertical line extending

through the point of pivotal connection of said back unit, and at least one upwardly and forwardly inclined member secured to said frame adjacent the front end of the bottom portion thereof, said seat unit having at least one lower forward portion thereof inwardly inclined and being complementary to and in alignment with the inclined surface of said inclined member.

5. A chair construction of the character described comprising a chair frame including bottom and side arm portions, a seat unit having at least two depending rollers and being normally inclined upwardly from back to front at an angle of approximately 4 degrees relative to the horizontal, said unit being supported within said frame and movable to and fro relative thereto, a back unit pivotally connected to the respective side arms of said frame and normally disposed rearwardly of the vertical at an angle of approximately 19 degrees, a pair of elongated elements each being rigidly secured adjacent one end to a side of said seat unit and pivotally connected adjacent the other end to a side of said back unit above the point where each element of the pair is rigidly secured, the respective points of pivotal connection of said elements normally being substantially below and approximately 11½ degrees rearwardly of a vertical line extending through the points of pivotal connection of said back unit to the side arms of said frame, and a pair of upwardly and forwardly inclined members secured to said frame adjacent the front end of the bottom portion thereof, said members being inclined at an angle of approximately 45 degrees, said seat unit having portions thereof downwardly and inwardly inclined complementary to the inclined surfaces of said respective inclined members and being in alignment therewith.

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