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Sloan

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[54] **RECLINING CHAIR AND MECHANISM THEREFORE**

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[52] **U.S. Cl.** **297/85,** 297/90, 297/83

[51] **Int. Cl.** **A47c 1/02**

[58] **Field of Search** 297/83, 84, 86, 90, 297/91, 320, 316, 68, 311, 322

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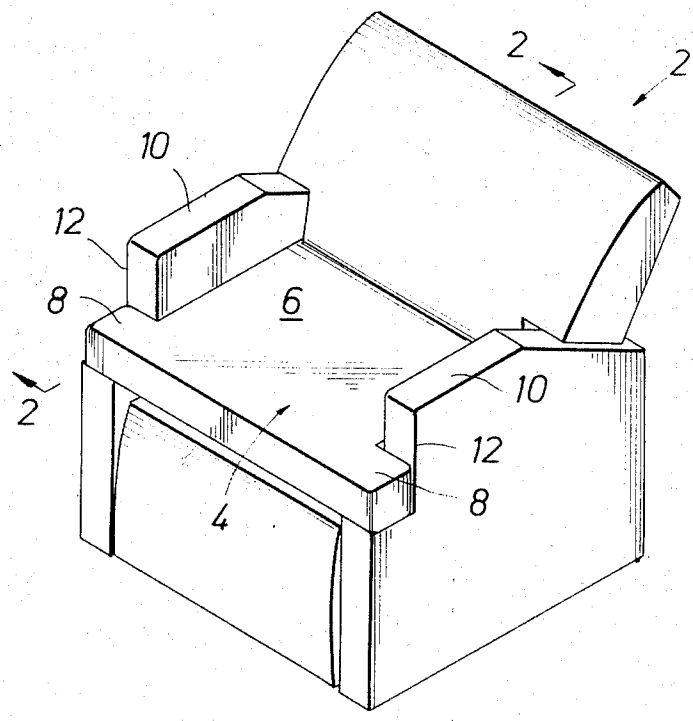
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[57] **ABSTRACT**

A traditional style reclining chair with a T-cushion adapted to accommodate a sitter in upright and reclined positions and a mechanism therefor in which the rear end of a seat frame drops as a back frame reclines from the upright to a semi-reclined position with minimal rearward movement of the front end of the seat frame. As the back frame reclines further to the reclined position, the rear end of the seat frame moves upwardly, although at all positions a slight floating action of the rear end of the seat frame is provided to enable the particular sitter to seek his own most comfortable position. The back frame is resiliently biased toward the semi-reclined position at the reclined position or any position therebetween. A leg support frame is upwardly extensible via a scissors mechanism upon movement of the back frame from the upright to the semi-reclined position and, according to one embodiment, extends further outwardly upon further movement of the back frame toward the reclined position. Reversible electric motors for effecting the foregoing are attached to the back frame and the scissors mechanism.

15 Claims, 8 Drawing Figures



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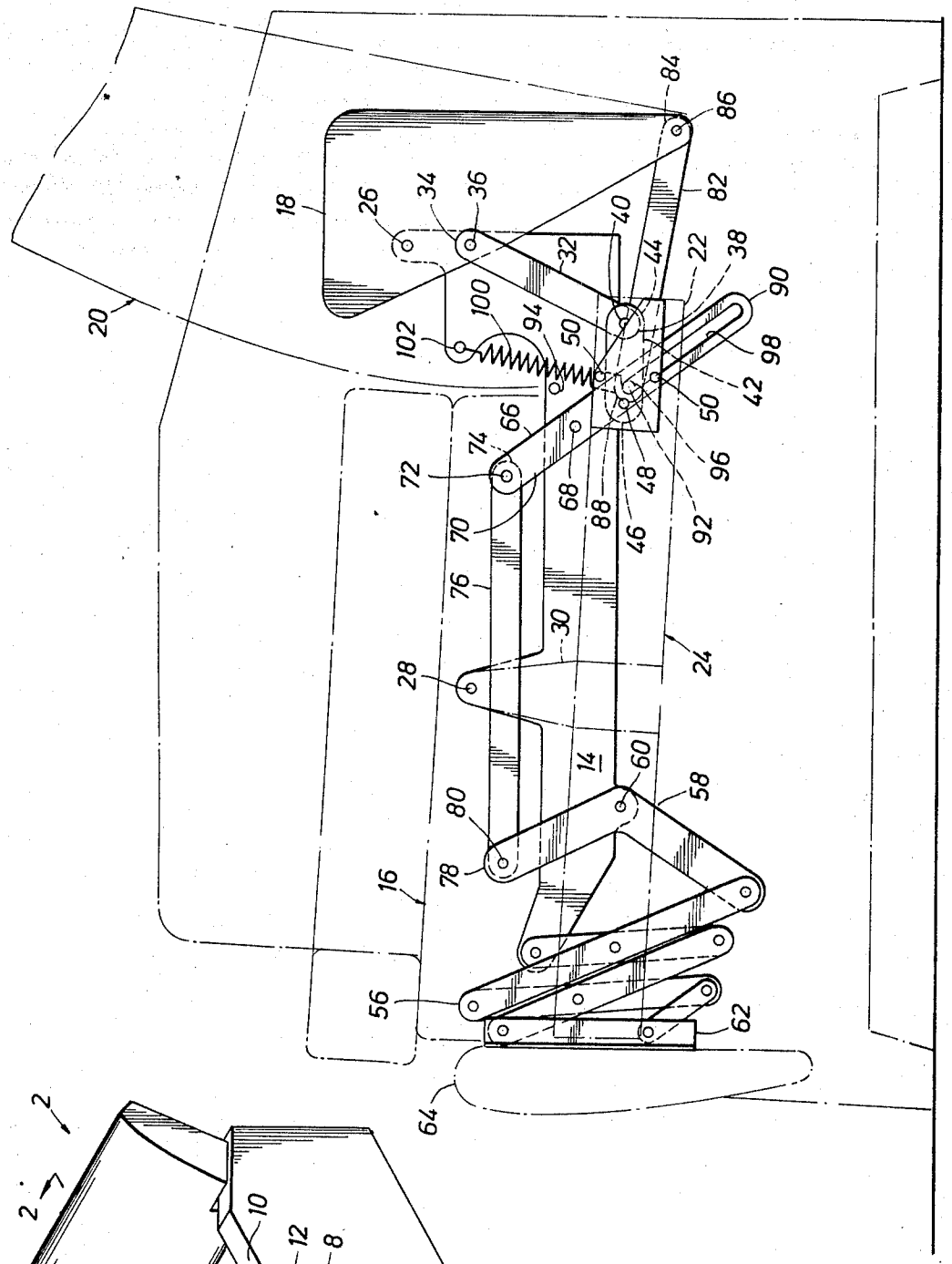


FIG. 2

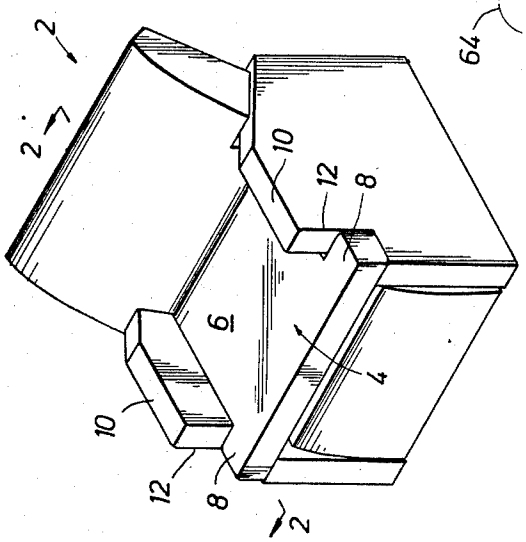


FIG. 1

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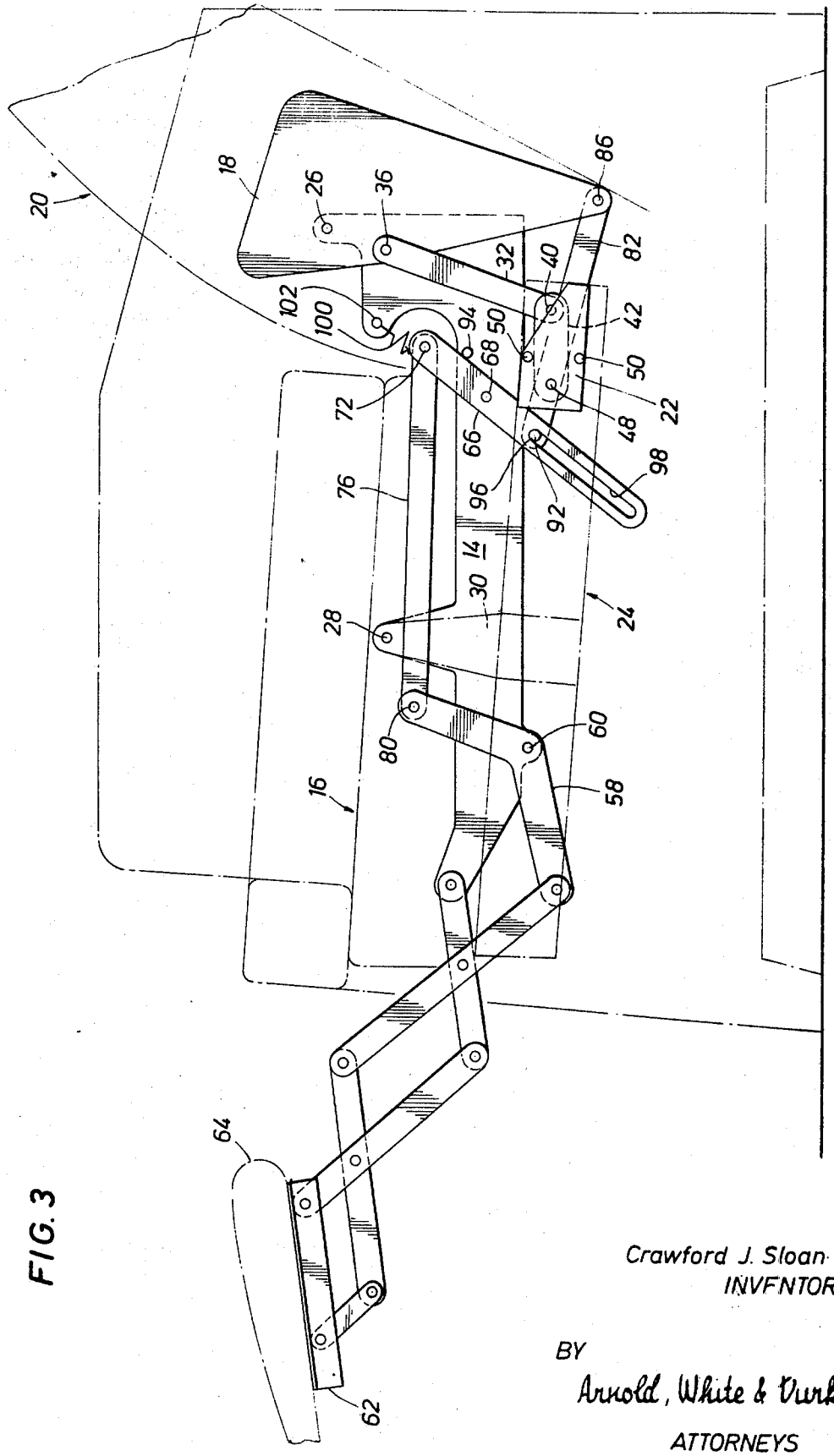


FIG. 3

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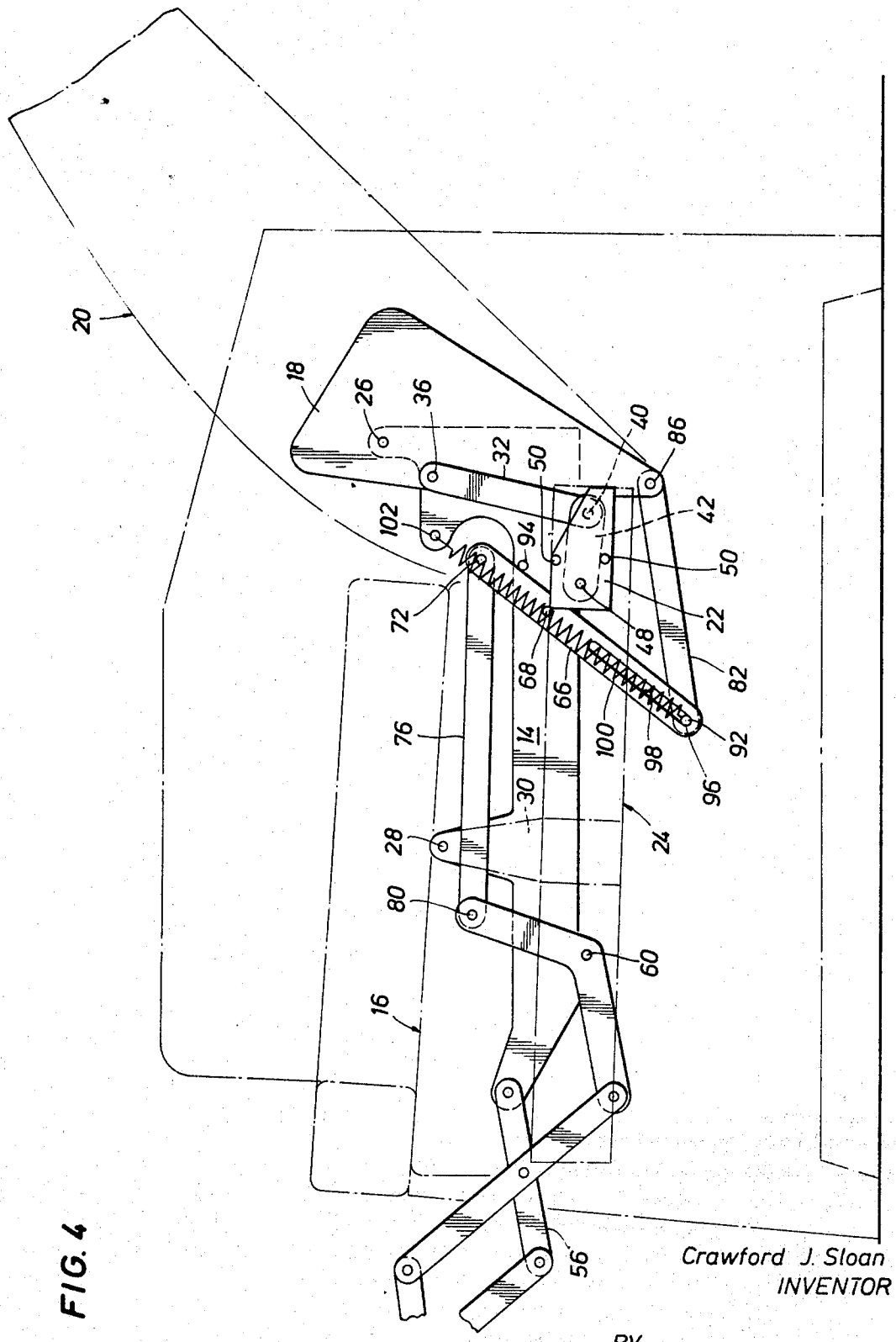
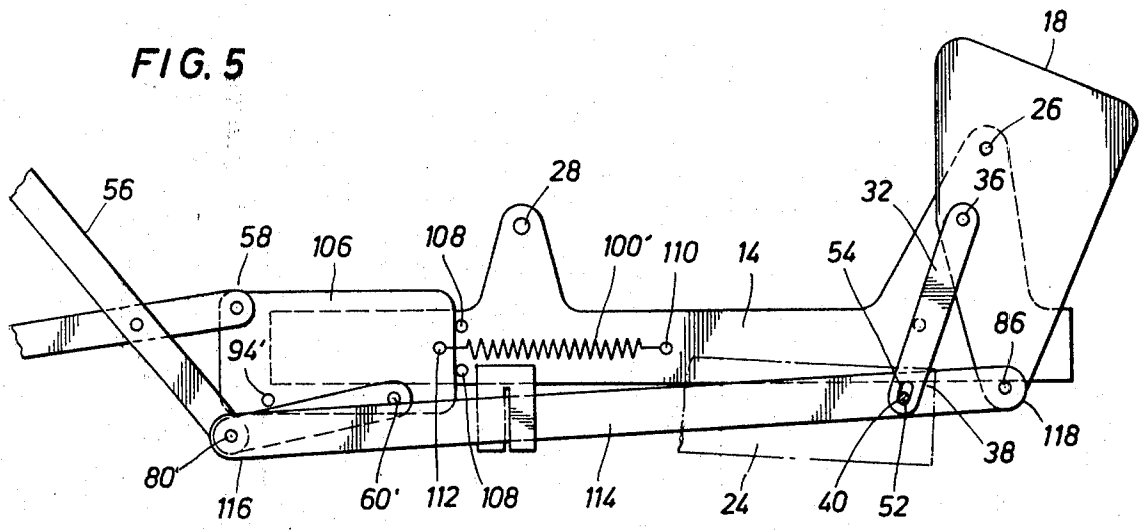


FIG. 4

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FIG. 5



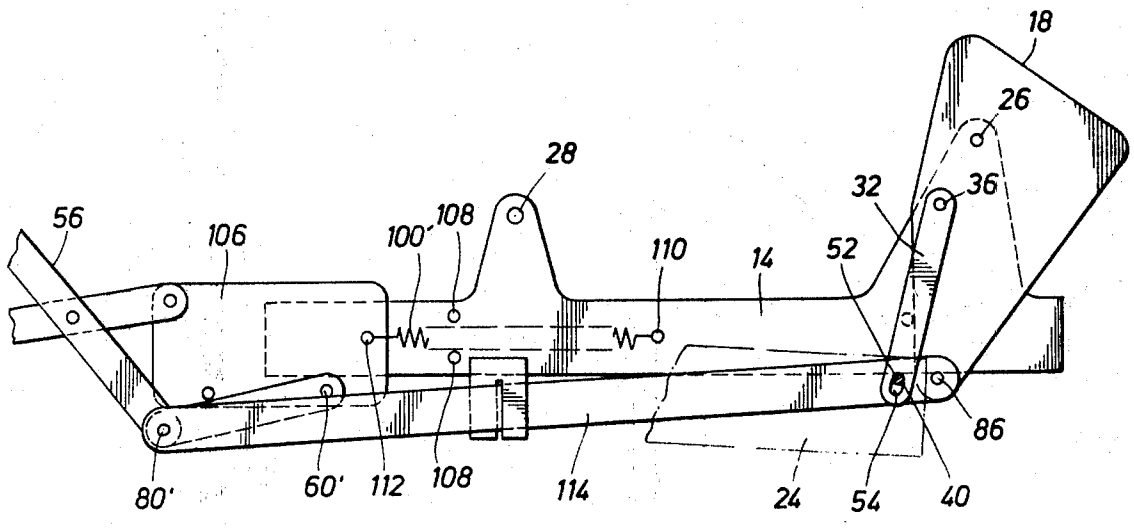


FIG. 6

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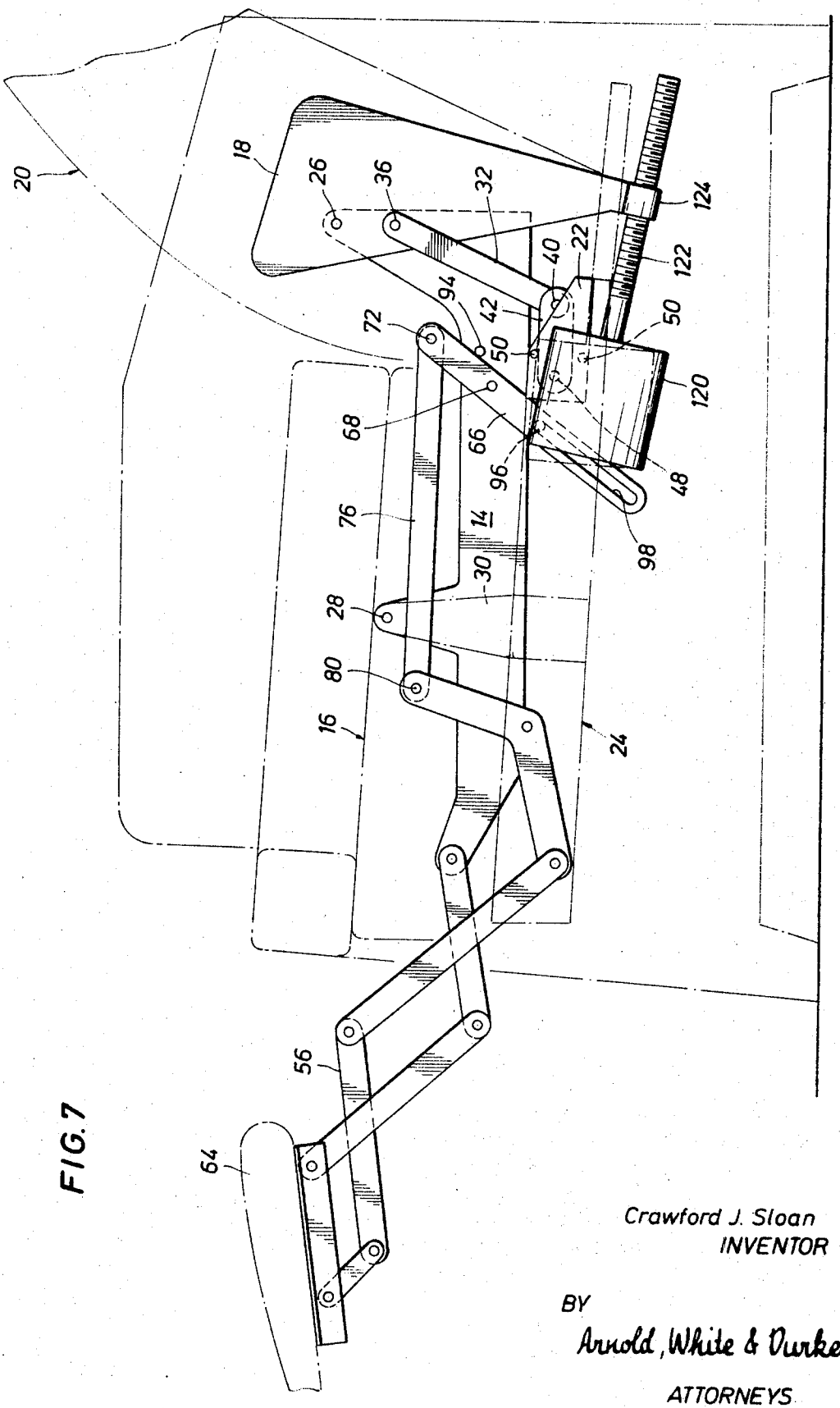


FIG. 7

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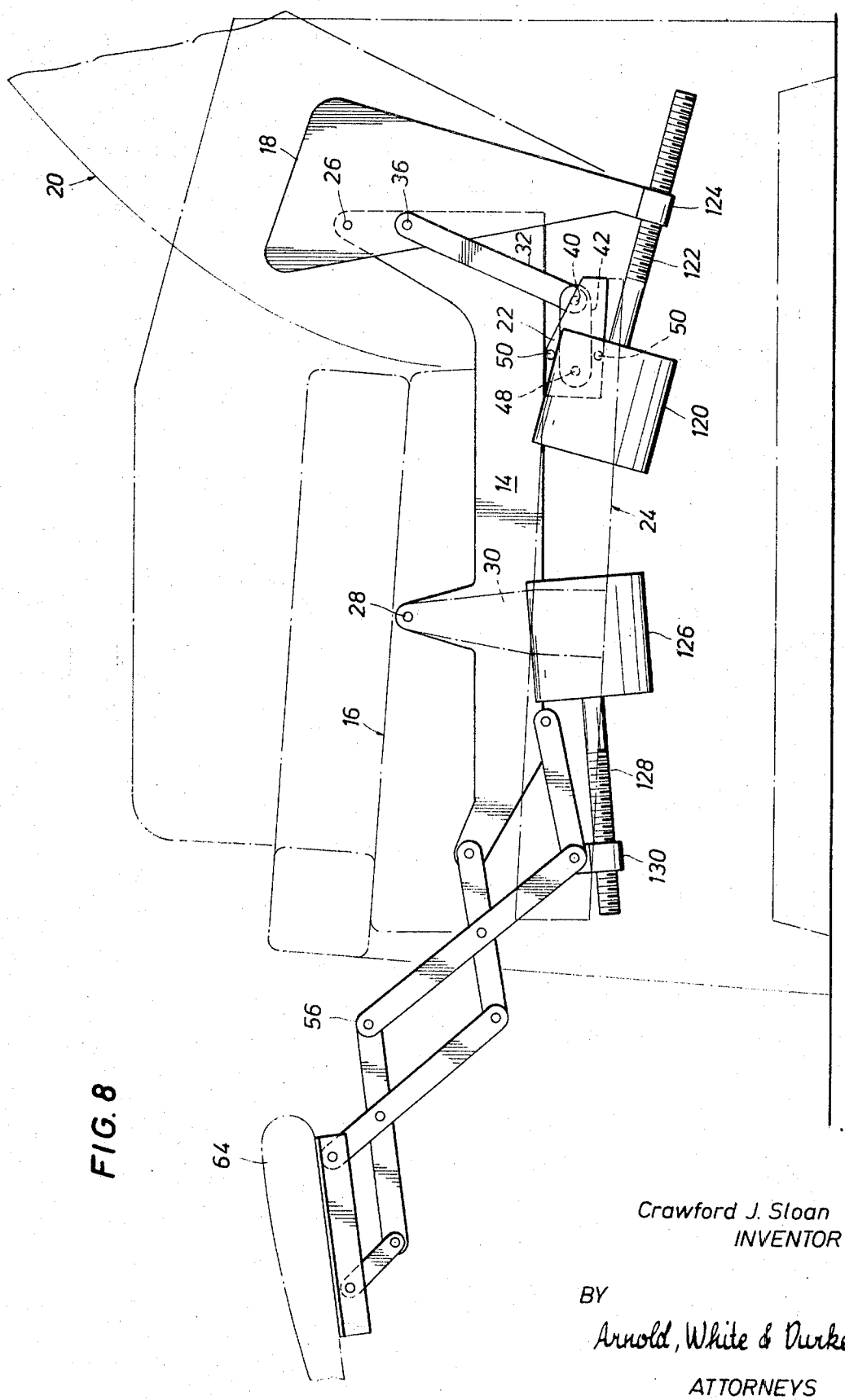


FIG. 8

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RECLINING CHAIR AND MECHANISM THEREFORE

BACKGROUND OF THE INVENTION

This invention relates generally to reclining chairs and mechanisms therefor, and more particularly to reclining chairs having a T-shaped seat cushion and mechanisms therefor.

For reclining chairs, particularly those reclining from an upright position to a semi-reclined position to a reclined position, it is desirable for the rear portion of the seat cushion to drop slightly as the chair reclines from the upright position to the semi-reclined position whereby the chair will tend to cradle the sitter in place. However, this has not been satisfactorily accomplished in the novel traditional style prior art reclining chairs which employ T-shaped seat cushions since the mechanisms heretofore used in a typical reclining chair have produced a movement of the seat such that the bar portions of the T-cushion, to be contrasted with the stem portion, would be crushed against the arm supports. That is, as the rear portion of the seat dropped in the usual traditional style prior art reclining chairs, the front portion thereof, including the bar portions in the case of a T-cushion, would undergo a significant rearward movement to deform the bar portions by engagement with the arm supports. Accordingly, traditional style prior art chairs with T-cushions have not used a rear seat drop in going from the upright position to the semi-reclined position or necessarily either the arm support has been shaped to accommodate the rearward movement of the bars of the T-cushion or the seat has been adapted to also slide forward to an unsightly position uncomfortably displaced from the back of the chair. Moreover, it has been found that the most comfortable angle of inclination of the seat varies over a slight range depending upon the physical characteristics of the sitter so that it is desirable to provide a slight floating action with respect to the rear of the seat frame.

SUMMARY OF THE INVENTION

In a broad aspect, the present invention contemplates a reclining chair having a chair frame, a back frame, and a seat frame, means for pivotally mounting the back frame and the seat frame to the chair frame, and means for dropping the rear end of the seat frame as the back frame reclines from the upright to the semi-reclined positions with a minimal rearward movement of the front end of the seat frame. The invention also includes means for raising the rear end of the seat frame upon further reclining of the back frame; means for providing the rear end of the seat frame with a slight floating action; means for resiliently biasing the back frame toward the semi-reclined position at the reclined position or any position therebetween; and means for producing an outward extension of a raised leg support frame upon movement of the back frame from the semi-reclined to the reclined positions.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a traditional style reclining chair embodying the present invention, the chair being illustrated in the upright position;

FIGS. 2—4 are elevation views of one embodiment of the present invention shown in the upright, semi-reclined, and reclined positions, respectively;

FIGS. 5–6 are elevation views of another embodiment of the invention shown in the semi-reclined and reclined positions, respectively;

FIGS. 7–8 are elevation views of two further embodiments of the present invention including automatic power means for effecting the reclining of the chair.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings wherein like reference characters designate identical or corresponding parts throughout the several views, and more particularly to FIG. 1 thereof wherein there is shown a traditional style reclining chair 2 illustrated in the upright position. Chair 2 has a T-shaped seat cushion 4 comprising a stem portion 6 and bar portions 8 and, as is customary in traditional style chairs, arms 10 supported by arm supports 12 extending substantially vertically upward from a point immediately behind the bar portions of the T-cushion. Of course, the seat cushion may be a discrete member, separate from but resting on a seat frame; and the back cusion may be integral with a back frame. Alternatively, the converse may exist; or the seat and back cushions may both be either separable from or integral with the seat and back frames, respectively. The present invention is directed to the interrelationship between the seat frame, the back frame, and a chair frame; accordingly, the specific relationship between the cushions and the frames is not essential to an understanding of this invention beyond the fact that the relative positions of the seat and back cushions generally correspond to the relative positions of the seat and back frames.

Referring now to FIG. 2, there is shown a chair plate 14 adapted to be fixedly secured to a relatively stationary chair frame 16, a back plate 18 adapted to be fixedly secured to a back frame 20, and a seat plate 22 adapted to be fixedly secured to a seat frame 24.

Back plate 18 is pivotally mounted to chair frame 20 at a pivot point 26 which is positioned substantially higher than the intersection of the back frame and the seat frame. Pivot point 26 is positioned relatively high to produce a forward movement of the lower portion of the back frame as it reclines from the upright position to a semi-reclined position so that there will not be an unsightly and uncomfortable gap between the bottom of the back frame and the rear of the seat frame.

Seat frame 24 is pivotally mounted relative to chair frame 16 about a pivot point 28 by any convenient means, such as supporting strut 30 pivotally mounted at one end to chair plate 14 at pivot point 28 and fixedly secured at the other end to the seat frame. Pivot point 28 is preferably positioned proximate the mid-portion of the seat frame but forward of the mid-point thereof to provide a pivot point about which a sitter can easily cause pivotal movement of the seat frame by shifting his weight forwardly or rearwardly but which will nevertheless tend to drop the rear end of the seat frame when one is seated thereon. Pivot point 28 is preferably positioned as high relative to the seat frame as possible consistent with aesthetic considerations so

that the front end of the seat frame will undergo a minimal rearward movement as the rear end of the seat frame pivots downwardly. It should be apparent that even less rearward movement of the front end of the seat frame may be attained by positioning pivot point **28** as far forward as possible; but, since that is not feasible if the sitter is to be able to comfortably and easily balance the seat frame about the pivot point by shifting his weight, it becomes quite essential to maximize the height of the pivot point relative to the seat frame and locate that pivot point just forward of the mid-point of the seat frame.

To effect a movement of the seat frame in response to movement of the back frame, a bar linkage **32** has one end **34** pivotally mounted relative to back frame **20** about a pivot point **36** and another end **38** pivotally relative to the seat frame at a pivot point **40**; and another bar linkage **42** has one end **44** pivotally mounted to end **38** of bar linkage **32** at pivot point **40** and another end **46** pivotally mounted relative to seat frame **24** at pivot point **48.** Thus, the seat frame is secured to the chair frame as part of a five-bar linkage. However, the pivotal movement of bar linkage **42** relative to the seat frame is narrowly limited by any convenient means, such as stops **50** fixedly secured to seat plate **22** so that, in essence, the seat frame responds as if it were a part of a four-bar linkage except for an additional limited pivotal movement of the seat frame relative to the chair frame about pivot point **28** within the limits provided by stops **50.** In that manner, the general inclination of the seat frame is a function of the position of the back frame although a slight variation in the inclination of the seat frame between the stops may be effected by a sitter's shifting his weight with respect to pivot point **28.** The further but limited degree of freedom provided by linkage **42** produces a slight floating action of the rear end of the seat frame, principally in the vertical direction, to comfortably accommodate various sitters in different positions.

As illustrated in FIG. **2,** the chair is in the upright position. It should be noted that pivot point **26** is higher than pivot point **36** which is higher than pivot point **40** but that pivot point **36** is behind a straight line between pivot points **26** and **40** when the back frame is in the upright position. In that manner, as the back frame reclines from the upright position shown in FIG. **2** to a semi-reclined position shown in FIG. **3,** pivot points **26, 36,** and **40** assume positions substantially on a straight line; and pivot point **40** will have been moved downwardly relative to the chair frame. Thus, as the back frame reclines from the upright position to the semi-reclined position, the seat frame will pivot about pivot point **28** and the rear end of the seat frame will drop. In either position there is still provided the slight floating action of the seat frame between stops **50.** However, as the back frame further reclines to a reclined position shown in FIG. **4,** pivot point **36** moves forward of the straight line between pivot points **26** and **40** so that the rear of the seat frame will move upwardly as is desirable in going from the semi-reclined position to the reclined position.

In FIG. **5,** there is shown another embodiment of the invention in which the floating action is provided in a slightly different manner. A pivot pin **52,** fixedly secured relative to seat frame **24** at pivot point **40,** is slidably and rotatably positioned in a closed slot **54** formed in end **38** of bar linkage **32.** Thus, the limited sliding movement of pivot pin **52** within slot **54** provides the further but limited degree of freedom corresponding to the slight floating action described with respect to the embodiment shown in FIG. **2.**

Referring again to FIG. **2,** there is shown a compound scissors mechanism **56** having one end **58** suitably secured relative to the forward end of chair frame **16,** as by being pivotally mounted to chair plate **14** at at least a pivot point **60,** and another end **62** adapted to support an extensible leg support frame **64.**

A bar linkage **66,** pivotally mounted proximate the mid-portion thereof relative to chair frame **16** at a pivot point **68,** has one end **70** pivotally mounted at a pivot point **72** to end **74** of a bar linkage **76,** the other end **78** of which is pivotally mounted at a pivot point **80** to the scissors mechanism. Thus, a four-bar linkage, effected between pivot points **60, 68, 72,** and **80,** is suitably provided for extending the scissors mechanism.

A bar linkage **82** has one end **84** pivotally mounted relative to back frame **20** at pivot point **86** and another end **88** pivotally mounted relative to another end **90** of bar linkage **66** at a pivot point **92.** Thus, a four-bar linkage type of mechanism is established between pivot points **26, 68, 86,** and **92,** bar linkage **66** being common to both four-bar linkages. Accordingly, pivotal movement of the back frame from the upright position shown in FIG. **2** to the semi-reclined position shown in FIG. **3,** will effect an outward extension of the scissors mechanism through the two four-bar linkages. The extent of the outward scissors-action of the scissors mechanism is limited by any appropriate means, such as stop **94** secured to the chair plate. If not already apparent it should be noted that the means for effecting movement of the seat frame is generally independent of the means for effecting movement of the leg frame, except that both are responsive to movement of the back frame. To provide a reclining chair having the capacity to further recline from the semi-reclined position shown in FIG. **3** to the reclined position shown in FIG. **4,** a pivot pin **96,** fixedly secured to end **88** of bar linkage **82,** is slidingly and rotatably secured in an elongate closed slot **98** formed in end **90** of bar linkage **66.** For movement between the upright and semi-reclined positions, pivot pin **94** is firmly secured against the upper end of slot **98** by resilient biasing means, such as coil spring **100** having one end fixedly secured relative to the chair frame at point **102** and another end fixedly secured relative to end **88** of bar linkage **82.** Thus, in reclining from the upright to the semi-reclined positions, the effect of the two interconnected four-bar linkages is simply to extend the scissors mechanism after which the back plate may recline further against the bias of spring **100** to assume the reclined position. Preferably spring **100** is selected to provide a appropriate tension so that a sitter can comfortably stop the chair at any position between the semi-reclined and reclined positions merely by resting against the back frame. It should also be noted that the spring bias toward the semi-reclined position will aid a sitter in returning to the semi-reclined position from the reclined position or any position therebetween.

To effect the appropriate leverage against spring **100** according to the embodiment shown in FIGS. **2** and **3,** in the upright and semi-reclined positions pivot point **26** is higher than pivot point **92** which is higher than pivot point **86** and pivot point **86** is behind a straight line between pivot points **26** and **92.** Thus, as the back

frame further reclines from the semi-reclined position, pivot point 86 will move closer to the straight line between pivot points 26 and 92 forcing pivot pin 96 down slot 98.

In the embodiment illustrated in FIGS. 5 and 6, there is shown another manner of extending the scissors mechanism and providing movement of the back frame against a resilient bias from the semi-reclined to the reclined positions. End 58 of scissors mechanism 56 is secured to a carriage 106 which is slidably mounted relative to chair frame 16. A limit on the outward extension of the scissors mechanism is provided by a stop 94' on the carriage; and stops 108 fixedly secured relative to the chair frame limit the rear position of the carriage. A coil spring 100' has one end fixedly secured relative to the chair frame at a point 110 and another end secured relative to the carriage at a point 112, so that spring 100' will resiliently bias the carriage toward its rearward position.

A bar linkage 114 has one end 116 pivotally mounted to the scissors mechanism at pivot point 80' and another end 118 pivotally mounted to back plate 18 at pivot point 86, effecting a four-bar linkage between pivot points 26, 60', 80', and 86 for extending the scissors mechanism in response to movement of the back frame from the upright position to the semi-reclined position. Since the outward extent of the scissors mechanism is limited by stop 94', further pivoting of the back frame from the semi-reclined position shown in FIG. 5 to the reclined position shown in FIG. 6 produces an outward sliding movement of carriage 106 against the resilient bias of spring 100'. Although the effect of the resilient bias of the embodiment of FIGS. 5 and 6 is substantially as that of FIGS. 2–4, the embodiment of FIGS. 5 and 6 has the additional capability of providing a further outward transverse movement of the leg support frame in going from the semi-reclined position to the reclined position.

Of course, the present invention further contemplates the use of automatic power means, such as reversible electric motors, for effecting the various movements heretofore described. Although a variety of functionally equivalent power means exist, reversible electric motors suffice to demonstrate the automatic capability.

For example, in FIG. 7, there is shown an embodiment similar to that of FIGS. 2–4, in which a reversible electric motor 120, having an extending turn screw 122, is suitably secured relative to the chair frame with the turn screw operatively engaging an internally threaded member 124 suitably secured to back plate 18. Accordingly, the motor may effect pivotal movement of the back frame, eliminating the need for a sitter to apply pressure via his back, while the rest of the mechanism functions as it does in the embodiment of FIGS. 2–4.

In FIG. 8, there is shown an embodiment similar to that of FIG. 7 in which the previously described means for effecting the outward scissors-action of the scissors mechanism is replaced by a reversible electric motor 126 having an extending turn screw 128. Motor 126 is suitably secured relative to the chair frame and turn screw 128 operatively engages an internally threaded member 130 suitably secured to the scissors mechanism. In the embodiments of FIG. 8, the position of the leg support frame is wholly independent of the position of the back frame, although each are similarly automatically controlled by mechanical power means.

According to the preferred embodiments, motors 120 and 126 are threaded members 124 and 130 are pivotally mounted with respect to the chair frame and the back frame and scissors mechanism, respectively, to prevent any binding of the threaded members on the turn screws.

It should be understood, of course, that the foregoing disclosure relates only to presently preferred embodiments of the invention and that numerous modifications or alternatives may be made therein without departing from the spirit and scope of the present invention. For example, although it is presently preferred to use two mechanisms in each reclining chair, it is within the contemplation of the present invention that there may be constructed a reclining chair requiring only one mechanism. In addition, it should also be understood that, although unitary chair plate 14 has been disclosed as fixedly secured to chair frame 16, the chair plate may comprise a plurality of sections which may or may not be secured to one another; and the same is likewise true with respect to back plate 18 and back frame 20, of course, the converse situation exists with respect to seat plate 22 and seat frame 24 in that there may be a single unitary L-shaped member extending from pivot point 28 down to the seat frame and therealong to the disclosed seat plate. It should also be apparent that the chair, seat, and back plates are not essential to the present invention since certain of the pivot points may be positioned directly on the respective frames in the absence of the plates. Thus, although those plates form a part of the presently preferred embodiments, it should be clear that these plates are merely a vehicle by which to describe the structural arrangement of and interaction between the respective frames and the other elements of the mechanism according to the present invention and that portions of the frames themselves may be considered the plates.

What is claimed is:

1. A reclining chair adapted for movement to accommodate a sitter in upright and reclining positions comprising:

a chair frame;

a back frame pivotally mounted relative to said chair frame about a first pivot point;

a seat frame pivotally mounted relative to said chair frame about a second pivot point forward of the mid-point of said seat frame and substantially higher than the lower surface thereof;

a first link having one end pivotally mounted relative to said back frame about a third pivot point lower than said first pivot point when said back frame is in the upright position and the other end pivotally mounted relative to said seat frame about a fourth pivot point lower than said third pivot point when said back frame is in the upright position and proximate the rear end of said seat frame; and

said third pivot point being positioned behind a straight line between said first and fourth pivot points when said back frame is in the upright position thereby enabling the pivoting of said back frame from the upright position to a semi-reclined position to effect a pivotal movement of said seat frame about said second pivot point and a generally downward movement of the rear end of said seat

frame as said back frame reclines from the upright position to the semi-reclined position.

2. The reclining chair of claim 1 wherein said third pivot point is positioned substantially on said straight line when said back frame is in the semi-reclined position thereby enabling the further pivoting of said back frame from the semi-reclined position to a reclined position to effect a pivotal movement of said seat frame about said second pivot point and a generally upward movement of the rear end of said seat frame as said back frame further reclines from the semi-reclined position to the reclined position.

3. The reclining chair of claim 1 further comprising means for providing said seat frame with a further but limited degree of freedom relative to said first link proximate said fourth pivot point, the major component of said further but limited degree of freedom being in the vertical direction.

4. The reclining chair of claim 1 further comprising a sencond link having one end pivotally mounted to said other end of said first link at said fourth pivot point and the other end pivotally mounted relative to said seat frame about a fifth pivot point proximate the vertical position of said fourth pivot point; and

stop means for narrowly limiting the pivotal movement of said seat frame relative to said second link.

5. The reclining chair of claim 1 further comprising a pivot pin fixedly secured relative to said seat frame at said fourth pivot point and rotatably and slidingly secured in an elongate closed slot formed in said other end of said first link.

6. The reclining chair of claim 1 further comprising means for slightly resiliently biasing said back frame toward a semi-reclined position when said back frame is between the semi-reclined position and a reclined position thereby enabling a sitter to comfortably stop the chair at any position therebetween by applying a small rearward force against said back frame.

7. The reclining chair of claim 1 wherein said first pivot point is positioned substantially above the intersection of said back frame and said seat frame.

8. The reclining chair of claim 1 further comprising:

reversible electric motor means operatively connected to said back frame to automatically effect pivotal movement of said back frame relative to said chair frame.

9. For use in a reclining chair having a chair frame, a back frame, and a seat frame and adapted for movement to accommodate a sitter in upright and reclining positions, a mechanism for interconnecting the chair, back, and seat frames comprising:

means for pivotally mounting the back frame relative to the chair frame about a first pivot point;

means for pivotally mounting the seat frame relative to the chair frame about a second pivot point forward of the mid-point of the seat frame and substantially higher than the lower surface thereof;

a first link having one end adapted to be pivotally mounted relative to the back frame about a third pivot point lower than said first pivot point when the back frame is in the upright position and the other end adapted to be pivotally mounted relative to the seat frame about a fourth pivot point lower than said third pivot point when the back frame is in the upright position and proximate the rear end of the seat frame; and

said third pivot point being positioned behind a straight line between said first and fourth pivot points when the back frame is in the upright position thereby enabling the pivoting of the back frame from the upright position to a semi-reclined position to effect a pivotal movement of the seat frame about said second pivot point and a generally downward movement of the rear end of the seat frame as the back frame reclines from the upright position to the semi-reclined position.

10. The mechanism of claim 9 wherein said third pivot point is positioned substantially on said straight line when the back frame is in the semi-reclined position thereby enabling the further pivoting of the back frame from the semi-reclined position to a reclined position to effect a pivotal movement of the seat frame about said second pivot point and a generally upward movement of the rear end of the seat frame as the back frame further reclines from the semi-reclined position to the reclined position.

11. The mechanism of claim 9 further comprising means for providing the seat frame with a further but limited degree of freedom relative to said first link proximate said fourth pivot point, the major component of said further but limited degree of freedom being in the vertical direction.

12. The mechanism of claim 9 further comprising:

a second link having one end pivotally mounted to said other end of said first link at said fourth pivot point and the other end adapted to be pivotally mounted relative to the seat frame about a fifth pivot point proximate the vertical position of said fourth pivot point; and

stop means for narrowly limiting the pivotal movement of the seat frame relative to said second link.

13. The mechanism of claim 9 further comprising:

a pivot pin adapted to be fixedly secured relative to the seat frame at said fourth pivot point and rotatably and slidingly secured in an elongate closed slot formed in said other end of said first link.

14. The mechanism of claim 9 further comprising:

means for resiliently biasing the back frame toward the semi-reclined position when the back frame is between the semi-reclined position and a reclined position thereby enabling a sitter to comfortably stop the chair at any position therebetween by applying a small rearward force against the back frame.

15. The mechanism of claim 9 wherein said first pivot point is positioned substantially above the intersection of the back frame and the seat frame.

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