Sept. 25, 1956 P. MAURER 2,764,224

RECLINING CHAIR WITH FOOT REST ARTICULATION

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Fig. 1

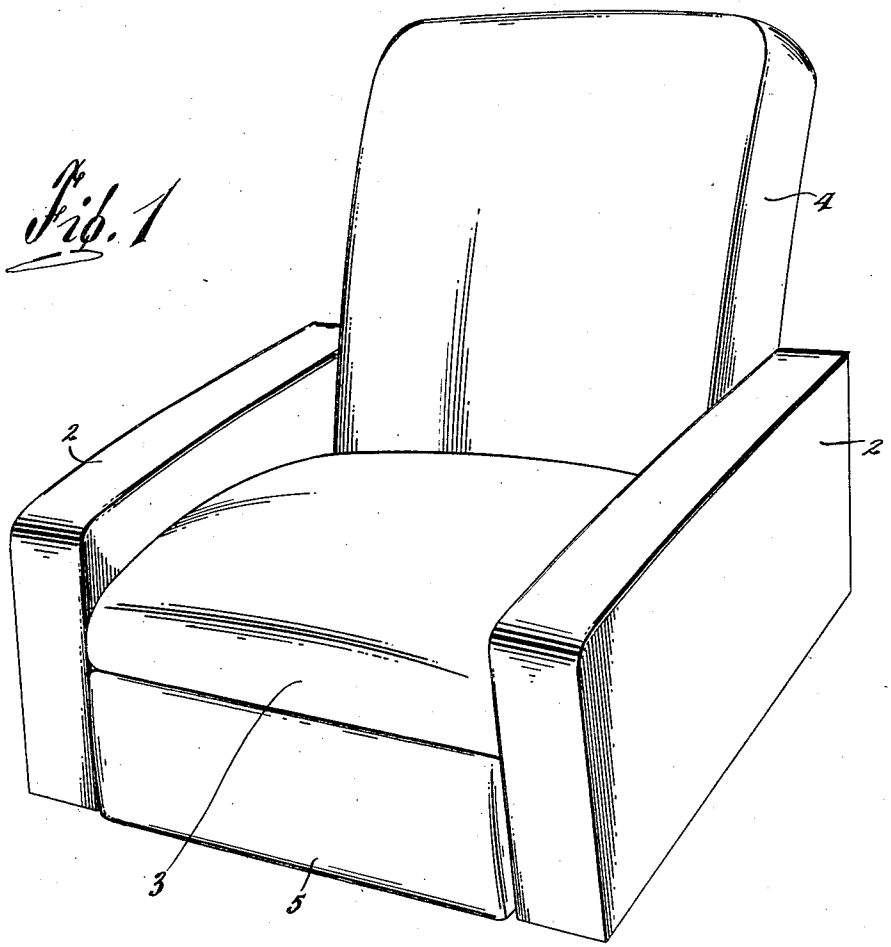
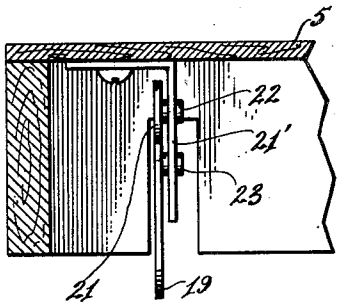


Fig. 3



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Fig. 2

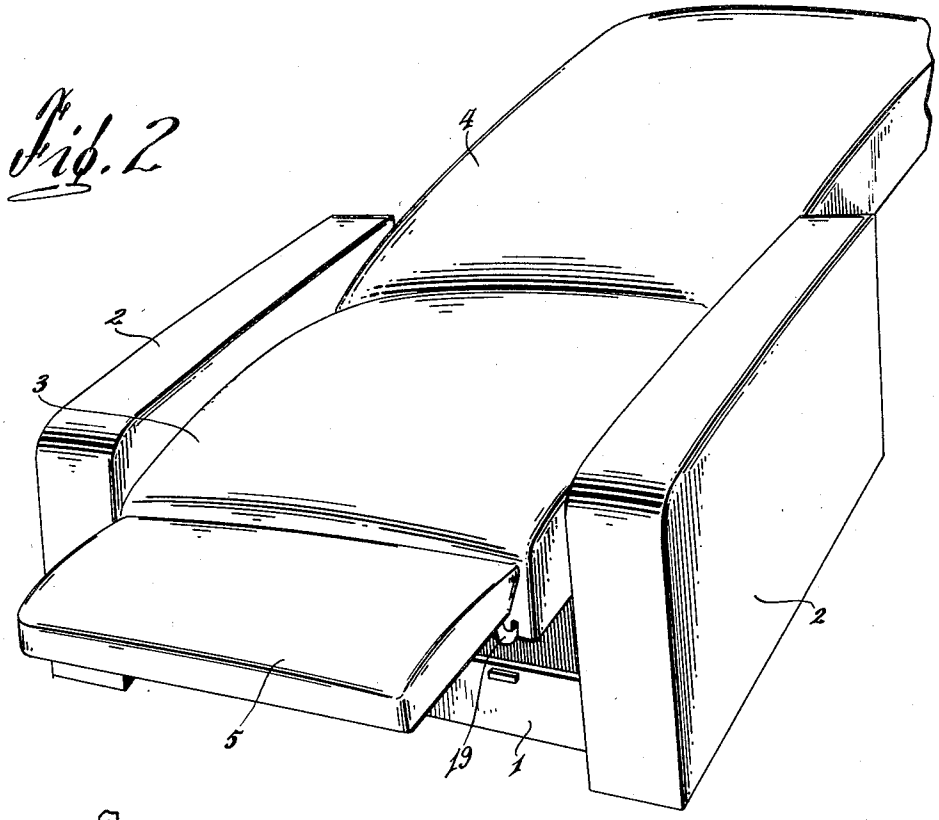
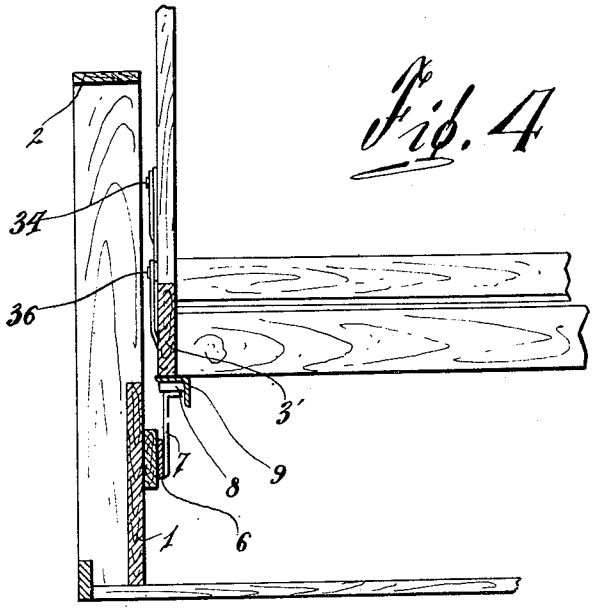


Fig. 4



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Fig. 5

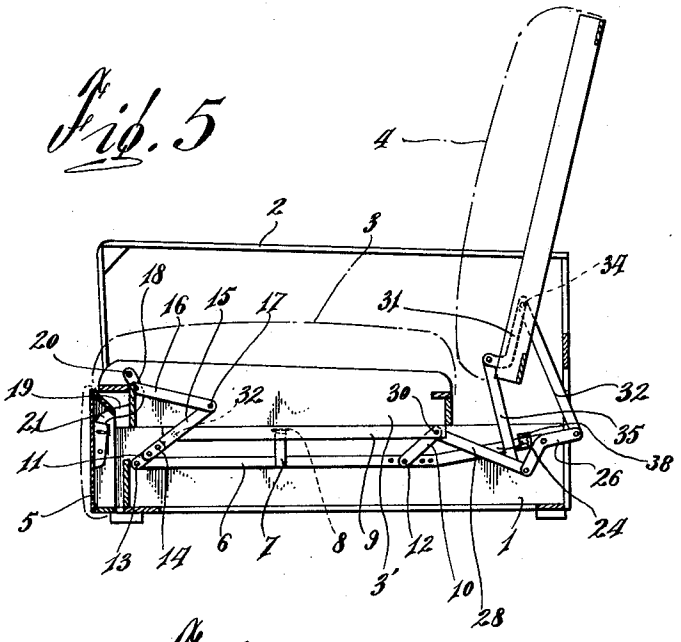
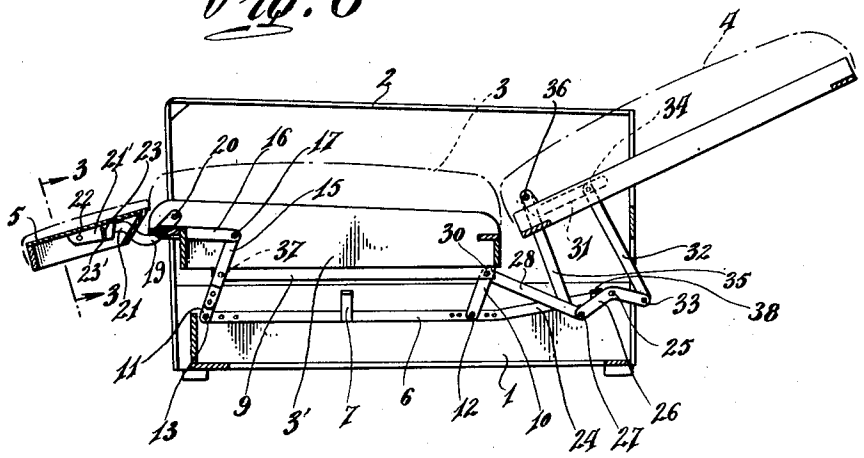


Fig. 6



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RECLINING CHAIR WITH FOOT REST ARTICULATION

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Claims priority, application Canada January 28, 1953

10 Claims. (Cl. 155—106)

The present invention relates to an article of furniture and more particularly to a sitting and reclining chair of the kind in which the seat and back are so mounted that they provide a counterbalancing effect so that by leaning back in the chair a person may stretch into a more or less reclining position with the back tilted backward to the desired angle and with the seat thereby elevated into a raised horizontal position.

The general object of the present invention is the provision of a chair of the character described having a novel and improved construction and arrangement whereby the back rest of said chair may be reclined smoothly and without effort from a substantially upright limit position to a fully horizontal or even past horizontal limit position. In the latter position, the seat is partly blocked and a downward pressure has to be exerted on the foot rest or a backward pressure has to be exerted on the seat to cause the back rest to return from its horizontal limit position. It is possible to use the chair, according to the invention, as an ordinary upright chair without the back rest taking an undesired inclined position and at the same time it will be possible to use this reclining chair as a couch when the back rest is in fully horizontal position, without the disadvantage of the back rest coming back to upright position when the user moves. Moreover, the chair, according to the invention, may be constructed for medical use in which the back rest takes a past horizontal limit position.

Yet another important object of the present invention is the provision of a chair of the character described provided with a foot rest which automatically takes a more or less inclined position depending on the inclination of the back rest.

Still another object of the present invention is the provision of a chair of the character described which may be used without a foot rest and still be comfortable due to the fact that only a small vertical movement of the seat is needed for the back rest to assume a maximum reclined position whereby the person using the chair may assume a relaxed reclined position while having his feet still resting on the floor. This constructional feature adds to the utility of the chair in small apartments or limited space.

Yet another important object of the present invention is the provision of a chair of the character described which is very simple in construction having a minimum of links and bars.

Still another important object of the present invention is the provision of a chair of the character described in which the lower edge of the back rest and the back edge of the seat will always remain close together independently of the relative angular position of the back rest and seat.

The foregoing and other important objects of the present invention will become more apparent during the following disclosure and by referring to the drawings in which:

Figure 1 is a perspective view of the chair with the back rest in upright position;

Figure 2 is a perspective view of the chair with the back rest in horizontal reclined position and the foot rest in horizontal elevated position;

Figure 3 is a section along line 3—3 of Figure 6;

Figure 4 is a cross-section of the chair showing the manner of suspending the seat;

Figure 5 is a longitudinal section of the chair showing a side view of the link arrangement when the back rest is in upright position; and

Figure 6 is a longitudinal section of the chair showing a side view of the link arrangement when the back rest is in reclined position.

Referring now more particularly to the drawings in which like reference characters indicate like elements throughout, the chair body **1** is preferably provided with side arm rests **2** and forms a rigid frame on which the seat **3** and back rest **4** are mounted by means of a system of links, arms and bars described hereinafter.

The seat **3** and back **4** are preferably upholstered and may be finished in any manner or style.

Furthermore, a foot rest **5** is mounted for pivotal movement at the forward end of the seat **3** so that it may take a vertical position, as shown in Figure 1, resting against the front face of the chair body **1** and an elevated horizontal position, as shown in Figure 2, aligned with the top face of the seat **3**.

A horizontal lower support bar **6** is secured to the chair body **1** on both sides thereof and is provided at its intermediate portion with an upright stop member **7** adapted to abut a rubber pad **8** depending from an upper horizontal angle bar **9** supporting the side boards **3'** of the seat **3**. The angle bar **9** is connected to the lower bar **6** by means of back and front links **10** and **11** at **12** and **13**, and **30** and **37** respectively. Thus, the arrangement constituted by the bars **6** and **9** and links **10** and **11** forms a deformable quadrilateral system. The links may have equal length and the bars may have equal length to form a deformable parallelogram or one of the links and one of the bars may be shorter than the other link and other bar respectively provided that the sum of the lengths of a bar and of a link be equal to the sum of the lengths of the other bar and of the other link. Forward rotation of the links **10** and **11** about their respective pivots **12** and **13** on the lower bar **6** will simultaneously elevate the seat **3** and displace it forwardly. During this movement, the seat **3** will remain in planes parallel to itself if the system of links and bars is a deformable parallelogram, but will recline slightly if the system is a quadrilateral as defined hereabove.

On the front link **11** is rigidly secured by welding, riveting or the like, the stepped portion **14** of an arm **15** which is aligned with said link **11** and extends upwardly therefrom. A link **16** is pivoted at **17** to the upper end of the arm **15** and is pivotally connected at its other end **18** to a crank lever **19** pivoted at its upper end **20** to the seat frame **3'** and having a downward extension **21** attached to a bracket **21'** secured inside the foot rest **5**. More particularly the lower end of the extension **21** is pivoted to the bracket **21'** at **22**, and a pin **23** secured to said extension **21** extends through an arcuate slot **23'** made in the bracket **21'** so that the foot rest may have a limited angular movement relatively to the crank lever **19**.

It is apparent from Figures 5 and 6 that forward rotation of the arm **15** around the pivot **13** will displace forwardly the link **16** and thereby cause upward movement of the crank **19** and elevation of the foot rest **5** as shown in Figure 6.

The rear end of the lower bar **6** which is rigidly secured to the chair body **1**, is provided with a slightly

upwardly inclined extension **24** at the rear end of which is pivoted at **25** a rocker **26** having two arms angularly extending with respect to each other. The front arm of the rocker **26** is pivotally connected at **27** to a link **28** itself pivoted at its front end to the upper angle bar **9** by means of the pivot connection **30** serving also to pivotally connect the back link **10**.

An L-shaped bar **31** is rigidly secured to the lower end portion of the frame of the back rest **4** and extends longitudinally thereof. A link **32** pivotally connects the rear arm of the rocker **26** to the bar **31** by means of pivot connections **33** and **34** respectively. The lower end of a side arm **35** is rigidly secured at an angle to the link **28** and its upper end is pivotally connected at **36** to the side leg at the front end of the bar **31**. Thus the system comprising the bar **31**, rocker **26**, link **32** and side arm **35** forms a deformable quadrilateral arrangement whereby the rocker **26** rotates in clockwise direction about its intermediate stationary pivot **25** as viewed in Figures 5 and 6, when the back rest **4** moves from an upright position shown in Figure 5 to a reclined position shown in Figure 6.

In the limit horizontal position of the back rest **4**, the links **10** and **11** are practically vertical thereby locking the mechanism. In order to release the back rest from said position, it is necessary to apply a downward pressure on the foot rest **5** to initiate the return movement of the mechanism.

From the arrangement described it will be seen that the reclining movement of the back rest **4** will displace the link **28** forwardly whereby the seat **3** will be moved forwardly and upwardly and the foot rest **5** will be simultaneously elevated.

The back rest **4** describes a complex pivotal movement due to the fact that the side arm **35** is rigidly secured to the link **28** which itself pivots around the pivot **30** and at the same time is moved forwardly. Thus, as the lower edge of the back rest **4** is elevated, it also moves forwardly in such a way that a constant contact is maintained between the rear edge of the seat and the bottom edge of the back.

It will be also noted that in the chair according to the invention, the various links, bars and arms have a minimum of stepped portions and that the majority of them are straight elongated bars, thereby resulting in an inexpensive construction.

In the chair illustrated in the drawings, a dead stop **38** is secured to the bar extension **24** and limits the reclining movement of the back rest **4** by abutting the rocker **26**. But this stop **38** could be displaced along extension **24** so as to permit the back rest to assume a limit reclined position past the horizontal.

Said latter position is possible because the pivot connections **33**, **27** and **30** will not become aligned until said position is reached.

It will be noted that the system of linkages according to the invention provide movement for three elements, namely: the foot, the seat and the back rest. Due to the particular construction of said system of linkages, it is possible to vary the movement of one element without having to vary the movements of the other two elements. This may be effected by changing the position or sizes or shapes of the bars and links associated with the element of which the movement is to be changed. For instance, links **10** and **11** may be lengthened in order to increase the upward and forward movement of the seat without changing the movement of the foot and back rests.

Similarly the location of the pivotal connections of the link **32** and side arm **35** to the bar **31** may be changed and/or said link **32** and arm **35** may be shortened or lengthened whereby the complex pivotal movement of the back rest will be varied without having to change the movements of the seat and leg rest.

Again, one may vary the extent of pivotal movement of the foot rest without changing the movement of the seat and back rest.

As a result of the above mentioned characteristic of the system of linkages described, proper adjustment of the various movements of the chair is easily effected to suit the user.

While a preferred embodiment according to the present invention has been illustrated and described, it is understood that various modifications could be resorted to without departing from the spirit and scope of the appended claims.

What I claim is:

1. In a sitting and reclining chair, a body frame, a seat frame, a back frame tiltable backward relatively to the body frame, and a pair of side units consisting of links, arms and bars hung on the body frame one at each side of the chair for supporting the seat frame and back frame for movement from a sitting to a reclining position automatically by pressure against the back frame, each side unit having a rocker pivoted intermediate its ends on the body frame to define two arms, a link pivoted to one arm of said rocker and to said seat frame, a side arm rigidly secured to said link at one end and pivotally connected to said back frame at its other end, a link pivotally connecting the other arm of said rocker to said back frame, and means for movably supporting the seat frame on said body frame.

2. A sitting and reclining chair, having a body frame, a seat frame and a back frame, a pair of lateral linkage units mounted one on each side of said body frame for supporting said seat frame for forward and upward movement, and said back frame for tilting backward movement when reclining from normal sitting position and reciprocally for return movement, each of said linkage units including a first bar secured to said body frame, a second bar secured to the seat frame, links pivotally connecting said two bars, an extension extending rearwardly from said first bar and rigid therewith, a rocker pivotally mounted on said extension intermediate its ends to form two arms, a first link pivotally connected to one arm of said rocker and to said second bar, a side arm rigidly secured to said first link at one end and pivotally connected to said back frame at its other end, a second link pivotally connected to the other arm of said rocker at one end and to said back frame at its other end, the pivotal connections of said side arm and second link to said back frame being spaced apart, so constructed and arranged that pivotal movement of said rocker relatively to said body frame will simultaneously elevate said side arm and displace the same forwardly to thereby impart to said back frame a combined rotational and forward movement.

3. A sitting and reclining chair comprising a body frame, a back frame, a seat frame and a foot rest pivoted on said seat frame for movement from a retracted downward limit position abutting against said body frame to an elevated substantially horizontal limit position, a pair of lateral linkage units mounted one on each side of the body frame for pivoting said foot rest and for supporting said seat frame for forward and upward movement, and the back frame for tilting backward movement when reclining from normal sitting position and reciprocally for return movement, each of said linkage units including a first bar secured to said body frame, a second bar extending above said first bar and secured to said seat frame, first and second links pivotally connecting said two bars, an extension rigid with said first bar and projecting rearwardly thereof, a rocker pivotally mounted on said extension intermediate its ends and forming two mutually inclined arms, a third link pivotally connecting the forward arm of said rocker to said second bar, a side arm rigidly secured to said third link at one end and making an angle therewith, said side arm pivotally connected to the lower end of said back frame at its other end, a fourth link pivotally connected at one end

to the rearwardly extending arm of said rocker and at its other end to said back frame at a point spaced from the pivotal connection of said side arm to said back frame, an arm secured to one of said first and second links and means connecting said last mentioned arm to said foot rest whereby pivotal movement of said one link will elevate said foot rest from its retracted position to its elevated position.

4. A sitting and reclining chair comprising a body frame, a back frame, a deformable parallelogram arrangement disposed on each side of said body frame and comprising an upper horizontal member movable upwardly and forwardly relative to said body frame, a lower horizontal member secured to said body frame and a back and a front link pivotally connecting said upper and lower horizontal members, a seat frame secured to said upper horizontal member, a foot rest, a crank-shaped lever pivotally mounting said foot rest on said seat frame, an arm rigidly secured to said front link and extending upwardly therefrom, a link pivotally connecting said arm to said crank-shaped lever so as to elevate said foot rest upon upward and forward movement of said seat frame, an extension rigid with and extending rearwardly of said lower horizontal member, a rocker pivotally mounted intermediate its ends on the rear end of said extension and forming two arms, a first link pivotally connected to the forward arm of said rocker and to said upper horizontal member, a side arm rigid with and projecting at an angle from said first link and pivotally connected at its free end to the lower end of said back frame and a second link pivotally connecting the rear arm of said rocker to said back frame.

5. A sitting and reclining chair as claimed in claim 4, further including abutment means to provide a reclined limit position for said back frame, and wherein said back frame when in said reclined limit position, extends outwardly and downwardly with relation to the horizontal.

6. A sitting and reclining chair as claimed in claim 4, further including an abutment member secured to said lower horizontal member and adapted to abut said upper horizontal member for limiting its downward movement.

7. A sitting and reclining chair as claimed in claim 6, further including a second abutment member secured to said extension of said lower horizontal member and adapted to abut said rocker for limiting the pivotal movement of said rocker.

8. A sitting and reclining chair as claimed in claim 3

wherein the sum of the length of said first bar between its connections with said connecting links and of the length of one of said connecting links between its connections with said bars is equal to the sum of the length of said second bar between its connection with said connecting links and of the length of the other of said connecting links between its connection with said bars.

9. A sitting and reclining chair comprising a body frame, a back frame, a deformable quadrilateral system disposed on each side of said body frame and comprising an upper member movable upwardly and forwardly relative to said body frame, a lower member secured to said body frame and first and second links connecting said upper and lower members, one of said links and one of said members being shorter than the other of said links and the other of said members respectively, a seat frame secured to said upper member, an extension rigid with and extending rearwardly of said lower member, a rocker pivotally mounted intermediate its ends on the rear end of said extension and forming two arms, a third link pivotally connected to the forward arm of said rocker and to said upper member, a side arm rigid with and projecting at an angle from said third link and pivotally connected at its free end to the lower end of said back frame, and a fourth link pivotally connecting the rear arm of said rocker to said back frame.

10. A sitting and reclining chair as claimed in claim 9 further including a foot rest, a crank-shaped lever pivotally mounting said foot rest on said seat frame, an arm secured to one of said first and second links and extending upwardly therefrom, a fifth link pivotally connecting said last named arm to said crank-shaped lever so as to elevate said foot rest upon upward and forward movement of said seat frame.

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