May 6, 1941. E. M. KNABUSCH ET AL 2,240,850

CHAIR

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FIG. 1.

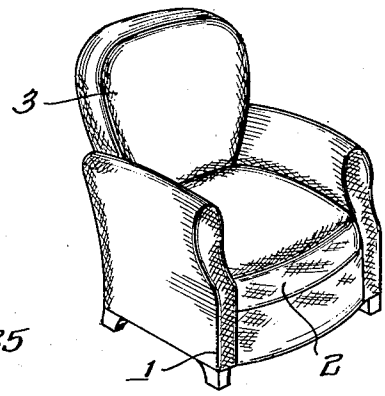


FIG. 2.

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FIG. 3.

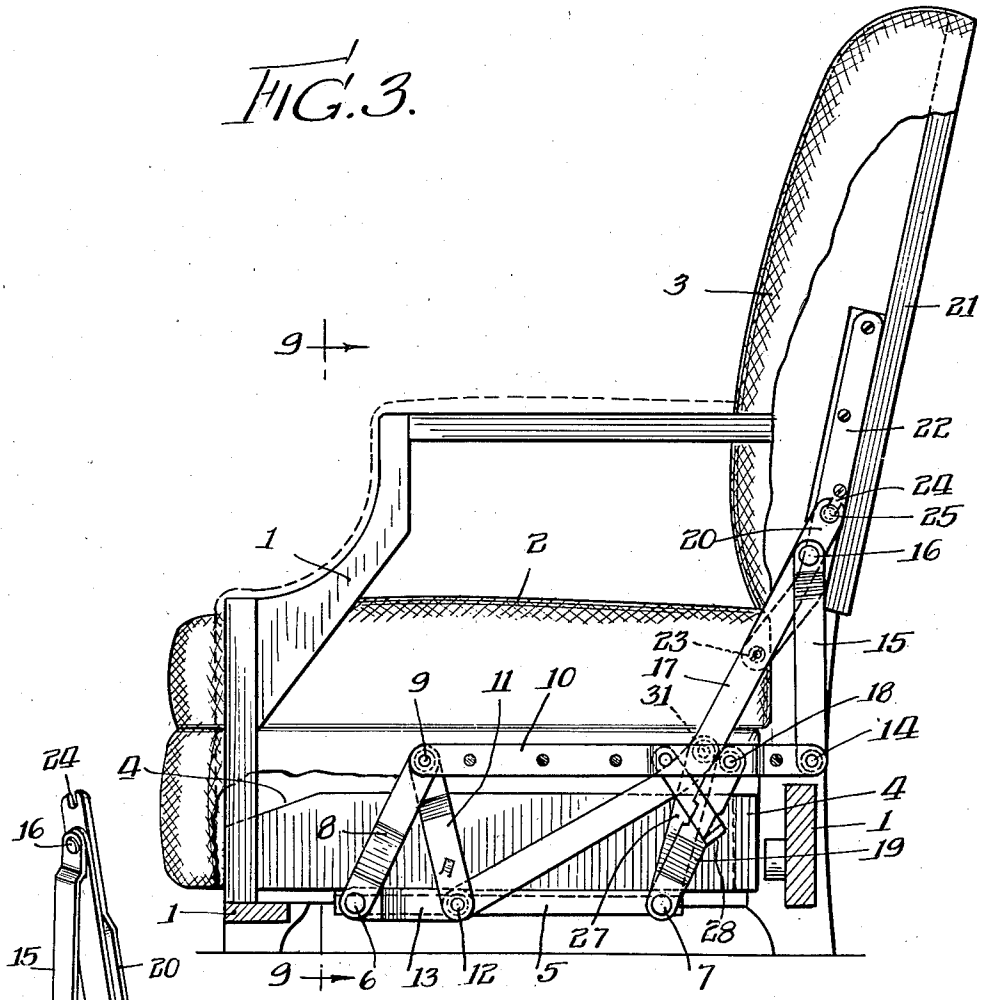


FIG. 4.

FIG. 5

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FIG. 6.

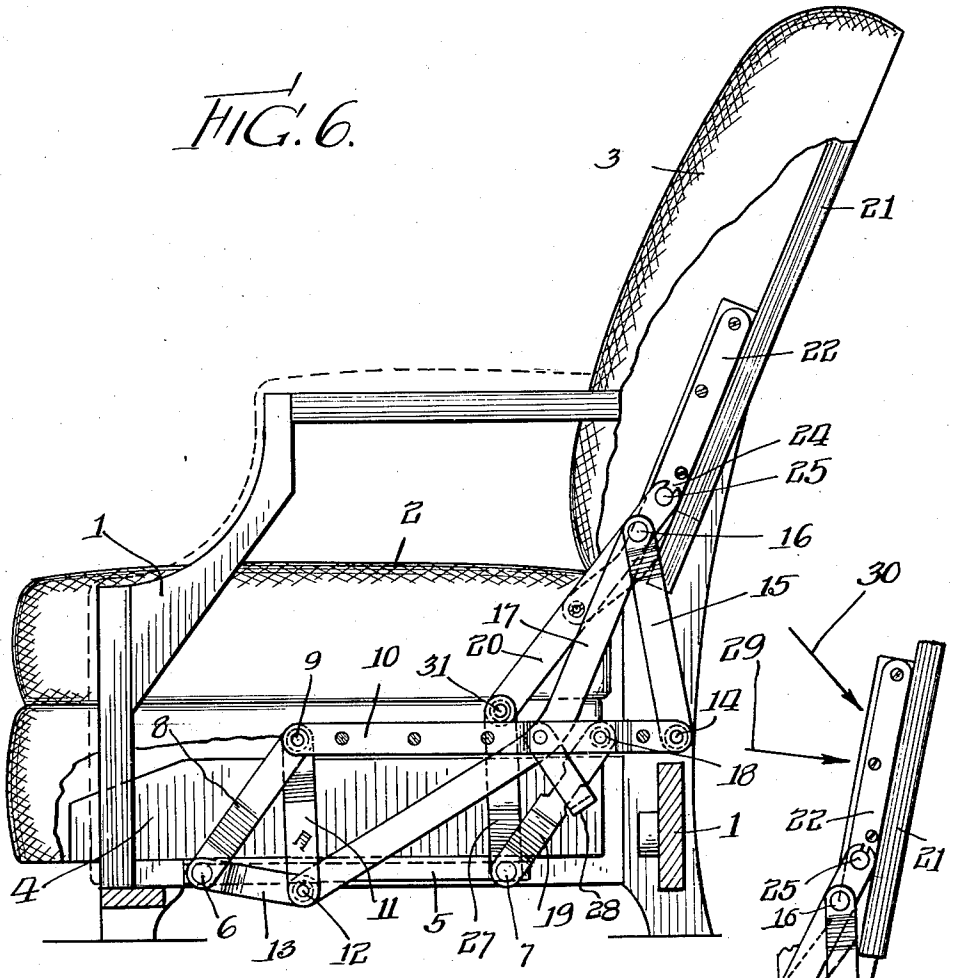
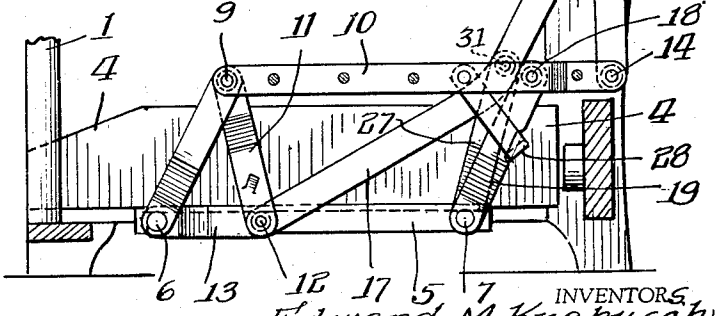


FIG. 7.



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FIG. 8.

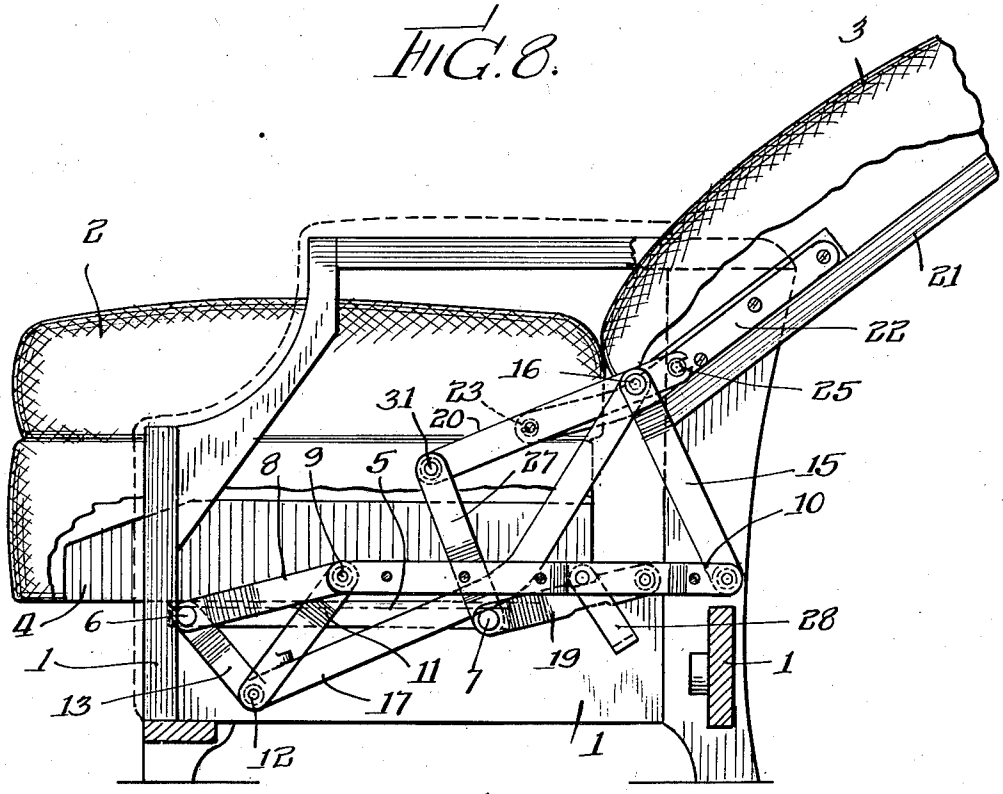
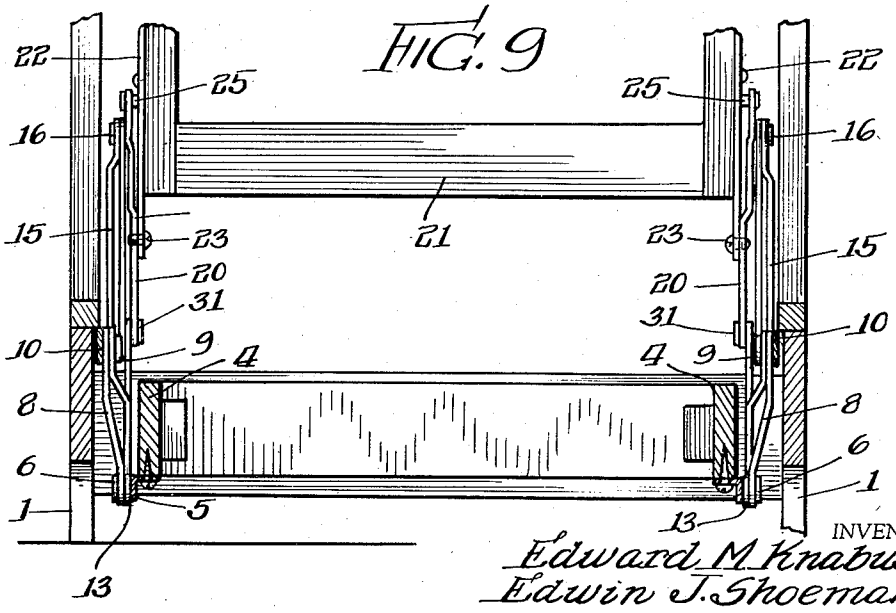


FIG. 9



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UNITED STATES PATENT OFFICE

2,240,850

CHAIR

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Application May 6, 1939, Serial No. 272,233

12 Claims. (Cl. 155—116)

This invention relates to chairs 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 out into a more or less reclining position, with the chair back tilted backward to the desired angle, and with the seat thereby elevated into a more or less raised position.

Generally stated, the object of the invention is to provide a novel and improved construction and arrangement whereby a chair of this character may be used with greater comfort and satisfaction, than those formerly made and sold of this kind, and whereby a chair of this class may serve equally well for ordinary purposes, substantially like an ordinary chair with a stiff and practically upright back, with entire comfort to the user, in addition to its capacity for automatic adjustment, by the body of the person, to provide a semi-couch effect upon which the person may rest comfortably in a more or less reclining position.

It is also an object to provide novel and improved features of construction tending to reduce the cost of production of a chair of this type.

It is also an object to provide novel features of construction tending to insure a stronger and more durable system of supporting links and levers for the movable back and seat of a chair of this kind, thereby to better insure against breakage or other difficulties, and to thus insure a longer life for a chair of this class.

Another object is to provide a novel and improved construction and arrangement that tends to obviate the necessity of using certain devices and features of construction heretofore considered necessary or desirable in a chair of this character.

It is also an object to provide certain details and features of construction and novel combinations tending to increase the general efficiency and desirability of a combined sitting and reclining chair of this particular character.

To these and other useful ends, the invention consists in matters hereinafter set forth and claimed and shown in the accompanying drawings, in which—

Fig. 1 is a perspective of a chair embodying the principles of the invention.

Fig. 2 is a similar view, but with the upholstery stripped off and omitted, and with the tilting back separated from the system of levers and links by which it is supported on the body frame of the chair.

Fig. 3 is in the nature of a side elevation, with one side of the chair body and other portions shown broken away or omitted, in order to show the unit of links and levers provided to support the movable back and seat of the chair, showing the said back in its raised or practically upright position, and the seat in its lowermost position, as would be the case when the chair is in use for sitting purposes, like an ordinary stiff back chair.

Fig. 4 is a perspective of one of the two side units of levers and links that support the said back and seat of the chair.

Fig. 5 is an enlarged detail fragmentary section on line 5—5 in Fig. 4 of the drawings.

Fig. 6 is a view similar to Fig. 3, showing the back tilted slightly backward and the seat slightly raised.

Fig. 7 is a view similar to Fig. 3, but with certain parts omitted for convenience of illustration.

Fig. 8 is a view similar to Fig. 3, but showing the back tilted farther back, and showing the seat in its raised or highest position.

Fig. 9 is a vertical sectional view on line 9—9 in Fig. 3 of the drawings.

As thus illustrated, the invention comprises a chair body 1 of any suitable or desired character, but preferably of a more or less solid and rugged character, providing a sort of rigid frame upon which a seat 2 and a back 3 can be supported in the desired manner, and which can be upholstered or finished in any suitable or desired style, thereby to conceal the mechanism or system of links and levers by which the seat and back are supported within and upon the said body frame of the chair.

The seat of the chair has a rigid frame 4, constructed in any suitable or desired manner, and provided on the lower edge of each side member thereof with a rigid angle-piece 5 as shown. Pivots 6 and 7 are provided upon the front and rear ends of each angle-piece. Links 8 have their lower ends pivoted on the pivots 6, and have their upper ends pivoted at 9 on the front ends of the rigid bars 10 that are rigidly secured by wood screws in horizontal position upon the inner sides of the two side walls of the said body frame 1 of the chair. Bars 11 have their upper ends pivoted on the pivots 9, and the lower end pivots 12 of the bars 11 are connected by bars 13 with the previously mentioned pivots 6, so that in effect a triangular link is provided at each side of the chair, with the pivots 6, 9, and 12 at the three corners thereof. The rear ends

of the rigid bars 10 are provided with pivots 14 upon which the vertically disposed back frame supporting links 15 are supported at their lower ends, and the upper ends of these links 15 are connected from their pivots 16 through the bars, arms or links 17 with the pivots 12 previously mentioned. The said bars 10 also have pivots 18 to support the upper ends of the vertically disposed links 19, and the lower ends of the latter are supported on the pivots 7 previously mentioned.

From the foregoing, it will be seen that we have provided seat frame bars suspended from fixedly supported rigid bars 10 by means of spaced links. The frame bar 5 and the links 8 and 19 pivotally suspended from the first bar 10 we desire to call a parallel motion connection. In operation, it will be understood that this parallel motion connection suspends the seat of the chair in such a manner that it is adapted to swing forwardly and upwardly with respect to the horizontal pivots 9 and 18.

The back of the chair has a rigid frame 21 that can be upholstered or finished in any suitable or desired manner, and that includes a pair of rigid lever arms or bars 22 suitably secured to the lower portion thereof at opposite sides of the chair. The lower ends of the arms 22 are secured at 23 on the arms 20, and these arms 20 have their upper ends provided with notches 24 that separably engage the studs 25 on the outer sides of the arms 22, as shown in the drawings. In this way, and by using screws at 23, and at 26, these can be taken out, and the chair back can be raised and disconnected from the system of links and levers by which both the seat and the back are supported in the body of the chair. It will also be seen that the said pivots 16 extend through the lever arms 20, and that when the back is connected in place, the bars or arms 22 become rigid with the arms 20, and that the lower ends of the arms 20 are connected by links 27 with the pivots 7 previously mentioned. The arms 20 being rigid and continuous with the back of the chair when mounted as above become in effect a part of the back frame and tilt with the back about its fulcrum.

A pair of rigid stops 28, one at each side of the chair, rigidly secured to the bars 10 previously mentioned, engage the links 19 to limit the forward motion of the chair back, and the downward motion of the chair seat.

In this way, therefore, a strong and compact and practically flat unit of links and levers and bars is provided at each side of the chair, between the seat frame and the outer side wall of the chair body, in the manner shown and described. In this way, the links and levers and bars are concealed from view, practically without the necessity of any waste space for the elements of these units, and hence without the necessity of making the chair any larger and any wider than is necessary for the comfort and convenience of the user, and for the general and attractive appearance of an article of furniture of this kind.

An important feature of the invention, it will be seen, by looking at Fig. 7 of the drawings, is the action of the chair when in use. The pivotal points are so located that a person may use the chair for sitting purposes, like an ordinary stiff back chair, in a comfortable and satisfactory manner. This is because pressure of the back of the person against the chair back. in the direction indicated by the arrow 29, does not tend to force the back in a rearward direction, and hence does not tend to raise the seat of the chair. In order to do that, in other words, a force or pressure must be exerted substantially in the direction of the arrow 30 shown in Fig. 7 of the drawings, which means that there must not only be a backward pressure exerted against the chair back, but also a downward pressure thereon, in order to tilt the back rearwardly, and to thereby raise the chair seat. In other words, the backward tilting action of the chair back is caused by throwing the head and shoulders backward, so that enough downward pressure will be exerted on the chair back to tilt it in a rearward direction. Hence, as stated, the chair is satisfactory for ordinary sitting purposes, to be used as an ordinary sitting chair, without danger of the user being suddenly and unexpectedly thrown backward, inasmuch as the person can lean backward as would be the case with an ordinary chair, without causing the rearward tilting action of the chair back. However, when it is desired to use the chair as a semi-couch, for reclining purposes, all that is necessary is to throw the head and shoulders backward and downward upon the upper end of the chair back, and the latter then readily tilts rearwardly into the desired inclined position thereof, and at the same time the seat of the chair is raised to insure the desired comfortable feeling necessary for a more or less inclined position of the body of the user of the chair.

This action of the chair, it will be seen, is quite largely due to the fact that the pivots 31 between the elements 20 and 27 are set forward a distance, which operates to make it harder to break the chair out of sitting position, so to speak, but as soon as it starts this movement there is assumed the natural balanced action, between the back and the seat, and from there to what is practically a couch or semi-couch or even practically a bed position. Thus a chair of this kind can be purchased for ordinary use as a sitting chair, and it would be satisfactory for this purpose, even though it might never be used for couch or bed purposes.

Thus it will be seen that the back 3 is a solid and practically one-piece element of the chair, as there are no parts, for example, that are required to have sliding motion on the frame 21 of the back, so that this frame and its cushion or facing or other covering is practically a one-piece affair, the general construction and the way in which the seat and back are mounted, serving to obviate the necessity of using any sliding parts or any sliding connections in the structure of the back. Moreover, it will be seen that with the construction shown and described, the bars 5 and 10 and the links 8 and 19 constitute a sort of parallel motion connection between the seat and the body of the chair, the said links always being parallel, and the said bars always being parallel, in any position of the seat and back, whereby the seat is maintained at a fixed angle to a vertical line, regardless of whether the seat is in its raised or lowered position. Each unit of bars and links, for each side of the chair, is in the nature of a one-piece affair, as all of the pivots can be permanent, instead of being removable, in each unit, and only the screws for insertion at 23 and 26 are removable.

There are certain other general advantages, as follows:

A reclining chair is provided having equal compensating movements between the seat and back, whereby for each degree of seat movement plus the load there is always an equal movement of the back plus the load at the particular back angle. In other words, it is evident that weight on the back affects the back movement much more when in a fully reclined position than when upright, hence the movement has to be greater in the seat than in the back, in order to properly balance with the load of the occupant. The opposite situation exists when starting out to recline in the chair, for then most of the back weight is carried perpendicularly, thereby causing the seat to carry the most weight. In this phase of occupancy it will be noted that because of this lesser weight on the back the latter moves faster than it does later when the position is more reclined. In other words, the weight of the load is increased as the back takes a horizontal position, and at the same time the back lessens its degree of travel as compared with the seat, the travel of which latter increases mostly upward as the chair is reclined.

The invention provides an all-in-one-piece construction, for each link and lever unit, with every joint riveted together at the time of manufacture. All pivots are provided with a fiber washer that prevents metal from touching metal, and all the rivets used are case-hardened. These features all tend to insure a chair construction free from all noises and squeaks, and which has a very smooth and satisfactory action. To serve as a take-up for all looseness or rattle that might develop as a result of wear or use, one of the said fiber washers is replaced with a formed spring steel washer.

The chair is so designed as to allow for easy assembly and removal of the parts thereof, eight wood screws being all that are necessary to assemble it into an upholstered chair. It is so constructed that it may be shipped knocked-down in a carton and the customer, upon receiving it. can assemble the back by merely inserting two screws with an ordinary screw driver. This is advantageous for long distance shipping, for there is a lower freight rate for knocked-down furniture than for completely assembled furniture. Also, the one-piece construction, for each link and lever unit, obviates the necessity of the upholstery manufacturer's having to locate pivots or do any other assembly work on the chair.

Moreover, the one-piece construction of the chair, for each link and lever unit, is such that everything is concealed within the upholstered or finished chair, showing no signs of its being a mechanical chair.

The construction of the chair embodies great strength, each and every part of it being capable of sustaining at least six times the strength that would be required in actual use.

Another advantageous feature is the provision of a chair that is so perfectly balanced on pivots that it requires no springs, ratchets, or friction devices of any kind whatever to steady or control its action. The parts are so balanced that the chair back follows the occupant's back in any movement he wishes to make, with no effort whatever imposed upon the occupant's neck.

Another important advantage of the invention is a construction whereby the occupant physically fits the action of the chair so that he or she is comfortable in all positions of the latter. In other words, the pivots have been so arranged that the body of the occupant fits the action of the chair seat and back in all positions.

Thus the invention provides a chair that not only works perfectly but that is also so constructed that it can be manufactured and sold at a low price.

Moreover, this invention can be applied to practically any chair of almost any design, and in whatever type of chair used it produces a very attractive and very comfortable construction, and one that will give long service.

It will be seen that with the foregoing construction, as shown in the drawings, the back frame **2** is fulcrumed about a movable axis, the latter being provided by the pivots **16**, and being movable relatively to the seat frame **4**, when the back swings forward and back, and when the seat moves forward and back and upwardly as well. The said movable axis moves toward the front of the chair, and then back, in the operation of adjusting the back and the seat to suit the comfort of the occupant.

With each metal link and bar unit completely and fully assembled and articulated, it becomes necessary to only attach the upper bar **10** of each unit to the chair body, and to attach the lower bar **5** to the chair seat, in order to enable said units to support both the seat and the back on the body frame. In this way, the two units can be made and completely assembled and articulated and then sent to furniture manufacturers to be incorporated in chairs of any desired design or style. In addition, it will be seen that these parallel motion connection units not only provide the axis **16**, but also the axis **31**, these two axes being held a fixed distance apart, the axis **16** being movable forward and downward when the back is tilted to a reclining position, and such tilting causing the axis **31** to move forward and upward. Thus the back tilts about the axis **16** and also tilts about the axis **31**, when the back is tilted in either direction. Each axis is fixed relatively to the back, but is movable relatively to the seat, and relatively to the chair body. Thus, the back moves forward a distance, when it is tilted into its reclining position, as shown in the drawings.

What we claim as our invention is:

1. In a combination sitting and reclining chair, the combination of a body frame, a seat frame, a back frame fulcrumed on a movable axis, the latter being movable forward and back relative to the body frame by the tilting of the back frame, a pair of side units of links and 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, each unit having an arm that is rigid with and which extends downwardly from the lower end of the back frame, each of said arms having two links pivoted at the said movable axis on the upper and rear portion of the arm, and the front and lower portion of each arm having a depending link connected at its lower end to a pivotal point on the seat frame, said two links comprising a first link pivotally associated with the body frame and a second link operatively connected with the said seat frame.

2. The combination with a chair body frame, a seat frame, swinging link means providing a parallel motion connection between the body frame and the seat frame at each side of the chair, a back frame, a link having operative connection at its lower end to the forward portion

of each parallel motion connection and pivoted to an intermediate portion of the back frame at its upper end, a supporting link extending from each said intermediate portion to a fixed point on the body frame, and a link connection between the rear end of each parallel motion connection and the lower portion of said back frame.

3. In a chair, a body frame, horizontal bars rigidly secured to the sides of said body frame, links hung on the front and rear ends of said bars, horizontal movable bars supported on the lower ends of said links, forming a parallel motion connection at each side of the chair, to support the seat thereof, a bar hung on the front end of each rigid bar, bars connecting the lower ends of said last-mentioned bars with the lower ends of said first-mentioned links, a back frame, links connecting said last-mentioned bars with a movable axis upon which the back frame is fulcrumed, back supporting links connecting said movable axis with the rear ends of said rigid horizontal bars, and means providing separable connections between the back frame and said second-mentioned links.

4. A structure as specified in claim 3, said movable axis having forward and back movement relative to the body frame.

5. A structure as specified in claim 3, said movable axis being located on two side bars that are rigid with the back frame, said movable axis being at the upper ends of the back supporting links.

6. For use in a combined sitting and reclining chair comprising a body portion, a seat portion and a back portion, means adapted for connection to said seat portion, link means operatively connected with said first-named means and being adapted for pivotal connection with said body portion, whereby said seat is swingable with respect to said body portion, lever means adapted for rigid interengagement with said back portion, a supporting link having a fulcrum pivotally interengaging said lever for disposing said lever and said back portion for angular tilting movement thereabout, said supporting link having a spaced pivot portion adapted for operative connection with said body frame, seat actuating linkage means operatively connected with said seat connection means and with said lever at a point spaced from said fulcrum and operative to shift the seat connection means forwardly in its path of swinging movement as said back portion is tilted rearwardly about its pivot.

7. A construction as defined in claim 6 including a further linkage having operative connection with said fulcrum and with said seat connection means for shifting said fulcrum forwardly in its path of movement in response to forward movement of said seat portion.

8. A construction as defined in claim 6 including a further linkage having operative connection with said fulcrum and with said seat connection means for shifting said fulcrum forwardly in its path of movement in response to forward movement of said seat portion, said supporting link means being positioned and arranged to move the fulcrum point downwardly in its path of forward movement.

9. A construction as defined in claim 6 wherein said seat actuating linkage comprises link means operatively connected to the lower portion of said lever and to said seat connection means for swinging said seat forwardly and upwardly as said lever is pivoted about its fulcrum toward back reclining position.

10. In a combination sitting and reclining chair having a back frame, a body frame and a seat frame mounted upon said body frame by swinging link means whereby said seat frame is adapted to swing with respect to said body frame; a fulcrum for permitting pivotal tilting of said back frame, said fulcrum being disposed on a back frame supporting link pivotally associated with said body frame, linkage means connected with said back frame and said seat frame to swing said seat frame forwardly in response to rearward tilting of the back frame, and further link means having operative connection with said seat frame and said back frame and operative to shift the locus of said fulcrum forwardly in response to forward swinging of said seat frame.

11. In a combination sitting and reclining chair having a body frame, a back frame and a seat frame, swinging link means connecting said seat frame to said body frame for relative swinging movement with respect thereto, said back frame being supported for angular tilting movement about a fulcrum, means for supporting said fulcrum for movement in a predetermined path forwardly and rearwardly with respect to said body frame, linkage operatively connected between the said back frame at a point spaced from the fulcrum and said seat frame and operative to swing the said seat forwardly as the back is tilted to reclined position about its fulcrum and link means operatively connected with the seat frame and said fulcrum and operative to shift said fulcrum forwardly in the said path in response to forward movement of said seat frame.

12. In a combination sitting and reclining chair having a body frame, a back frame and a seat frame, swinging link means connecting said seat frame to said body frame for relative swinging movement with respect thereto, a back frame supporting link pivotally disposed upon said body frame and having a fulcrum pivotally interengaging said back frame, linkage operatively connected between the said back frame at a point spaced from the fulcrum and said seat frame, and operative to swing the seat frame forwardly as the back frame is tilted to reclined position about its fulcrum, and a link operatively connected with the seat frame and pivotally engaged with said back frame and operative to shift the said back fulcrum forwardly in response to forward movement of said seat frame.

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