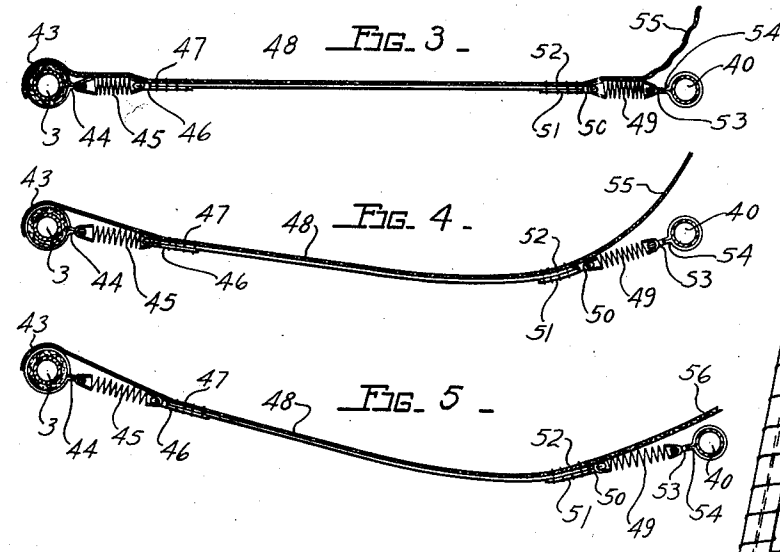
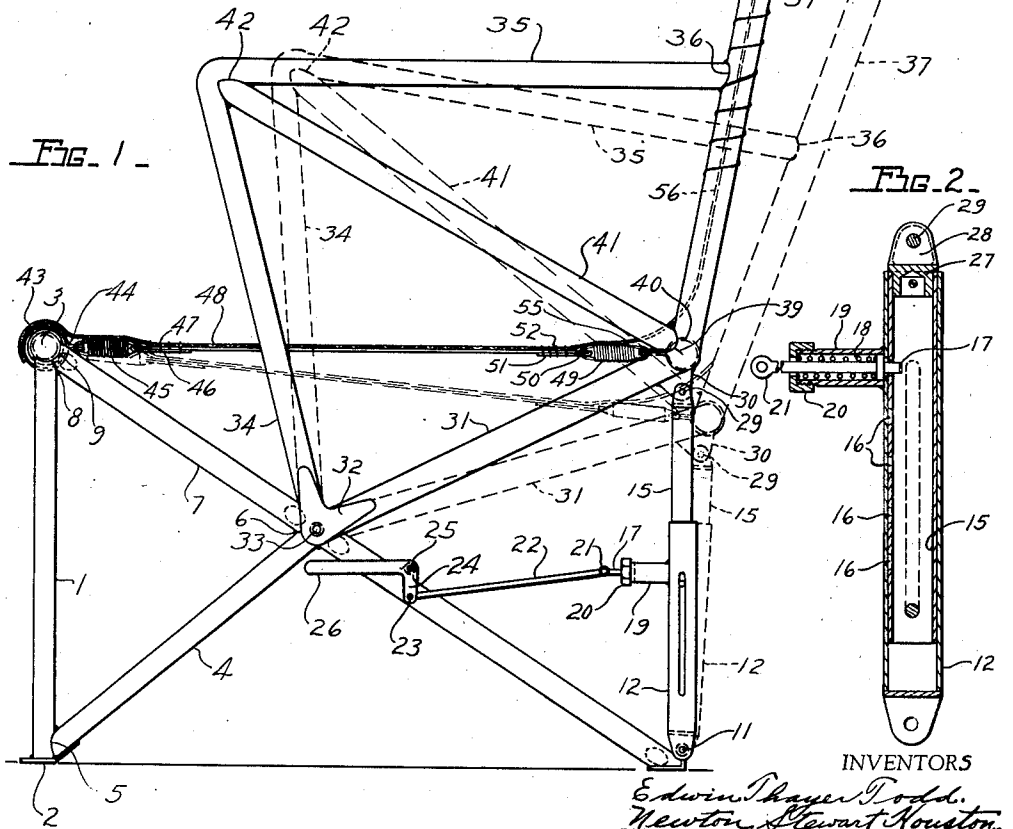
May 22, 1934. E. T. TODD ET AL 1,959,696

CHAIR

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CHAIR

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FIG. 6.

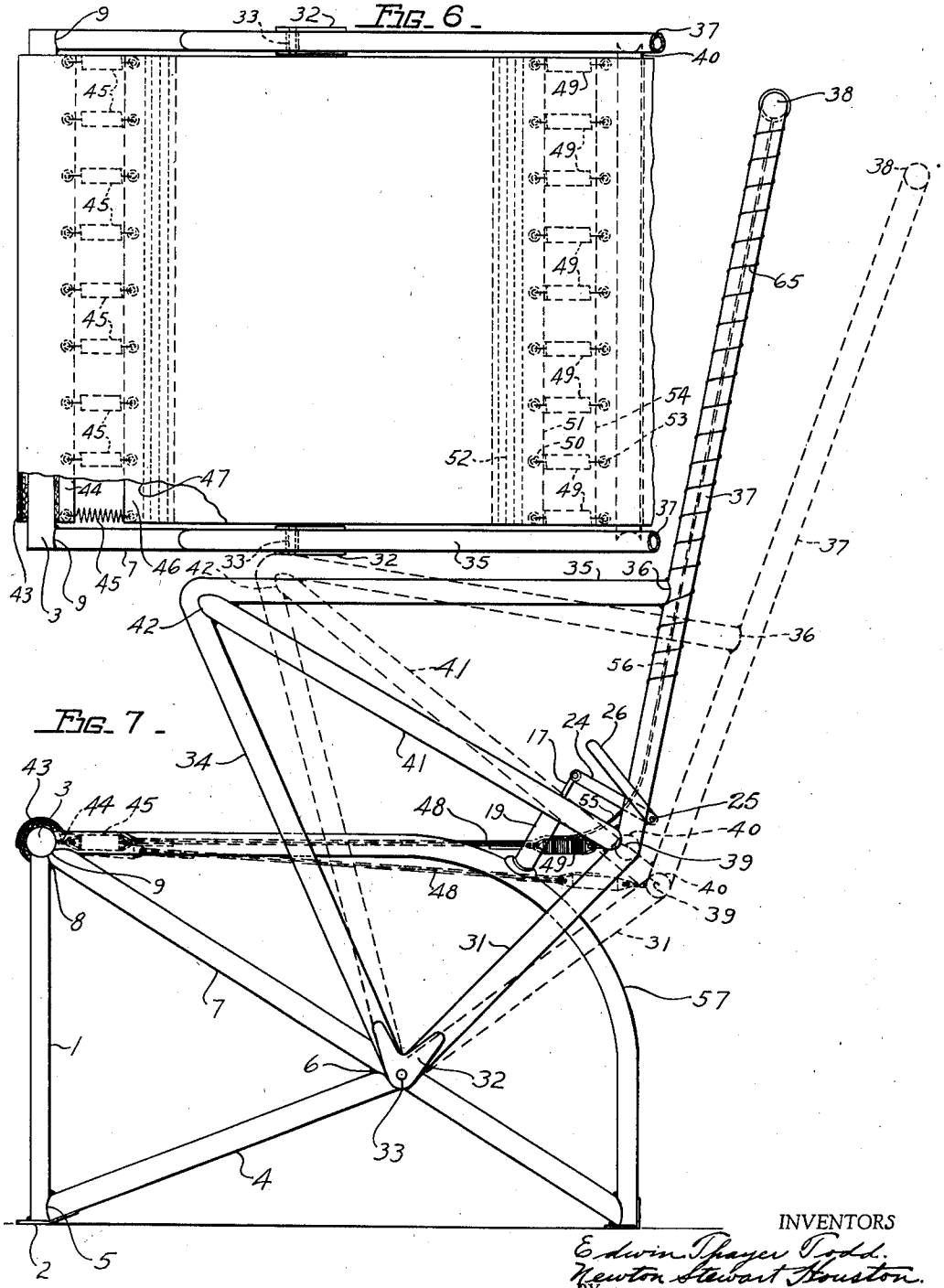


FIG. 7.

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CHAIR

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FIG. 8.

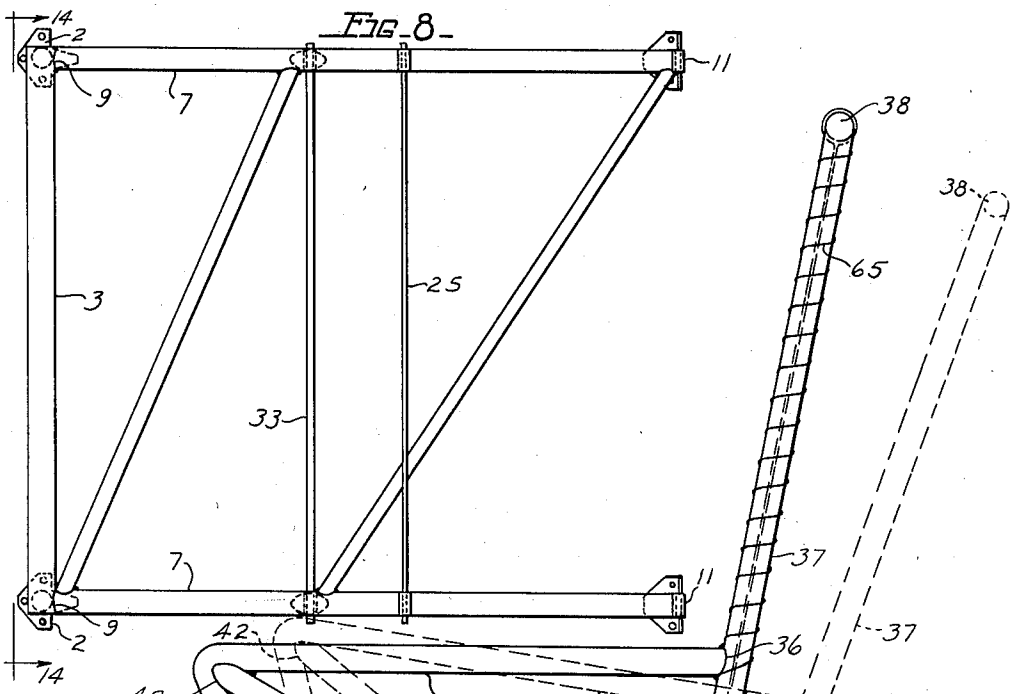
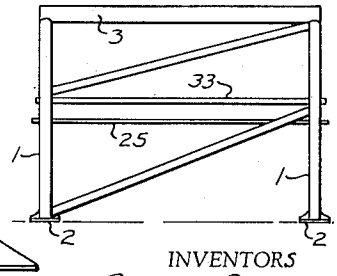


FIG. 9.

FIG. 14.



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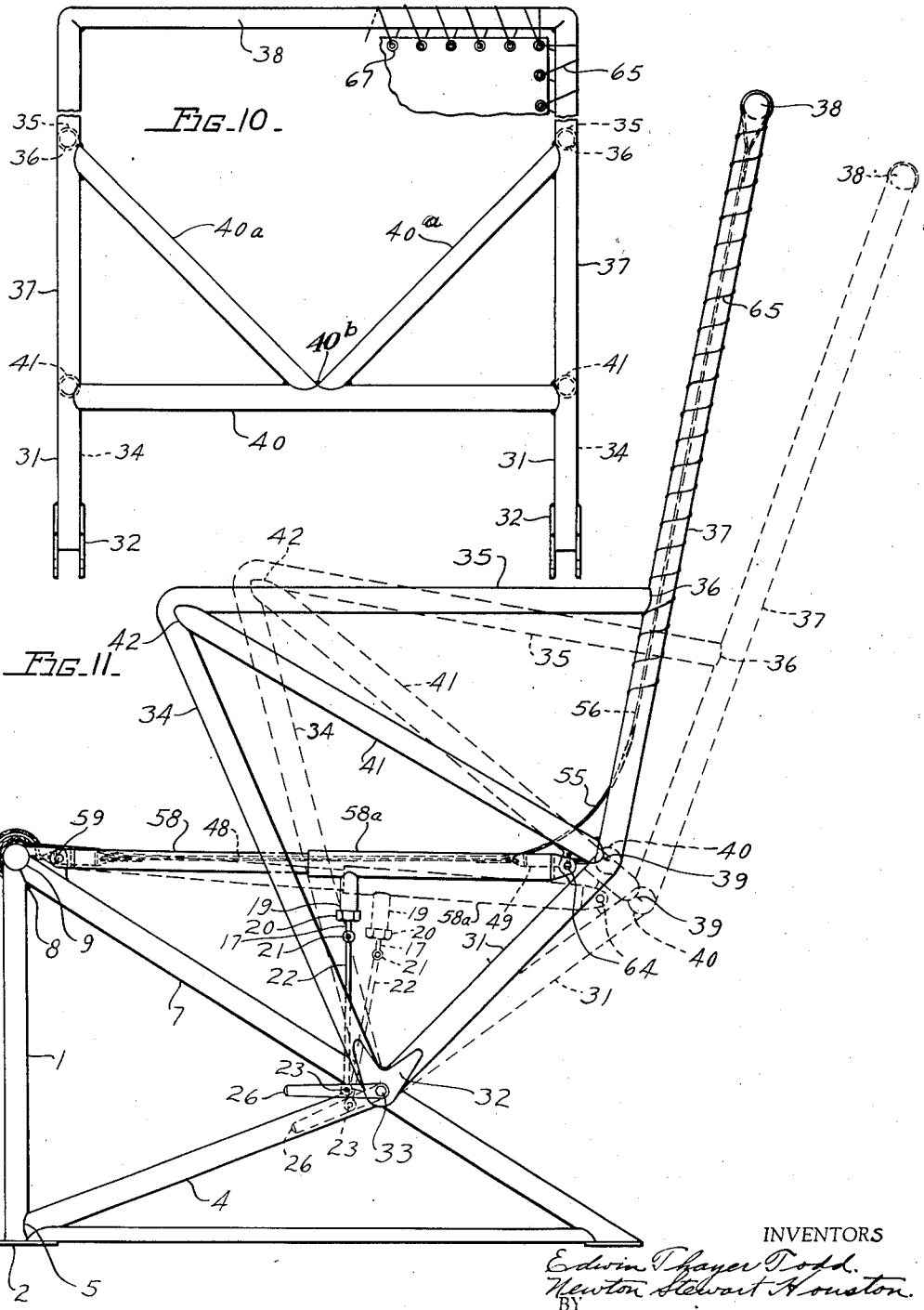


FIG. 10.

FIG. 11.

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CHAIR

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FIG. 12.

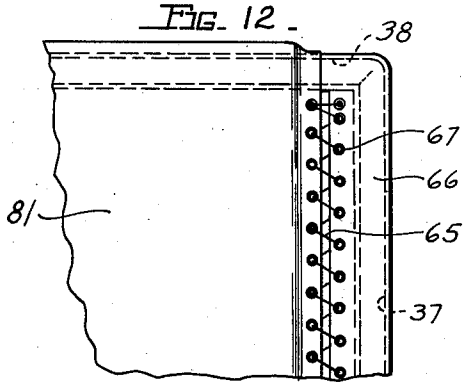


FIG. 13.

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1,959,696

CHAIR

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Application January 21, 1933, Serial No. 652,818

16 Claims. (Cl. 155—77)

Our invention relates to chairs and, in particular, to chairs for airplanes and motor vehicles.

It is the object of our invention to provide a chair having a frame comprising a stationary portion and a movable portion associated with a flexible seat and back portion, and means for regulating the tension on at least a portion of the seat and back portion so as to control the relative position between the stationary and movable portions of the chair as well as accommodate the seat and back portions to the user of the chair in either upright or reclining position.

In particular, it is our object to provide a chair having a stationary portion for mounting it on a floor, a pivoted portion comprising the side and back frame of the chair movable from an erect position to a reclining position; and a flexible seat and back strip, a portion of which at least interconnects the stationary and movable portions of the chair and yieldingly holds the movable portion of the chair in erect position while, at the same time, accommodating itself to the weight of the user of the chair. This yielding connection also accommodates the change in position of the seat and back strip when the movable portion of the chair is moved to reclining position and energy is stored thereby.

It is an object to provide a stationary chair supporting member and pivoted intermediate its length a tiltable back and side arm member and to interconnect the two members by a flexible strip comprising a seat and a back providing springs connected to the respective foundation and side arm and back members having their free ends connected to spaced points on the flexible seat or back so that, when the user is seated on the seat, the springs will extend to accommodate the weight of the user and such slack as may be provided in the back portion of the flexible member will be taken up.

It is our object to provide means by which the chair seat pivots at or near its forward edge in such a manner that the seat rotates downwardly about that axis.

It is a further object to provide means by which the chair back rotates about a pivotal axis or fulcrum point in such a manner as to deflect or depress the rearward edge of the seat and at the same time increase the linear distance between the forward edge of the seat and the line of attachment of the rear edge of the seat to the back; and to so arrange the parts that the increase in linear distance is provided for the purpose of having means for storing energy in the structure, such as the springs, which would otherwise be lost during the reclining motion, and, at the same time, provide for an elongation of the seat length for the purpose of providing a greater supporting area for the legs of the occupant. The movement is conducted in such a manner that the lever arm of the applied force increases as the lever arm of the restoring or reacting force decreases thereby providing any desired deformation of the energy storing means with the addition of any small increment of applied force.

We, therefore, provide means for storing the energy which would otherwise be lost during the reclining motion, the means being so arranged as to return the energy during the motion which is a return from reclining position.

It is our object to provide means furnishing an adequate support for the forward edge of the seat in such a manner that the support remains fixed relative to the foundation or base to which it is attached and on which the means rests. This provides for restrained oscillation about the lower forwad edge of the means.

In addition thereto, we provide means for locking the movable back and side structure on the base or foundation structure. The foundation structure is stationary in any of the desired positions: and we provide cooperating guiding means of mechanically supporting and guiding the body of the back and side members in addition to the pivotal support on the foundation or stationary portion of the chair.

It is a further object to provide a flexible seat and back portion which permits of the use of cushions: and permits of the reversing of the position of the back and side frame without disturbing the cushions.

Referring to the drawings:

Figure 1 is a side elevation of one form of the chair of our invention, the dotted lines showing the side arm and back structure in partially reclining position;

Figure 2 is a section through telescoping tubes showing the locking mechanism for locking the side arm and back structure in various positions;

Figure 3 is a section through the flexible seat and the front bar of the stationary portion of the chair and the rear bar of the movable portion of the chair showing the parts when the chair back is in erect position and there are no occupants:

Figure 4 is a similar view showing the parts when the chair is in erect position but occupied;

Figure 5 is a similar view showing the chair occupied and in partially reclining position;

Figure 6 is a top plan view of the chair seat, stationary supporting portion of the chair and a part of the side arm movable structure, the seat being broken away to show a portion of the spring attachment;

Figure 7 is a side elevation of a modified form of chair;

Figure 8 is a top plan view of the stationary portion of the chair structure shown in Figure 1;

Figure 9 is a side elevation of another modified form of chair;

Figure 10 is a rear elevation of the movable back and side arm portion of the chair;

Figure 11 is a side elevation of the chair slightly modified showing the horizontal plunger and guide member with its lock;

Figure 12 is a detail view of the attachment of the flexible back by lacing to the side member of the back frame;

Figure 13 is a side elevation of a reversible chair employing cushions;

Figure 14 is a front elevation of the stationary portion of the chair structure shown in Figure 1.

Referring to the drawings in detail, it will be observed that the chair structure consists of a stationary portion engaging the floor, a movable back and side arm portion pivoted on the stationary portion, means for guiding the pivoted portion on the stationary portion, and means for locking the pivoted portion in various positions with respect to the stationary portion.

In addition to this means, there is provided a flexible strip comprising the seat and back of the chair attached respectively at its free ends to the stationary and movable portions of the chair. It is connected intermediate its free ends by a series of springs to an intermediate portion of a movable part of the chair. It is also connected optionally by springs adjacent the end where it is attached to the stationary portion of the chair, the ends of the springs being mounted on the stationary portion of the chair.

Stationary portion of the chair: Foundation frame

This foundation frame consists of a pair of front upright members 1, preferably tubular, having feet 2. At the top of these members there is a cross tubular member 3 designated as the front seat support. On either side of the of the foundation frame structure projecting rearwardly and diagonally as well as upwardly are the frame members 4 which join the front member 1 at 5. At their upper rear ends the frame members 4 join at 6 a rearwardly and diagonally downwardly extending frame member 7, the forward ends of which join the front frame member 1 at its top as at 8 and the rear of the transverse member 3 as at 9.

Locking mechanism

This side frame member 7 extends rearwardly and downwardly and terminates on the floor in a foot or shoe which is provided with the eye 11 for receiving the pivoted locking and guiding tube 12. Within this tube is telescoped a second tube 15 having a series of spaced locking apertures 16 for receiving a locking plunger 17 actuated by a spring 18 carried in a tubular housing 19 mounted on the side of the tube 12. This spring 18 is retained in the tubular member 19 by the detachable adjusting cap 20 through which projects the opposite end of the plunger 17 that terminates in an eye 21. This eye is connected to a pitman 22 pivoted at 23 on the arm 24 of a bell crank pivoted at 25 on the frame member 7. The other arm of the bell crank 26 forms a handle which can be grasped by the operator for adjusting the position of the locking plunger 17.

The upper end of the sleeve 15 is provided with an attaching plug 27 likewise having spaced ears 28 for receiving a pivot bolt 29 carried on ears 30 attached to the bottom of a diagonal seat frame member 31.

Movable frame: Side and back members

The diagonal side frame member 31 is provided with a fitting 32 carrying a pivot bolt 33 which extends through the stationary foundation frame member 7. This fitting also receives a vertically disposed side frame member 34 which forms the front of a side frame, the horizontal portion of which is designated 35. The free end of the member 35 joins at 36 the vertical frame member 37 constituting a part of the back of the chair. These members 37 are connected together by a rear seat support tube 38. The bottom of the members 37 is connected at 39 to the diagonal side frame member 31. The side frame members 37 are also interconnected at this point transversely by an intermediate seat support tube 40. Diagonal brace tubes 40*a* extend from a center point 40*b* on the tube 40 to points on the inside of the members 37.

This juncture point of the tubes 31, 37 and 40 is also the juncture point of the rear end of a diagonal side frame brace 41, the forward end of which joins at 42 the juncture of the side frame members 34 and 35.

Flexible seat and back member

The flexible seat and back member comprises a textile strip of canvas or other material which is mounted through a loop 43 on the front seat support 3. This front seat support also carries a clip 44 for supporting a plurality of longitudinally arranged springs 45. The free ends of these springs are attached rearwardly to a supplementary strip 46 attached at 47 to the under side of the seat portion 48 of the flexible strip.

At the rear of this seat portion there is attached another series of springs 49 their forward ends being connected at 50 to a strip 51 attached at 52 to the bottom of the seat 48. The rear end of each spring 49 is connected at 53 to a clip 54 which is mounted upon the intermediate seat support tube 40. The flexible seat member 48 is continuous and, therefore, proceeds over the springs 49 in a loop 55 upwardly in a generally vertical direction forming a back 56 which is mounted at its top upon the rear seat support tube 38.

Referring not only to Figure 1 but to Figures 3, 4 and 5, it will be noted that in Figure 3, when there is no occupant in the chair, the flexible seat portion 48 is held taut in a horizontal plane by the springs 45 and 49. When a person sits in the chair, the weight of the person bends and depresses the seat 48 as in Figure 4 taking up some of the slack 55. This flexes the springs 45 and 49 partially and forms a

yielding comfortable seat for the occupant. When the occupant desires to recline, the pin 17 is pulled out of the opening 16, the occupant throws his weight against the back frame 37 thereby bringing the seat 48 and back strip 56 into the position indicated in Figure 5 still further tensioning the springs 45 and 49 and storing up energy in those springs.

When the occupant of the chair wishes to bring the pivoted frame back to its vertical position, he leans forwardly, unlocks the pin 17 and his weight upon the seat portion 48 which tensions the springs 45 and 49 plus any tensioning of those springs by the extension of the back portion 56 into a horizontal position permits the stored energy of the springs under tension to draw the back frame into its vertical position where it can again be locked as desired. Thus, the energy stored in the springs due to their being tensioned by the weight of the occupant plus their being tensioned by the extension of the back 56 is sufficient to move the back frame with the side arm members into the normal vertical position.

It will be noted that the telescoping tubes 12 and 15 act as guides for this movement about the pivot 33.

In Figure 7 the locking device comprises the handle 26, pivot shaft 25 which is mounted on the back members 37, the arms 24 and plunger 17 operating in the tubular member 19 which in this instance is mounted on the brace 41 and slides on an arcuate frame member 57.

Turning to Figure 9, it will be noted that in that case there is provided a pivoted tubular member 58 pivoted at 59 on the diagonal brace 7 adjacent the front of the chair. The rear end is provided with a bell crank lock comprising a handle 60 pivoted at 61 and having a pawl 62 engaging openings in the brace 31 of the chair back. The free end of this locking tube 58 is guided by the guide member 63 which connects the diagonal member 41 with the member 31. The pivot 61 of the handle 60 being located between the frame member 31 and the guide member 63 prevents the swinging of the back when the pawl 62 is in one of the holes of the frame member 31.

Referring to Figure 11 the tube 58 is telescopically received by a companion tube 58*a* which is pivoted at 64 to the back frame. Mounted upon this tube 58 is the locking mechanism comprising the pawl 17 operating in the tube 19 entering apertures 16 in the tube 58*a*. The pawl 17 is actuated by the pitman 22 connected to the lever 26, which lever is in turn pivoted at 33.

The several figures, particularly Figures 10, 12 and 13, show the seat strip laced by laces 65 to the back frame either directly or to a cover 66 having eyelets 67, which cover is mounted upon the back frame.

In Figure 13 is shown a reversible chair. This chair comprises the foundation frame work consisting of the members 1, 2, 3, 4 and 7. The movable back and side frame is pivoted at 33. It comprises diagonal members 68 attached to the fittings 32, a vertical side frame member 69, a horizontal members 70 and a second vertical member 71. The lower end of 71 is mounted upon the cross tube 40 which is connected by a diagonal member 72 to the lower end of 68 by means of the fittings 32. The fittings 32 and the lower ends of the side frame members 37 are separately supported on the pivot bolt 33. Mounted on these side frame members 37 are studs 73 and springs 74 yieldingly working between the side rails 75. The chair shown in Figure 13 is adapted to have the back members so shifted that two opposite sides of the chair may be used as its front or as its back, depending upon the position of the back members. The seat may be maintained in a horizontal position regardless of the position of the back, or the seat may be inclined regardless of the position of the back. If for any reason the user should desire the seat inclined forwardly and downwardly, it may be so inclined regardless of the fact that it is not usually desirable to have seats so inclined. The chair construction permits such use but does not make it absolutely compulsory.

The usual locking mechanism is provided for locking the chair in different positions. The side frame members 37 together with the cross member 38 may be swung bodily about the pivot 33 to opposite positions as indicated.

The seat and back strip are arranged in the following manner. A single seat strip 48 is connected between the ends of the springs 45 and 49. Mounted on this strip are two abutting cushions 76 and 77 between the ends of which is connected as at 78 the back strip now indicated as 79 which has mounted on either side of it adjacent its back portion the cushions 80 and 81. This strip 79 is adapted to swing from one side to the other from the back frame so that its lower portion alternately lies upon the surface of either cushion 76 or 77.

It will be noted in this construction that the distance between the tubes 3 and 40 increases as the chair is tilted thereby stretching the springs and the weight of the occupant will further stretch these springs.

But, in this instance, as in the other instances, as the occupant stretches out in a horizontal position, the springs will feel the effect of the weight to a lesser extent than when the occupant is sitting in an erect position, but this tendency to relax the springs is more than overcome by the extension of the springs due to the increase in the distance between the centers of the rods 3 and 40.

It will be understood that we desire to comprehend within our invention any type of materials and any type of structural form, whether tubular or otherwise.

It will be understood that we desire to comprehend within our invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In combination, in a chair, a foundation frame, a swinging back frame, means pivotally connecting the back frame to the foundation frame remote from the plane of the former, whereby the back frame may be moved bodily up and down, a flexible body supporting strip interconnecting said frames, yielding means adapted to resist the flexing of the body strip and to also resist the movement of the back frame, and means to lock the back frame and the foundation frame in various relative positions with respect to one another.

2. In combination, in a chair, a foundation frame, a swinging back frame, means pivotally connecting the back frame to the foundation frame remote from the plane of the former,

whereby the back frame may be moved bodily up and down, a flexible body supporting strip interconnecting said frames, yielding means adapted to resist the flexing of the body strip and to also resist the movement of the back frame, means to lock the back frame and the foundation frame in various relative positions with respect to one another, comprising telescopic means to lock one of said frames in its relationship to the other.

3. In combination, in a chair, a foundation frame resting on the floor, a back frame mounted thereon, means pivotally connecting the back frame to the foundation frame remote from the plane of the former, whereby the back frame may be moved bodily up and down, a body supporting strip mounted on the forward end of the foundation frame and the upper end of the back frame, means connecting an intermediate portion of said strip to the back frame, said connection comprising yielding means adapted to be flexed by the weight of a person on the strip and by the movement of the back frame with respect to the foundation frame, and additional yielding means connected to the front of the foundation frame and to an adjacent portion of the seat strip.

4. In combination, in a chair, a flexible body supporting strip constituting a seat connected to the front and rear of the chair and a back strip, means for varying the distances between said points of connection, yielding means connected to the seat adapted to resist the depression of the seat and the extension of the distance between the points of connection of the seat to the chair, and means at the center of the chair to pivot one portion of the chair on another portion, said seat being connected to the respective portions whereby the yielding means in cooperation with the weight of the occupant of the seat will tend to move one part of the chair with respect to the other part of the chair, and means connecting the back strip to the pivoted chair portion, said back strip being adapted at one end to travel with the seat strip.

5. In combination, in a chair, a chair frame, a back frame, means pivotally connecting the back frame to the chair frame remote from the plane of the former whereby the back frame may be moved bodily up and down, a body supporting strip connected to both frames, means to place a portion of said strip under tension to support the weight of the occupant of the chair and to resist the movement of the back frame with respect to the chair frame.

6. In a chair, a stationary foundation frame, a movable side frame thereon, a pivoted back frame pivoted to the foundation frame and movable with respect to both of said frames, means on one of said frames for guiding said back frame, a seat strip yieldingly mounted between opposite ends of the first and second frames, a back strip connected at one end to the seat strip and at the other end to the top of the back frame.

7. In a chair, a stationary foundation frame, a movable side frame thereon, a pivoted back frame pivoted to the foundation frame and movable with respect to both of said frames, means on one of said frames for guiding said back frame, a seat strip yieldingly mounted between opposite ends of the first and second frames, a back strip connected at one end to the seat strip and at the other end to the top of the back frame, spaced cushion members mounted on the seat strip with their inner ends on either side of the point of attachment of the back strip to the seat strip whereby one of said cushions is interposed between the seat strip and the seat portion and the back strip.

8. In a chair, a stationary foundation frame, a movable side frame thereon, a pivoted back frame pivoted to the foundation frame and movable with respect to both of said frames, means on one of said frames for guiding said back frame, a seat strip yieldingly mounted between opposite ends of the first and second frames, a back strip connected at one end to the seat strip and at the other end to the top of the back frame, spaced cushion members mounted on the seat strip with their inner ends on either side of the point of attachment of the back strip to the seat strip whereby one of said cushions is interposed between the seat strip and the seat portion of the back strip, and cushion members on either side of the back strip.

9. In a chair, a stationary foundation frame, a movable side frame thereon, a pivoted back frame pivoted to the foundation frame and movable with respect to both of said frames, means on one of said frames for guiding said back frame, a seat strip yieldingly mounted between opposite ends of the first and second frames, a back strip connected at one end to the seat strip and at the other end to the top of the back frame, spaced cushion members mounted on the seat strip with their inner ends on either side of the point of attachment of the back strip to the seat strip whereby one of said cushions is interposed between the seat strip and the seat portion of the back strip, cushion members on either side of the back strip, and means for attaching the sides of the back strip to the sides of the back frame.

10. In combination, in a chair, a foundation frame, a side frame, means for pivotally connecting said frames together at a point intermediate the front and rear extremities of said foundation frame, a lower seat strip yieldingly connected at its ends to said frames, the points of connection of said strip being adapted to vary in distance from each other according to the adjustment of the frames with respect to each other, an independently movable back frame pivoted on the foundation frame, means to limit the movement of the back frame on the side frame, and a combined seat and back strip suspended from the top of the back frame and connected to the seat strip connecting the first two frames, said parts being so arranged that the back frame may be shifted with relation to the lower strip so that the occupant may be seated on opposite sides alternately of the strip supported by the back frame.

11. In a chair, a foundation frame, a side frame pivoted and supported thereon, spaced guide members comprising a portion of the side frame, back frame members pivoted to the foundation frame and having means adapted to engage in said guides on the side frame members, means to limit the movement of the side frame on the foundation frame, and means on said guides for limiting the movement of the back frame members.

12. In a chair, a foundation frame, a side frame pivoted and supported thereon, spaced guide members comprising a portion of the side frame, back frame members pivoted to the foundation frame and having means adapted to en-

gage in said guides on the side frame members, means on said guides for limiting the movement of the back frame members, and means to adjustably position said back frame and side frame members as a unit with respect to the foundation frame.

13. In a chair, a foundation frame, a side frame pivoted and supported thereon, spaced guide members comprising a portion of the side frame, back frame members pivoted to the foundation frame and having means adapted to engage in said guides on the side frame members, means on said guides for limiting the movement of the back frame members, means to adjustably position said back frame and side frame members as a unit with respect to the foundation frame, including means to lock the foundation frame and the side frame with the back frame in various relative positions with respect to one another.

14. In a chair, a foundation frame, a side frame pivoted and supported thereon, spaced guide members comprising a portion of the side frame, back frame members pivoted to the foundation frame and having means adapted to engage in said guides on the side frame members, means on said guides for limiting the movement of the back frame members, means to adjustably position said back frame and side frame members as a unit with respect to the foundation frame, including means to lock the foundation frame and the side frame with the back frame in various relative positions with respect to one another, and yielding means connected to a seat extending between the side frame and the foundation frame adapted to restore said side frame and back frame to their initial position after having been moved from a vertical to a reclining position.

15. In combination, in a chair, a three part frame comprising a foundation frame, a side frame and a back frame movable relative to one another and mounted on a common pivot center on the foundation frame, a common seat strip yieldingly mounted on the foundation frame and the side frame, cushions thereon, means to limit the movement of the back frame on the side frame, a combined seat and back strip connected to the first mentioned seat strip and to the top of the back frame, the parts being so arranged that the back frame may be moved so that the occupant can face in either direction and when facing in one direction the back frame and side frame will tilt so as to permit the occupant to occupy a reclining position.

16. A chair having in combination, a base frame, a back frame having side arms thereon, means pivotally connecting the back frame to the base remote from the plane of the former, whereby the back frame may move bodily up and down, a seat and back fabric strip connected to the extreme ends of the two frames, and yieldable means connected between the middle of the strip and the lower end of the back frame, and means to lock the two frames in adjusted position.

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