

July 20, 1937.

W. F. HEROLD

2,087,253

TILTING MECHANISM ESPECIALLY FOR CHAIRS

Filed May 16, 1935

3 Sheets-Sheet 1

Fig. 1.

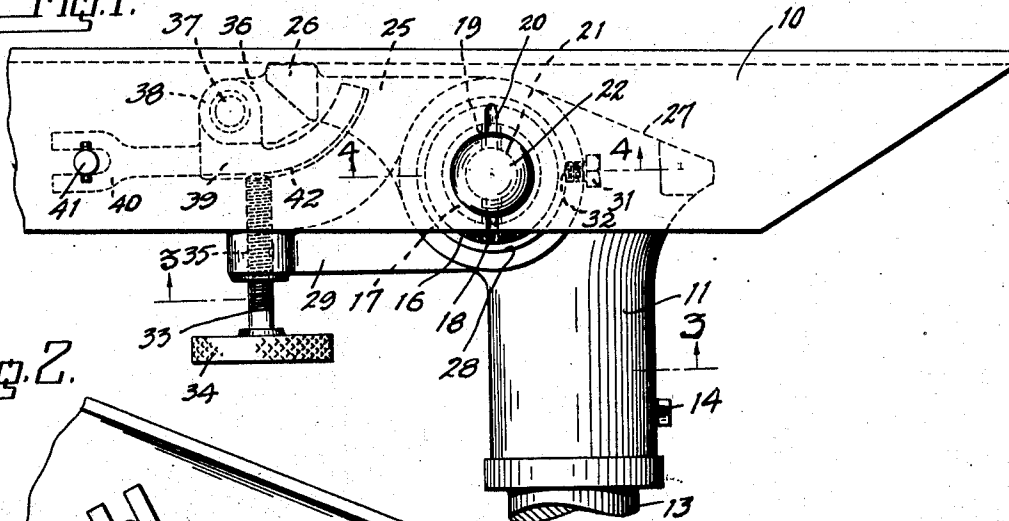


Fig. 2.

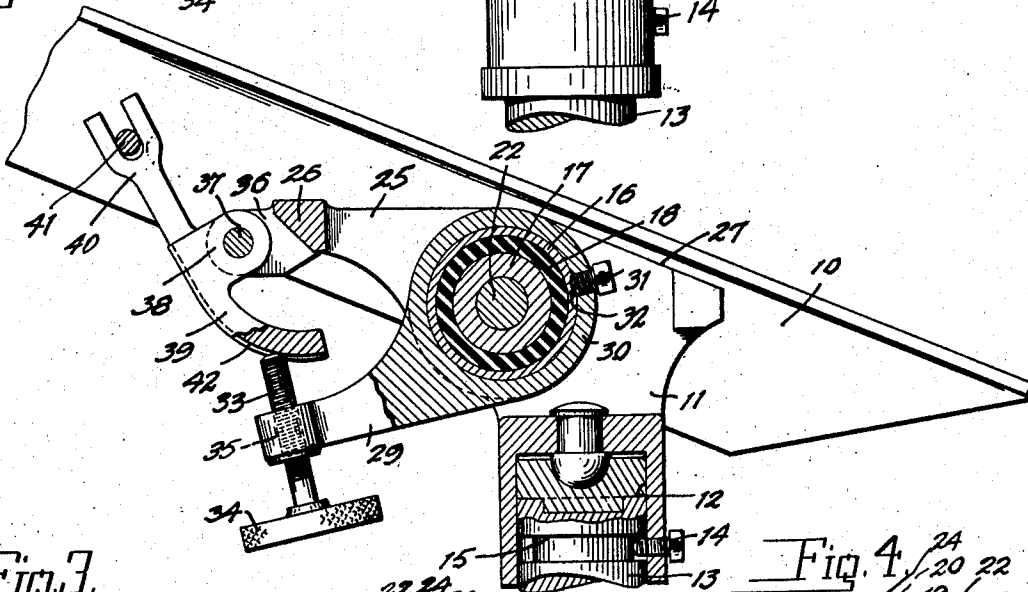


Fig. 3.

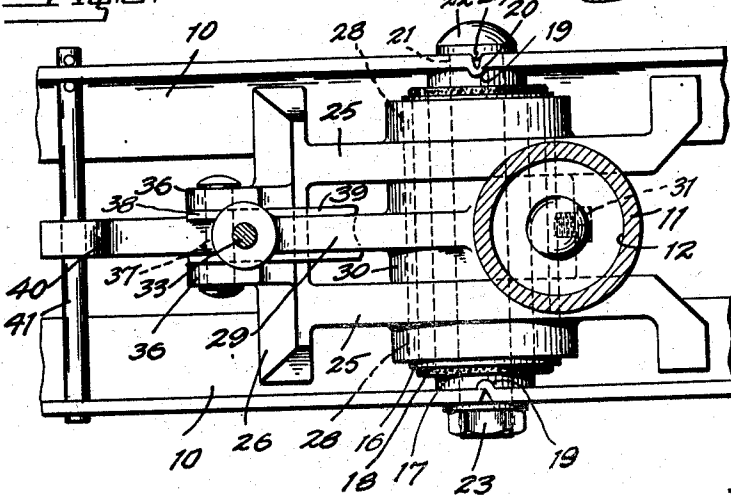
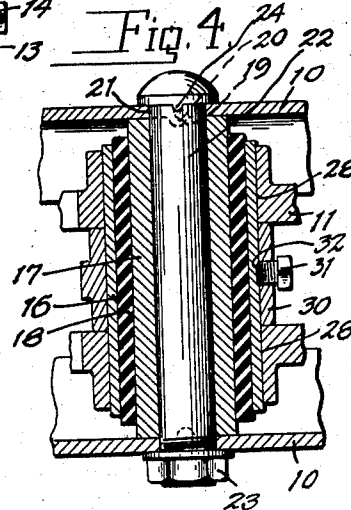


Fig. 4.



INVENTOR
WALTER F. HEROLD.
BY
E. W. WATSON.
ATTORNEY

July 20, 1937.

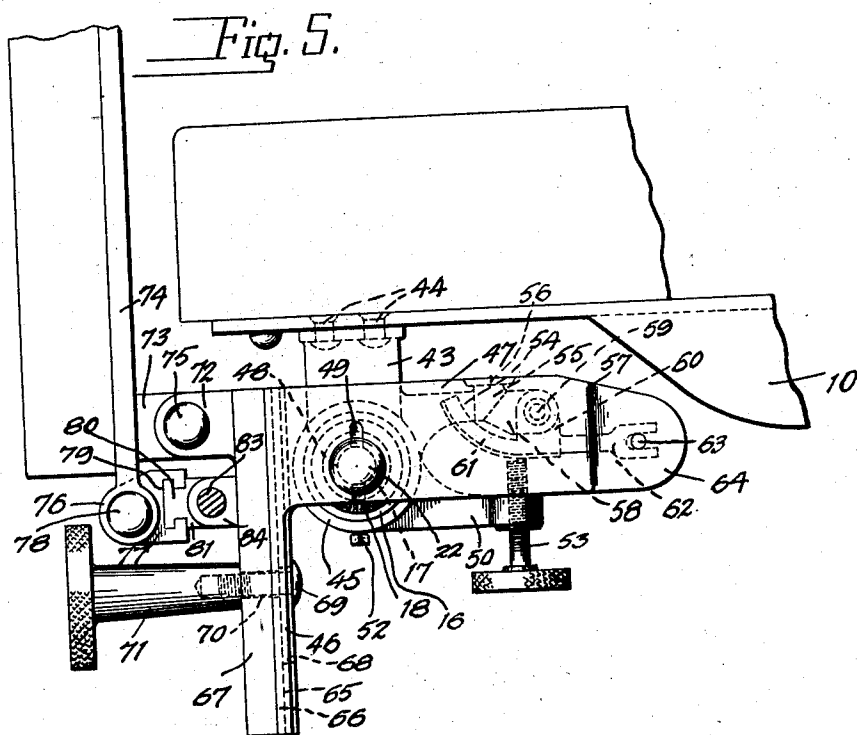
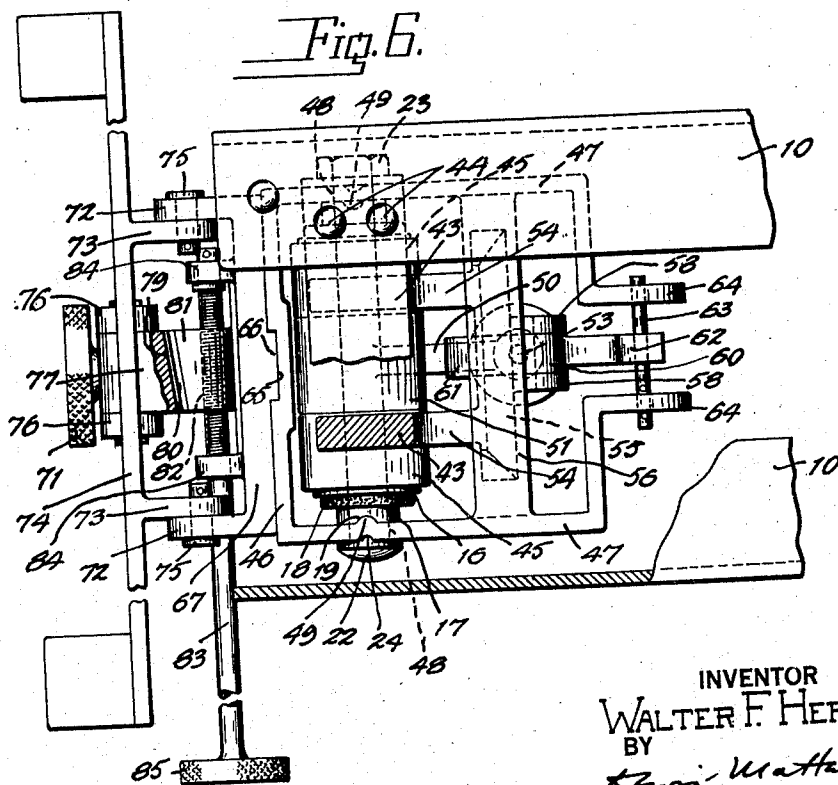
W. F. HEROLD

2,087,253

TILTING MECHANISM ESPECIALLY FOR CHAIRS

Filed May 16, 1935

3 Sheets-Sheet 2



INVENTOR
WALTER F. HEROLD.
BY
Erwin W. Hatten
ATTORNEY

July 20, 1937.

W. F. HEROLD

2,087,253

TILTING MECHANISM ESPECIALLY FOR CHAIRS

Filed May 16, 1935

3 Sheets-Sheet 3

Fig. 7.

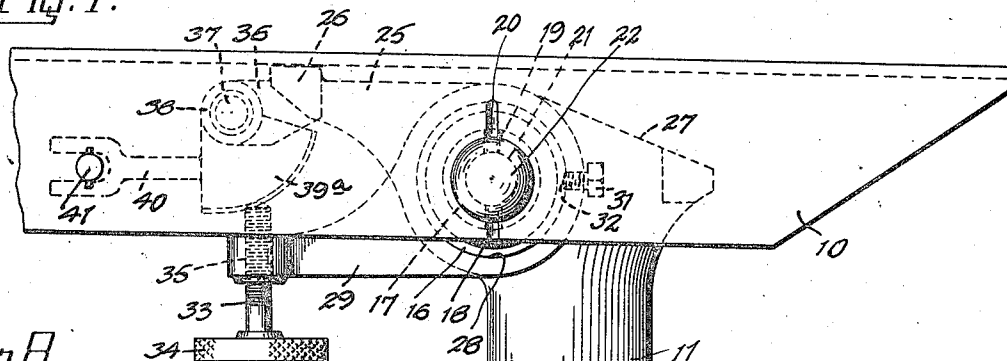


Fig. 8.

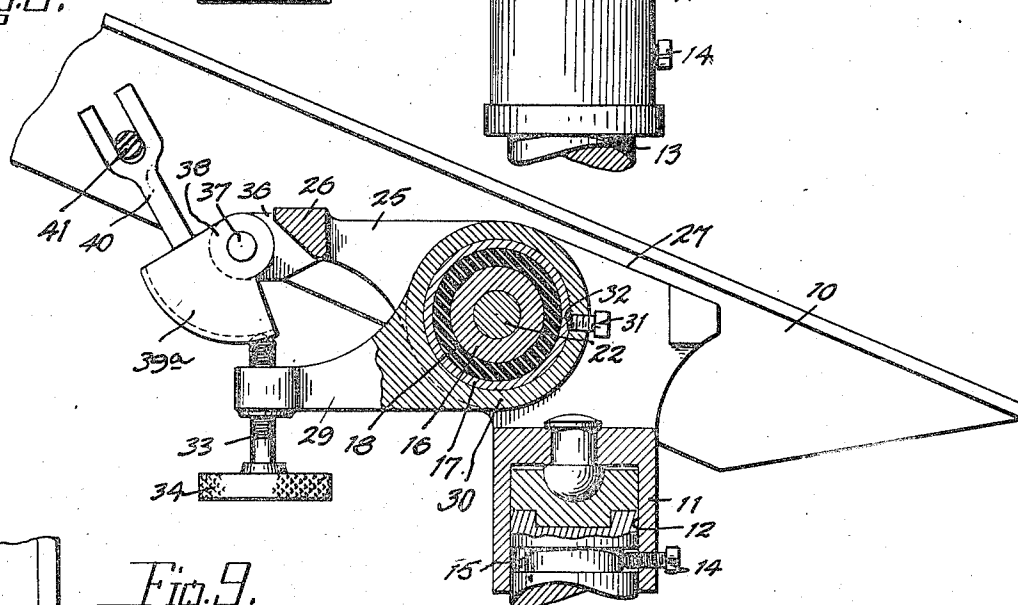
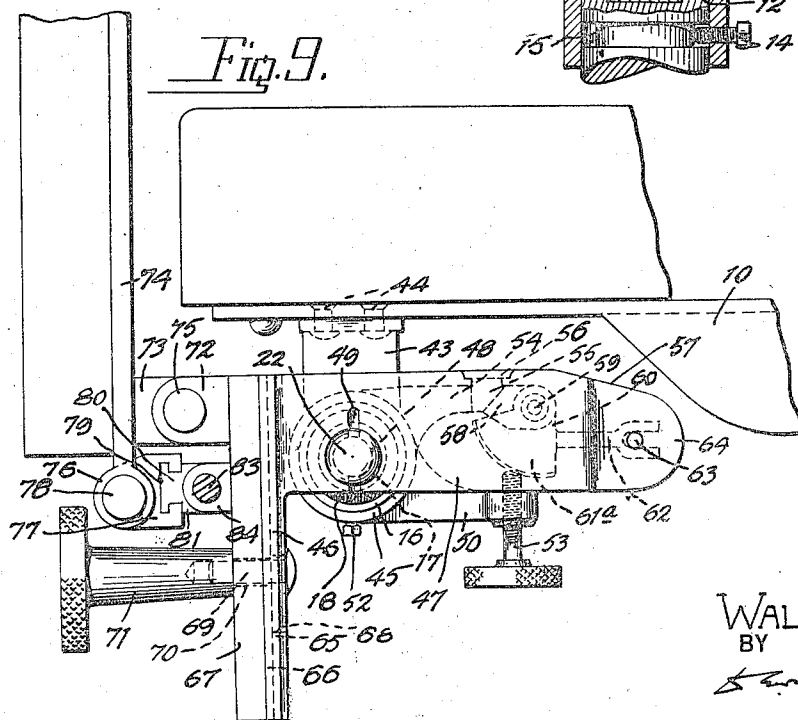


Fig. 9.



INVENTOR
WALTER F. HEROLD.
BY
Ernest W. Hatten
ATTORNEY

UNITED STATES PATENT OFFICE

2,087,253

TILTING MECHANISM ESPECIALLY FOR CHAIRS

Walter F. Herold, Bridgeport, Conn., assignor
to The Bassick Company, Bridgeport, Conn.,
a corporation of Connecticut

Application May 16, 1935, Serial No. 21,738

10 Claims. (Cl. 155-77)

The present invention relates to tilting mechanism especially for chairs, either of the type in which the chair seat is tiltable relatively to a supporting base, or in which the chair back is tiltable relatively to the chair seat, and is an improvement over the chair iron disclosed in my U. S. Patent No. 2,008,209, dated July 16, 1935, and in which the tilting action takes place in a hinge joint of rubber or other suitable material, the rubber being in the form of a cylinder disposed under permanent pressure and tension between inner and outer co-axial concentric members to which the rubber is in effect bonded, the relative movement between these members being supported by the torsional strain set up in the compressed rubber.

According to the invention disclosed in said application the rubber is under a predetermined initial tension yieldingly holding the tiltable member in its normal non-tilted position, and as the tiltable member is tilted the tension and resistance in the rubber is built up to support the increased load as the pressure moment is increased during tilting.

It is proposed in the present invention to provide means whereby the angularity of movement of the joint elements will be of a different order from the angularity of movement of the tilting member with a consequent difference in the tension set up in the rubber, one embodiment consisting in providing a gradual increase in the angularity of movement of the joint elements and another embodiment in providing a gradual decrease, to the end that the proper angularity of movement to produce the desired tension in the rubber may be produced independently of the particular angularity of movement of the tilting member. It is further proposed to provide means whereby the angularity of movement of the joint elements will vary at different degrees of tilt of the tilting member, having a different movement for a given number of degrees of tilt of the tilting member at one end of the tilting range than at the other end of the tilting range.

With the above and other objects in view embodiments of my invention are shown in the accompanying drawings and these embodiments will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claims.

In the drawings:

Fig. 1 is a side elevation of a chair iron embodying the invention, the forward ends of the seat supporting spider arms being broken away.

Fig. 2 is a vertical sectional view, and showing the tilted position.

Fig. 3 is a bottom plan horizontal sectional view, taken along the line 3-3 of Fig. 1.

Fig. 4 is a horizontal sectional view taken along the line 4-4 of Fig. 1.

Fig. 5 is a side elevation of a modified form of chair iron, according to the invention, adapted for tiltable supporting a chair back.

Fig. 6 is a plan view thereof with the seat removed and with certain parts broken away and in section.

Fig. 7 is a side elevation of another modified form of chair iron, according to the invention.

Fig. 8 is a vertical sectional view showing the same in tilted position.

Fig. 9 is a side elevation of a further modified form of the invention, adapted for tiltable supporting a chair back.

Similar reference characters indicate corresponding parts throughout the several figures of the drawings.

Referring to the drawings and more particularly to Figs. 1 to 4 thereof, the chair iron, according to the illustrated exemplary embodiment of the invention shown therein, comprises a pair of angular cross-section spider arms 10-10 adapted to be screwed to the under side of the chair seat in the usual manner, and mounted for tilting movement upon a bracket 11 having a vertically disposed socket 12 engaged by a vertically disposed post or spindle 13, the bracket having swivel movement on the post and being retained thereon by a set screw 14 in the bracket engaging an annular groove 15 in the post.

The tiltable mounting of the spider arms is effected by securing one member of the joint element to the bracket and the other member to the spider arms, the resilient rubber support being disposed between these members, as will presently more fully appear.

The joint element comprises an outer tubular member 16, an inner tubular member 17, and a cylindrical body of rubber 18 between them, this rubber body being highly compressed and confined between the members 16 and 17 and being in effect bonded to their surfaces, so that upon relative rotary movement between the members 16 and 17 the rubber body is put under torsional strain. In practice the rubber body is bonded to the inner member 17, as by vulcanization, and is then forced into the outer member 16 under great pressure, its diameter prior to insertion in the member 16 being considerably greater than the interior diameter of the member 16, so that the

rubber is thus highly compressed and is in effect bonded to the inner surface of the member 16 by the great surface friction set up between them under compression.

5 The ends of the inner tubular member 17 of the joint element project beyond the rubber member 18, as well as beyond the outer tubular member 16, and are provided with grooves 19 which are adapted to be interlockingly engaged with inwardly embossed vertically extending ribs 20—20
10 extending above and below tie-bolt-receiving apertures 21—21 respectively provided in the sides of the spider arms, a tie-bolt 22, headed at one end and screw threaded at the other being engaged through the bore of the inner tubular
15 joint member 17 and through the apertures 21—21 and having a nut 23 screwed upon its threaded end, this assembly rigidly connecting the spider arms to the member 17 and providing
20 a supporting spacer or strut between the arms. A rib 24 formed on the head of the bolt engages the recess formed by the embossing of the rib 20 and thus locks the bolt against relative turning movement.

25 The bracket 11 is provided with a forwardly projecting yoke portion 25 having a transverse connecting bridge portion 26 at its forward end, against which the upper portions of the spider arms 10 rest in the normal non-tilted position of
30 the chair seat. The tilting axis of the joint is disposed within the yoke portion forwardly of the vertical swivel axis of the post 13, and the upper surface of the bracket is inclined rearwardly and downwardly, as at 27, tangentially to the tilting arc of the spider arms, to form a limit stop to the
35 tilting action, as shown in Fig. 2.

The yoke portion of the bracket is provided in each side with cylindrical bearing openings 28—28, in which the end portions of the outer
40 joint member 16 are engaged for rotary movement, as will presently more fully appear.

Within the space between the sides of the yoke portion a tension applying and adjustment lever 29 is disposed, its collar portion 30 being engaged
45 about the intermediate portion of the outer joint member 16 and secured thereto by a set screw 31 in the collar engaging a recess 32 in the member 16. An adjusting screw 33 having a hand-wheel or nut 34 at its end is engaged in a threaded opening 35 in the end of the lever 29 and is adapted to
50 bear at its upper end upon a swinging cam member, as will presently more fully appear. It will be obvious that by adjusting the screw 33 the outer joint member 16 is rotated with respect to
55 the bracket 11 and the inner joint member 17, and through the torsional strain imposed on the rubber 18 any initial tension may be set up in the latter, the greater the initial tension the more force required to tilt the chair seat. The tension
60 it will be observed is increased through the counter-clockwise movement of the lever 29.

Upon the bridge portion 26 there are formed a pair of forwardly projecting ears 36—36 supporting a transverse bearing pin 37 upon which is
65 rotatably engaged the hub portion 38 of a cam member 39, this cam member having a forwardly projecting forked arm 40 engaging a transverse bar 41 secured to and extending between the spider arms 10—10, so that as the chair seat and
70 spider arms are tilted swinging movement is imparted to the cam member relatively to the bracket. The cam member has a recessed cam face 42 in which the end of the screw 33 engages, and the design of the cam is such that as it is
75 swung it gradually forces the screw 33 and the

tension lever 29 downwardly in counter-clockwise direction. In this way the tension build-up in the rubber is gradually increased over that normally produced by the turning of the inner tubular member 17 during tilting, so that in the rearwardly tilted position substantially greater tension is produced in the rubber than would be the case if the outer tubular member 16 of the joint remained stationary. While less effort is required to start the tilting the build up of pressure will support the increased load as the weight is shifted rearwardly, so that an easy tilting action is produced with adequate support in the tilted position.

The build up of pressure in the rubber element 15 as the seat is tilted should under normal conditions be such as to compensate for the additional weight or pressure moment imposed as the tilting is increased, in other words, the increase of tension should be proportionate to the increase of the pressure moment, and therefore approximate stable equilibrium at any point of tilt will result.

In Figs. 5 and 6 I have shown a modified form in which the invention is embodied in a tilting back for a chair, as for instance a posture chair. 25 A bracket 43 is secured, as by rivets 44, to the rearward ends of the spider arms 10—10, and is provided with a pair of spaced cylindrical bearing portions 45—45 in which the joint element, comprising the outer and inner cylindrical tubular elements 16 and 17 and the intermediate rubber element 18, is disposed.

A tilting frame member comprising a rearward chair back supporting portion 46 and side portions 47—47 is provided in said side portions with tie-bolt-receiving apertures 48—48 and inwardly embossed locking ribs 49—49 for rigidly connecting the inner member of the joint element, the grooves 19—19 in the ends of the inner member 17 being engaged with said ribs and the tie-bolt 22 being engaged through said apertures 48—48 and through the bore of the inner member and being secured by the nut 23.

Within the space between the cylindrical bearing portions 45—45 a tension adjustment lever 50 45 is disposed and projects beneath the swinging cam member, presently to be more fully referred to, the collar portion 51 of the lever being engaged about the intermediate portion of the outer joint member 17 and secured thereto by a set-screw 52. An adjusting screw 53 having a hand-wheel or nut at its end is engaged in a threaded opening in the end of the lever 50 and is adapted to bear at its upper end upon the under surface of the cam member.

The bracket 43 is provided with a pair of forwardly projecting arms 54—54 supporting a bridge portion 55, against which a cross bar 56 extending between the side portions 47—47 of the tilting frame member rests in the normal non-tilted position. The upper surfaces of the forward ends of the side portions 47—47 are inclined, as at 57, and engage the under surfaces of the spider arms 10—10 in the fully tilted position to provide a limit stop.

A pair of forwardly projecting ears 58—58 are formed on the bridge portion 55 and support a bearing pin 59 upon which the hub portion 60 of the cam member 61 is rotatably engaged, the cam member being substantially similar in design and action to the cam member 39 of the embodiment of the invention shown in Figs. 1 to 4, being provided with a forwardly projecting fork member 62 engaging a transverse rod 63 secured between the inwardly and forwardly bent 75

end portions 64—64 of the side portions 47—47 of the tilting frame member.

The chair back is mounted for vertical and angular adjustment relatively to the tilting frame member, and for this purpose the rearward portion 46 of the tilting frame member, which projects for a considerable distance below the side portion 47—47, is provided with a vertically disposed recess 65 in which is engaged the vertically disposed rib 66 of a bracket member 67, an elongated slot 68 being provided in the recessed portion 65 and engaged by a bolt 69 extending through an aperture 70 in the bracket member 67, a hand wheel or nut 71 being screwed upon the end of the bolt which normally secures the bracket member 67 in its adjusted position on the portion 46, but upon being loosened permits vertical adjustment for the purpose of raising or lowering the height of the chair back.

A pair of ear lugs 72—72 are provided at the upper end of the bracket member 67 to which a pair of ear lugs 73—73 formed on the chair back frame member 74 are pivotally connected by pins 75—75.

Centrally of the frame member 74 and below the lugs 73—73 there are provided a pair of ears 76—76 to which a block member 77 is pivotally connected by means of a pin 78, this block member being provided in its forward face with an inclined T-slot 79 in which is engaged an inclined T-rib 80 provided upon a link-block member 81, this member 81 having a threaded passage 82 therethrough in which is engaged a screw shaft 83 journaled in bearing lugs 84—84 formed on the bracket member 67 and provided at its outwardly extended end with a hand wheel 85. In order to adjust the angular relation of the chair back with respect to the member 67 the screw shaft 83 is turned, in one direction or the other whereupon the link block member 81 is shifted transversely in one direction or the other, and through its inclined T-rib and slot connection with the block member 77 swings the lower end of the chair back frame member about the pivots 75—75 either toward or away from the member 67.

The operation is substantially similar to that of the first embodiment, except that, instead of the seat tilting about the supporting base, the chair back, supported by the bracket 67 and tilting frame member, tilts relatively to the chair seat and bracket 43 upon rearward pressure being applied against the back by the person seated in the chair, the cam member 61 being swung through the connection of its forked end 62 with the cross-bar 63 of the tilting form member to apply gradually increasing tension to the joint element.

In Figs. 7 and 8 I have shown another modification substantially identical with the embodiment shown in Figs. 1 to 4, but in which a cam member 39^a is substituted for the cam member 39, this cam member 39^a being designed to have an opposite effect from the cam member 39, its cam face gradually decreasing, so that as the chair seat is tilted the tension that would normally be applied if the outer joint member 16 remained stationary is gradually decreased as the chair seat is tilted, the lever 29 moving in clockwise direction from the position shown in Fig. 7 to the position shown in Fig. 8.

In Fig. 9 I have shown a further modification substantially identical with the embodiment shown in Figs. 5 and 6, but in which a cam member 61^a, having a gradually decreasing cam face,

similar to the cam 39^a, of the embodiment shown in Figs. 7 and 8, is substituted for the cam 61.

I have illustrated and described preferred and satisfactory embodiments of my invention, but it will be obvious that changes may be made therein, within the spirit and scope thereof, as defined in the appended claims.

Having thus described my invention what I claim and desire to secure by Letters Patent is:—

1. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to one of said members, and means rigidly connected to said other joint element and in operative connection with said other member, whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising movable movement transmitting means cooperatively connected between said last named means and said tiltable member and movable through tilting of said tiltable member adapted to have gradually varying amplitude during equal increments of movement to transmit movement to said last named means as said tiltable member is tilted whereby the rate of tension applied to said tension element during angular movement of said tiltable member is varied during relative rotation between said joint elements.

2. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to said tiltable member, and means rigidly connected to said other joint element and in operative connection with said support, whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising movable movement transmitting means cooperatively connected between said last named means and said tiltable member and movable through tilting of said tiltable member adapted to have gradually varying amplitude during equal increments of movement to transmit movement to said last named means as said tiltable member is tilted whereby the rate of tension applied to said tension element during angular movement of said tiltable member is varied during relative rotation between said joint elements.

3. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to one of said members, and means rigidly connected to said other joint element and in operative connection with said other member, whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising cam means cooperatively connected between said last named means and said tiltable member and movable through tilting of said tiltable member adapted to have gradually varying

amplitude during equal increments of movement to transmit movement to said last named means as said tiltable member is tilted whereby the rate of tension applied to said tension member during equal increments of angular movement of said tiltable member is varied during relative rotation between said joint elements.

4. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to one of said members, and means rigidly connected to said other joint element and in operative connection with said other member, whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising cam means cooperatively connected between said last named means and said tiltable member and movable through tilting of said tiltable member adapted to have gradually increasing amplitude during equal increments of movement to transmit movement to said last named means in a direction to increase the tension of said tension element as said tiltable member is tilted whereby the rate of tension applied to said tension member during equal increments of angular movement of said tiltable member is gradually increased during relative rotation between said joint elements.

5. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to one of said members, and means rigidly connected to said other joint element and in operative connection with said other member, whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising cam means cooperatively connected between said last named means and said tiltable member and movable through tilting of said tiltable member adapted to have gradually decreasing amplitude during equal increments of movement to transmit movement to said last named means in a direction to decrease the tension of said tension element as said tiltable member is tilted whereby the rate of tension applied to said tension member during equal increments of angular movement of said tiltable member is gradually decreased during relative rotation between said joint elements.

6. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to said tiltable member, and means rigidly connected to said other joint element and in operative connection with said support, whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising a cam member pivoted upon said support engaging said last mentioned means and connected to said tiltable member whereby tilting

of said tiltable member is adapted to impart movement to said cam member and said last named means relatively to said support and whereby the rate of tension applied to said tension member during equal increments of angular movement of said tiltable member is varied by rotation of said other joint element.

7. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to one of said members, means rigidly connected to said other joint element and in operative connection with said other member, whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising movable movement transmitting means cooperatively connected between said last named means and said tiltable member and movable through tilting of said tiltable member adapted to have gradually varying amplitude during equal increments of movement to transmit movement to said last named means as said tiltable member is tilted whereby the rate of tension applied to said tension element during angular movement of said tiltable member is varied during relative rotation between said joint elements, stop means on and cooperating between said supporting member and said tiltable member for limiting the movement of said tiltable member in one direction, one of said joint elements being disposed in a state of initial rotation relatively to the other joint element to produce initial tension in a direction to normally force said tiltable member in said one direction.

8. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly connecting one of said joint elements to said tiltable member, and means rigidly connected to said other joint element and in operative connection with said support whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising a cam member pivoted upon said support engaging said last mentioned means and connected to said tiltable member whereby tilting of said tiltable member is adapted to impart movement to said cam member and said last named means relatively to said support and whereby the rate of tension applied to said tension member during equal increments of angular movement of said tiltable member is varied by rotation of said other joint element, stop means on and cooperating between said supporting member and said tiltable member for limiting the movement of said tiltable member in one direction, one of said joint elements being disposed in a state of initial rotation relatively to the other joint element to produce initial tension in a direction to normally force said tiltable member in said one direction.

9. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of joint elements and a tension element acting between said joint elements, means rigidly con-

necting one of said joint elements to said tiltable member, and means rigidly connected to said other joint element and in operative connection with said support, whereby upon tilting of said
5 tiltable member there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising a cam member pivoted upon said support engaging said last mentioned means and connected to said tiltable member whereby tilting of
10 said tiltable member is adapted to impart movement to said cam member and said last named means relatively to said support and whereby the rate of tension applied to said tension member
15 during equal increments of angular movement of said tiltable member is varied by rotation of said other joint member, and an adjustment screw carried by said last named means engaging said cam to adjust the relation of said last
20 named means to said cam.

10. In a tilting mechanism, a supporting member and a member tiltable relatively to said supporting member, resilient joint means carried by said supporting member comprising a pair of

joint elements and a tension element acting between said joint elements consisting of an annular body of rubber compressed and confined between said joint elements and bonded to them,
5 means rigidly connecting one of said joint elements to one of said members, and means rigidly connected to said other joint element and in operative connection with said other member, whereby upon tilting of said tiltable member
10 there is relative rotary movement between said joint elements to tension said tension element, said operative connection comprising movable movement transmitting means cooperatively connected between said last named means and said
15 tiltable member and movable through tilting of said tiltable member adapted to have gradually varying amplitude during equal increments of movement to transmit movement to said last
20 named means as said tiltable member is tilted whereby the rate of tension applied to said tension element during angular movement of said tiltable member is varied during relative rotation between said joint elements.

WALTER F. HEROLD.