July 20, 1937. W. F. HEROLD 2,087,254

TILTING MECHANISM FOR CHAIRS

Filed May 16, 1935 2 Sheets-Sheet 1

Fig. 1.

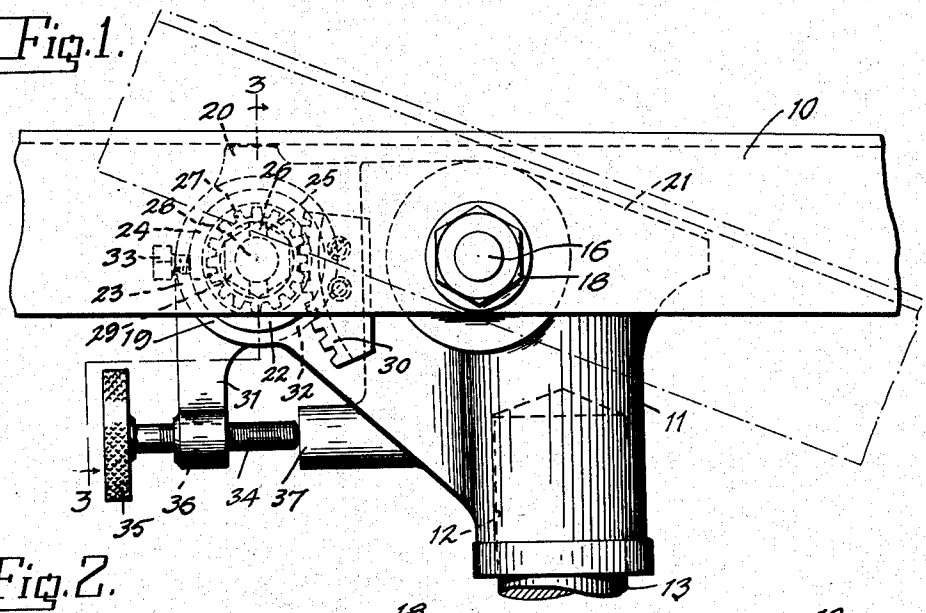


Fig. 2.

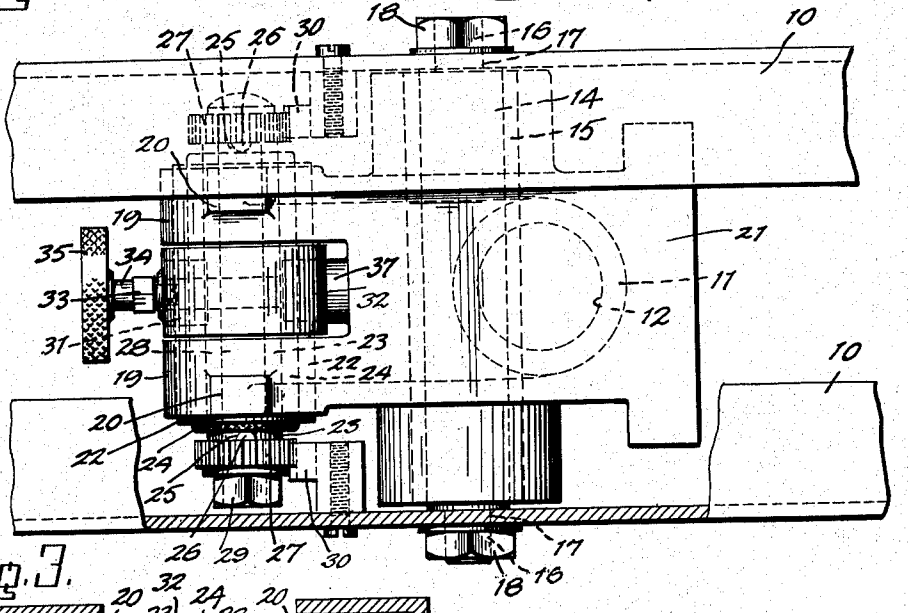
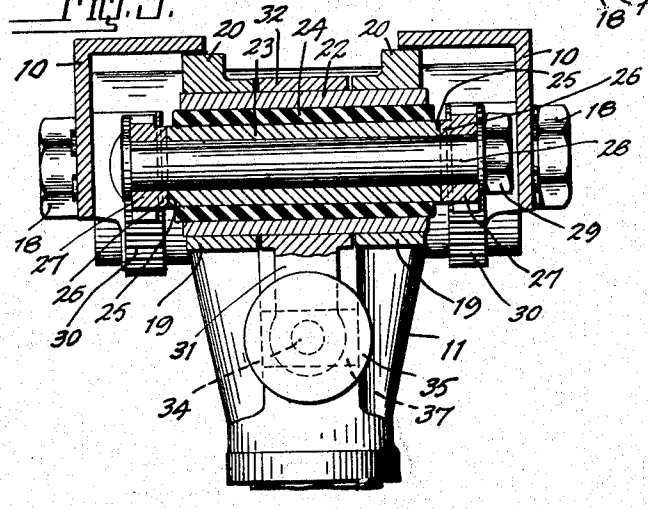


Fig. 3.



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Filed May 16, 1935 2 Sheets-Sheet 2

Fig. 4.

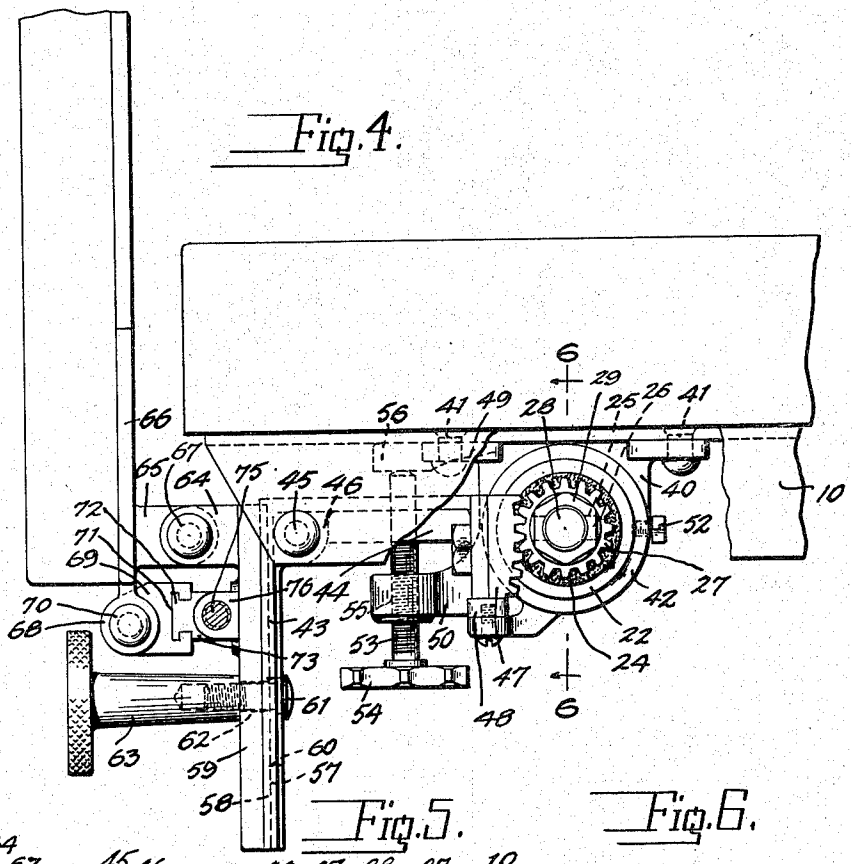


Fig. 5.

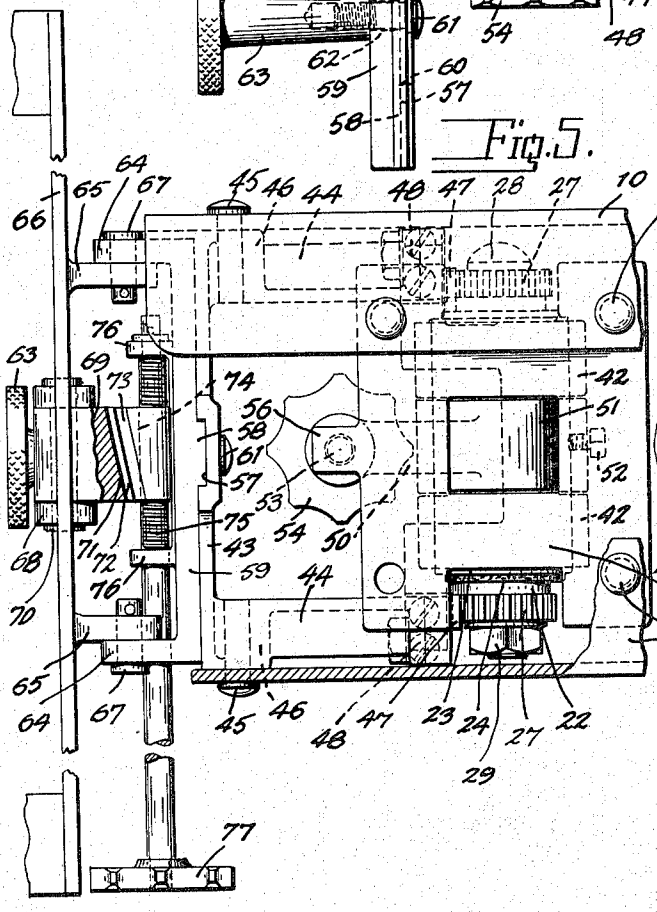
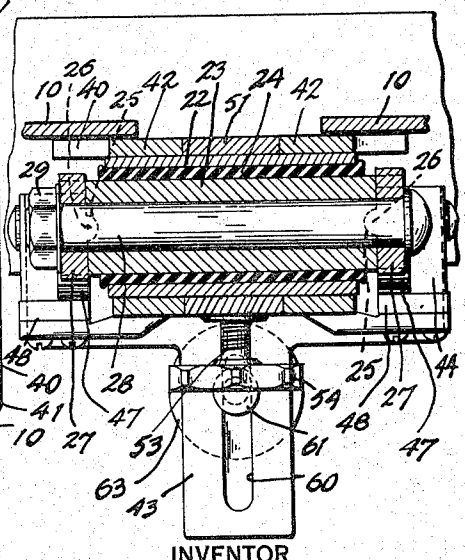


Fig. 6.



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2,087,254

TILTING MECHANISM FOR CHAIRS

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2 Claims. (Cl. 155—77)

The present invention relates to tilting mechanism 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 copending application S. N. 695,989 filed October 31, 1933, Patent No. 2,008,209 issued 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 in increased ratio to the angularity of movement of the tilting member, and consequently the tension set up in the rubber will be of a different order than is the case where the angularity of movement of the joint elements corresponds to that of the tilting member, 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.

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 and rearward ends of the seat supporting spider arms being broken away.

Fig. 2 is a top plan view, a portion of one of the spider arms being broken away.

Fig. 3 is a vertical sectional view, taken along the line 3—3 of Fig. 1.

Fig. 4 is a side elevation of a modified form of chair iron, according to the invention, adapted for tiltably supporting a chair back.

Fig. 5 is a plan view thereof with the seat removed and with certain parts broken away and in section.

Fig. 6 is a vertical sectional view, taken along the line 6—6 of Fig. 4, the seat being removed.

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

Referring to the drawings and more particularly to Figs. 1 to 3 thereof, the chair iron, according to the illustrated exemplary embodiment of the invention, comprises a pair of angular cross-section spider arms 10—10 adapted to be screwed to the underside 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 in the usual manner.

The tiltable mounting of the spider arms is effected by means of transverse shaft 14 extended through a transverse tubular bushing 15 in the bracket 11, the shaft having reduced threaded extensions 16—16 at its ends, engaged through apertures 17—17 in the spider arms, and having nuts 18—18 screwed thereon which rigidly connect the shaft to the spider arms, this shaft providing a supporting spacer or strut between the arms. The bearing bushing 15 is preferably formed of rubber, graphite impregnated bronze or other suitable type of oil-less and noiseless bearing material.

The bracket 11 is provided in forwardly spaced relation to the tilting axis of the shaft 14 with a pair of forwardly projecting transversely spaced cylindrical bearing portions 19—19, having upwardly projecting flat-surfaced lugs 20—20 formed upon the upper sides, and against which the upper portions of the spider arms 10—10 rest in the normal non-tilted position of the chair seat. The upper surface of the bracket 11 is inclined rearwardly and downwardly, as at 21, tangentially to the tilting arc of the spider arms to form a limit stop to the rearward tilting action of the chair seat, as indicated by the dot-and-dash lines Fig. 1.

The bearing portions 19—19 are adapted to receive the tension applying element which comprises an outer tubular member 22 adapted to rotatably engage said bearing portions, an inner tubular member 23, and a cylindrical body of rubber 24 between them, this rubber body being highly compressed and confined between the

members 22 and 23 and being in effect bonded to their surfaces, so that upon relative rotary movement between the members 22 and 23 the rubber body is put under torsional strain. In practice the rubber body is bonded to the inner member 23, as by vulcanization, and is then forced into the outer member 22 under great pressure, its diameter prior to insertion in the member 22 being considerably greater than the interior diameter of the member 22, so that the rubber is thus highly compressed and is in effect bonded to the inner surface of the member 22 by the great surface friction set up between them under compression.

The ends of the inner tubular member 23 project beyond the rubber member 24, as well as beyond the outer tubular member 22, and are provided with grooves 25—25, which are adapted to be interlockingly engaged with ribs 26—26 formed upon pinion gears 27—27, and which gears are rigidly connected to said inner tubular member by means of a tie-bolt 28, headed at one end and screw threaded at the other end, a nut 29 being engaged upon said screw threaded end.

To the inner surfaces of the sides of the spider arms 10—10 there are secured a pair of segment gear members 30—30, the teeth of which are concentric to the tilting axis of the chair seat, and which mesh with the pinion gears 27—27.

Within the space between the bearing portions 19—19 a tension applying an adjustment lever 31 is disposed, its collar portion 32 being engaged about the intermediate portion of the outer joint member 22, and being secured thereto by a set screw 33. An adjusting screw 34 having a hand wheel or nut 35 at its end is engaged in a threaded opening 36 in the end of the lever 31 and is adapted to bear at its inner end upon an abutment portion 37 formed upon the bracket 11. It will be obvious that by adjusting the screw 34 the outer tension element member 22 is rotated with respect to the inner tension element member 23, the latter being held against rotation through the engagement of the pinions 27 with the segmental gear members 30 of the spider arms and through the engagement of the spider arms with the stop lugs 20—20. A torsional strain is thus set up in the rubber producing an initial tension in the latter which exerts pressure to move the chair seat in counter-clockwise direction and thereby retain it in its normal non-tilted position, the greater the initial tension the more force required to tilt the chair seat rearwardly from its non-tilted position. As the chair seat is tilted rearwardly the gear segments 30 rotate the inner tension element member 23 through an angular movement having an increased ratio over the angular tilting movement of the chair seat, and thus tension is built up in the rubber which increases in direct proportion to this ratio as the chair seat is tilted rearwardly, thus providing adequate support for the increased load as the weight is shifted rearwardly. The build-up of the pressure in the rubber element 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. 4 and 5 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. A bracket 40 is secured, as by rivets 41, near the rearward ends of the spider arms 10—10, and is provided with a pair of spaced cylindrical bearing portions 42—42 in which the tension element, comprising the outer and inner cylindrical tubular elements 22 and 23 and the intermediate rubber element 24, is disposed, the inner element having the pinion gears 27—27 rigidly secured to its ends by means of the tie-bolt 28.

A tilting frame member comprising a rearward chair back supporting portion 43 and side portions 44—44 is tiltably mounted upon the rearward ends of the spider arms by means of pins 45—45 engaging bearing portions 46—46 formed upon the side portions 44—44. Segmental gears 47—47 are secured upon the forward ends of the side portions 44—44 and mesh with the pinion gears 27—27 of the tension element, the tilting member being limited in its non-tilted position by abutment of the lower ends of the segmental gears 47—47 with stop lugs 48—48 provided on the bearing portions 42 and being limited in its tilted position by engagement of the upper surfaces of the side portions 44—44 with inclined abutment surfaces 49—49 provided upon the bracket 40.

Within the space between the cylindrical bearing portions 42—42 a tension adjustment lever 50 is disposed and projects rearwardly, the collar portion 51 of the lever being engaged about the intermediate portion of the outer tension element member 22 and secured thereto by a set-screw 52. An adjusting screw 53 having a hand-wheel or nut 54 at its end is engaged in a threaded opening 55 in the end of the lever 50 and is adapted to bear at its upper end upon the under surface of an abutment lug 56 formed upon the bracket 11.

The chair back is mounted for vertical and angular adjustment relatively to the tilting frame member, and for this purpose the rearward portion 43 of the tilting frame member, which projects for a considerable distance below the side portion 44—44, is provided with a vertically disposed recess 57 in which is engaged the vertically disposed rib 58 of a bracket member 59, an elongated slot 60 being provided in the recessed portion 57 and engaged by a bolt 61 extending through an aperture 62 in the bracket member 59, a hand wheel or nut 63 being screwed upon the end of the bolt which normally secures the bracket member 59 in its adjusted position on the portion 43, 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 64—64 are provided at the upper end of the bracket member 59 to which a pair of ear lugs 65—65 formed on the chair back frame member 66 are pivotally connected by pins 67—67.

Centrally of the frame member 66 and below the lugs 65—65 there are provided a pair of ears 68—68 to which a block-member 69 is pivotally connected by means of a pin 70, this block member being provided in its forward face with an inclined T-slot 71 in which is engaged an inclined T-rib 72 provided upon a link block member 73, this member 73 having a threaded passage 74 therethrough in which is engaged a screw shaft 75 journaled in bearing lugs 76—76 formed on the bracket member 59, and provided at its outwardly extended end with a hand wheel 77. In order to adjust the angular relation of the chair back with respect to the member 59 the screw shaft 77 is turned in one direction or the

other whereupon the link-block member 73 is shifted transversely in one direction or the other, and through its inclined T-rib and slot connection with the block member 69 swings the lower end of the chair back frame member about the pivots 67—67 either toward or away from the member 59.

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 59 and tilting frame member, tilts relatively to the chair seat and bracket 42 upon rearward pressure being applied against the back by the person seated in the chair, the segmental gears 47—47 being swung to rotate the inner tension element member 23 through the pinion gears 27—27 to apply gradually increasing tension in the rubber body 24 of tension to the element.

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 said supporting member, a gear rigidly connected to said other joint element and a gear carried by tiltable member and meshing with said first mentioned gear whereby upon tilting of said tiltable member there is relative rotary movement between said joint elements to tension said tension element, stop means on and cooperating between said supporting member and said tilting member for limiting the movement of said tilting 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 tilting member in said one direction.

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 consisting of an annular body of rubber compressed and confined between said joint elements and bonded thereto, means rigidly connecting one of said joint elements to one of said members, a gear rigidly connected to said other joint element and a gear carried by said other member and meshing with said first mentioned gear, whereby upon tilting of said tiltable member there is a relative rotary movement between said joint elements to tension said tension element, stop means on and cooperating between said supporting member and said tilting member for limiting the movement of said tilting member in one direction, one of said joint elements being disposed in a state of initial rotation relatively to the other element to produce initial tension in a direction to normally force said tilting member in said one direction.

WALTER F. HEROLD.