

Oct. 12, 1937.

W. F. HEROLD

2,095,947

TILTING MECHANISM

Filed Nov. 24, 1933

2 Sheets-Sheet 1

Fig. 2.

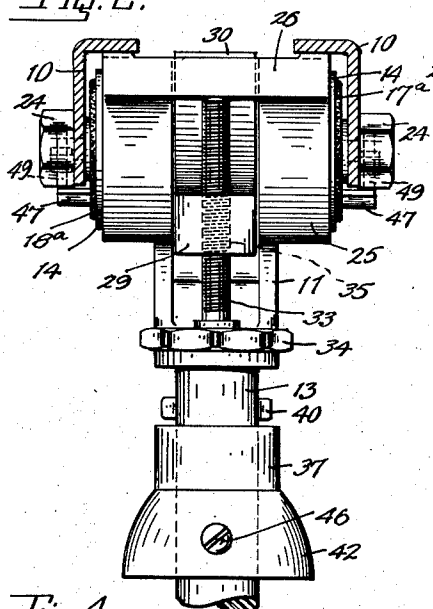


Fig. 1.

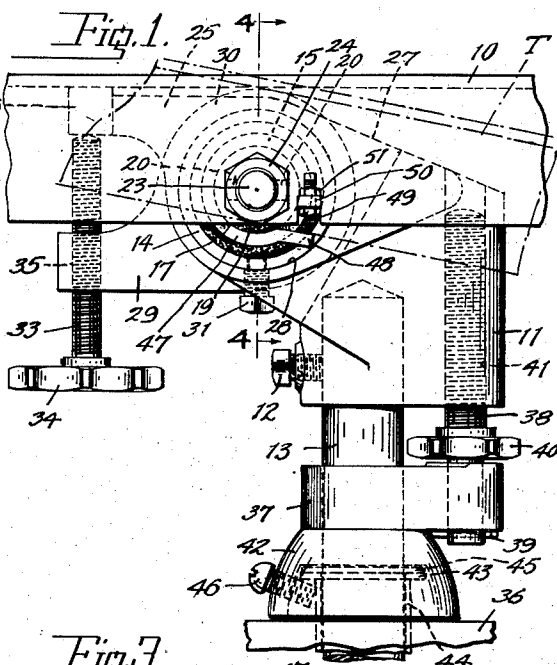


Fig. 4.

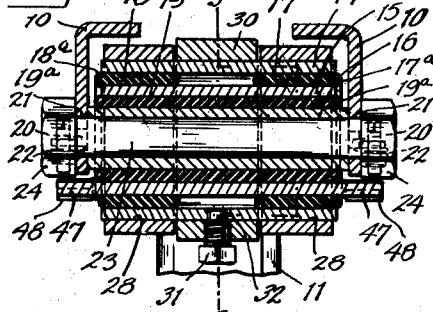


Fig. 3.

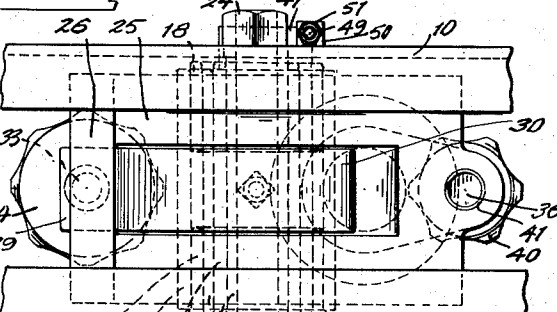
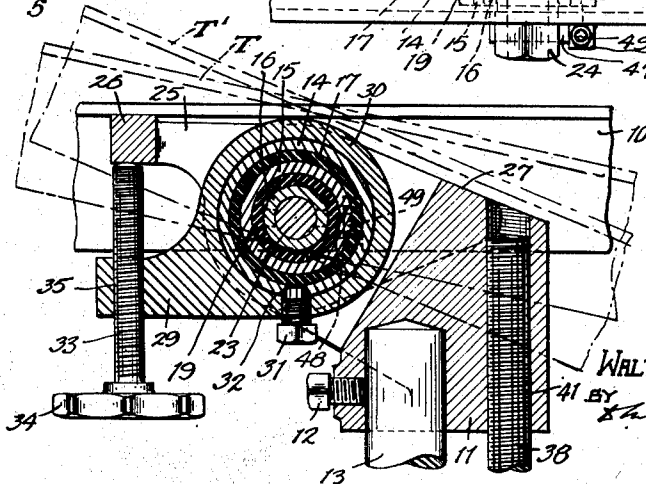


Fig. 5.



INVENTOR.
WALTER F. HEROLD.
BY *Wm. W. H. H.*
ATTORNEY.

Oct. 12, 1937.

W. F. HEROLD

2,095,947

TILTING MECHANISM

Filed Nov. 24, 1933

2 Sheets-Sheet 2

Fig. 7.

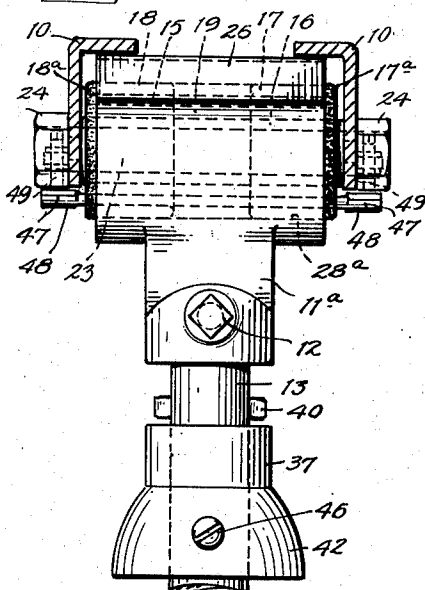


Fig. 6.

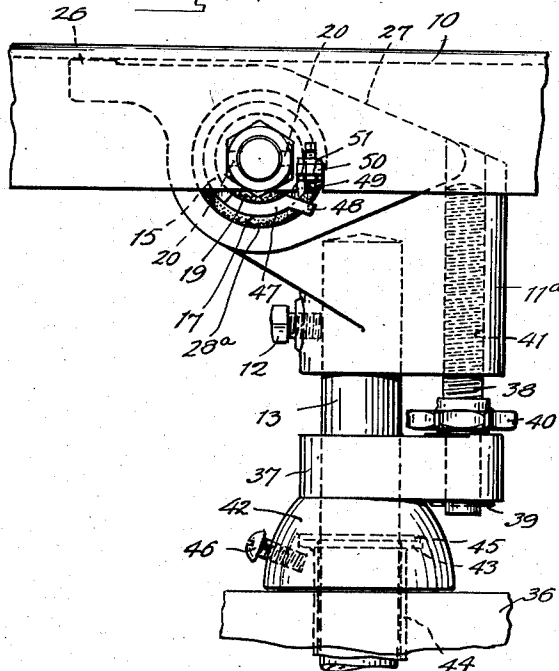
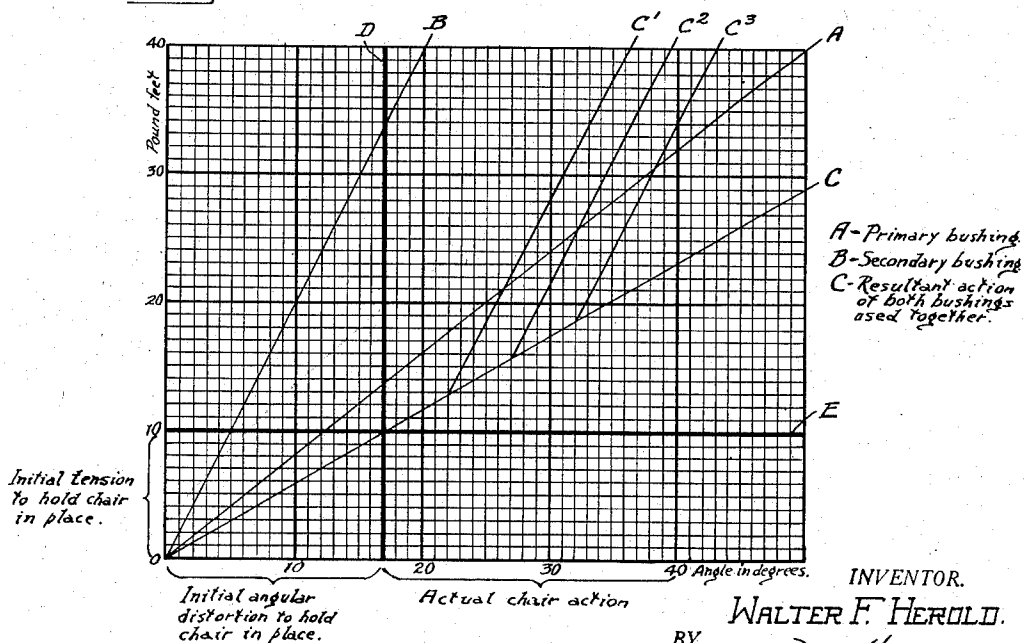


Fig. 8.



UNITED STATES PATENT OFFICE

2,095,947

TILTING MECHANISM

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

Application November 24, 1933, Serial No. 699,497

5 Claims. (Cl. 287—85)

The present invention relates to tilting mechanism, and while it has application in any structure where one member is arranged to be tilted with respect to another it is described by way of example in the illustrated embodiment as applied to chair irons, particularly for use with tiltable chair seats, these being usually mounted for swiveling movement upon a base support.

Heretofore chair irons have for the most part employed coil springs for supporting the tilting movement and various means have been devised for mounting the springs and regulating the tension, but in all of these the relatively movable metal parts were in contact and under pressure of the springs so that during relative movement there was considerable surface friction with the result that the tilting action was irregular and the parts would creak and squeak. They furthermore required frequent lubrication, and this was not only very inconvenient and objectionable, because of the inaccessibility of the mechanism and the likelihood of soiling the hands and clothing, but the lubricated structure became a trap for picking up dirt and dust.

An object of the present invention is to provide a tilting mechanism in which the tilting action takes place in a hinge joint of rubber or other suitable resilient material, the rubber preferably being in the form of a plurality of concentric cylinders disposed under permanent pressure and tension between a plurality of coaxially movable concentric members to which the rubber cylinders are in effect bonded, and the relative movement between these members being resiliently supported by the torsional strain set up in the compressed rubber. It is particularly proposed to provide a tilting mechanism capable of easy tilting and the necessary support under a wide range of weight and strain conditions, so that the chair or other structure equipped therewith will be capable of supporting persons or objects of widely different weights and builds. The present trend in office chairs is for full upholstered high backs, so that the chair irons required are capable of carrying heavier weights than heretofore, and which at the same time have easy tilting action and the necessary support at various angles of tilt. To this end it is proposed to provide a light pressure range operable over a predetermined angle of tilt and a heavy pressure range brought into operation at the end of the light pressure range. It is further proposed to provide for convenient adjustment of the pressure and angles within the respective light and heavy pressure ranges, so that the chair iron or

other structure may be effectively adjusted to obtain the desired tension for the particular requirements of the user of the chair or other structure. A further object is to provide a tilting mechanism in which the angular strain and motion is distributed or divided between a plurality of resilient elements so that no one element takes the full load or full angular movement, thereby permitting of the use of smaller, more compact elements, and adding greatly to the life of the tilting mechanism because excessive strains will not be imposed on the resilient elements.

A further object is to provide a tilting mechanism construction providing an entirely resilient rubber cushioned full floating support in all directions and an easy cushioned action. Another object is to provide a tilting mechanism which will be noiseless in operation, will not deteriorate to any appreciable extent even after long and excessive use, and will require no lubrication.

With the above and other objects in view embodiments of the 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 present invention, the end portions of the spider arms being broken away.

Fig. 2 is a front view, the spider arms being shown in section, taken along the line 2—2 of Fig. 1.

Fig. 3 is a plan view.

Fig. 4 is a transverse section, taken along the line 4—4 of Fig. 1.

Fig. 5 is a vertical section, taken along the line 5—5 of Fig. 4.

Fig. 6 is a side elevation of a modified form of the invention.

Fig. 7 is a front view thereof.

Fig. 8 is a chart illustrating characteristic curves developed under different pressures and degrees of angular distortion.

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

Referring to the drawings, the chair iron according to the illustrated exemplary embodiment of the invention shown therein comprises a pair of angular cross-section spider arms adapted to be screwed to the under side of the chair seat in the usual manner, and mounted for tilting movement upon a bracket secured by a set screw to the upper end of the vertically

disposed spindle 13, the tiltable mounting of the spider arms being effected by securing the inner member of the joint element to the bracket and the outer member to the spider arms, the resilient rubber supporting elements being disposed between these members, as will presently more fully appear.

The joint element comprises an outer tubular member 14, an intermediate tubular member 15 in concentrically spaced relation within the member 14, an inner tubular member 16 in concentrically spaced relation within the member 15, and cylindrical bodies of rubber in the spaces between these members 14, 15 and 16, there being a pair of axially spaced tubular rubber elements 17 and 18 between the members 14 and 15 and a single tubular rubber element 19 between the members 15 and 16. In practice the rubber elements are bonded to the outer and inner surfaces of the intermediate member 15, as by vulcanization, and are then forced into the outer member 14 and over the inner member 16 under great pressure, so that the rubber is thus highly compressed and is in effect bonded to the inner surface of the member 14 and the outer surface of the member 16 by the great surface friction set up between them under compression. The rubber element 19 may of course be first vulcanized to the inner member 16 and then forced into the intermediate member 15. The ends of the rubber elements project beyond the ends of the outer and intermediate members 14 and 15, as at 17^a, 18^a and 19^a—19^a, and the ends of the inner member 16 project beyond the rubber body 19 and are shouldered and flattened to produce key lugs 20—20 for locking the inner member to the spider arms. For this purpose the spider arms are each provided with an aperture 21 and radially extending cut-outs 22—22 for receiving the lugs 20—20, a tie-bolt 23 being engaged through the bore of the inner member 16 and having its threaded ends extended through the apertures 21 and secured by nuts 24, this assembly rigidly connecting the spider arms to the inner member 16 and providing a supporting spacer or strut between the arms.

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 the chair seat. The tilting axis of the joint is disposed within the yoke portion forwardly of the vertical swivel axis of the spindle 13, and the upper surface of the bracket is inclined rearwardly and downwardly as at 27, tangentially of the tilting arc of the spider arms to form a limit stop to the full tilting action, as shown by the dot-and-dash lines T¹ in Fig. 5.

The yoke portion 26 of the bracket is provided in each side with cylindrical bearing openings 28—28 in which the end portions of the outer joint member 14 are engaged for rotary adjustment movement, as will presently more fully appear. Within the space between the sides of the yoke portion a tension adjustment lever 29 is disposed and projects beneath the bridge portion 26, its collar portion 30 being engaged about the intermediate portion of the outer joint member 14 and secured thereto by a set-screw 31, the member 14 having a hole 32 therein in which the end of the set-screw lockingly engages. 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 bears at its upper end upon the under surface of the bridge portion 26.

The spindle 13 passes down through the chair base 36 and is mounted for swiveling movement and vertical adjustment in respect thereto. For this purpose a collar 37 is provided on the spindle through which the spindle is free to move vertically, and within a rearwardly extending portion of this collar a vertical adjusting screw 38 is swivelly secured by a cotter pin 39, a hand-wheel or nut 40 being secured upon the screw above the collar and the screw engaging a vertical threaded passage 41 in the bracket 11.

A skirt portion 42 of the collar rests upon the upper flanged end 43 of a tubular bushing 44 secured in the chair base, a bearing washer 45 being interposed between the flange and the skirt and upon which the collar is free to swivel. A set-screw 46 in the skirt has its inner end disposed beneath the flange 43 and retains the collar and spindle against vertical displacement while permitting free swiveling action. Turning of the screw 38 adjusts the height of the chair seat and connected parts relatively to the collar 37 and chair base 36.

The intermediate joint member 15 is provided at each end of its lower portion with extension portions 47—47, having angularly bent lugs 48—48 disposed in the path of adjustably mounted stop screws 49—49, provided in outwardly bent lug portions 50—50 in the sides of the respective arms 10—10, these screws being adjustable toward or away from the lugs 48—48, and adapted to be fixed in adjusted position by suitable lock-nuts 51. The relative position of the stop screws 49—49 to the lugs 48—48 determines the angular tilt of the initial tilting range, as shown by the dot-and-dash lines T in Figs. 1 and 5.

If desired the adjusting arm 29, may be dispensed with, as also the outer member 14, as shown in the modification Figs. 6 and 7, in which case the rubber elements 17 and 18 will be directly engaged and secured in the bore 28^a of the bracket 11^a with the rubber elements under predetermined angular distortion and initial tension. The adjustment necessary will then be taken care of entirely by the stop screws 49—49.

In operation initial tilting action both distorts the outer rubber elements 17 and 18, which will be referred to in this description and in the chart, Fig. 8, as the "secondary bushing", and the inner rubber element 19, which will be referred to as the "primary bushing". As the stop screws 49—49 engage the lugs 48—48 the intermediate member 15 is rotated as a unit with the member 16, the rubber element 19 or secondary bushing, and the arms 10—10, so that further tension is then applied to the rubber elements 17 and 18, or primary bushing, to permit tilt to the full limit position, as indicated by the dot-and-dash lines T¹, Fig. 5, the rubber element 19 or secondary bushing being under no further strain during this action. By adjusting the stop screws 49—49 the point at which the intermediate member 15 is taken up in the tilting action may be varied as desired. Initial tension in the whole joint may be adjusted by means of the hand-wheel 34.

The action is graphically illustrated in the chart, Fig. 8. The line A represents the curve of the primary bushing (rubber element 19), considered alone, and the line B the curve of the secondary bushing (rubber elements 17 and 18),

considered alone. Assuming an initial tension in the joint of 10 pound feet the primary bushing is shown distorted 12 degrees while the secondary bushing is shown distorted 5 degrees, making a total initial distortion in the joint of 17 degrees under 10 pound feet tension, and represented by the resultant line C showing the action of both bushings used together. E—E and D—D represent the base lines of the actual chair action, the full movement of which is, for example, 23 degrees.

The line C—C¹ shows the action with the stop screws 49—49 set to take up the bushing 15 at 5 degrees of relative movement. At the point where the stop screws 49—49 take up the bushing 15 the angular relative movement of 5 degrees is accomplished under a tension of 13 pound feet. From this point the line is parallel to the secondary bushing line B and at the full movement of 23 degrees the tension required is approximately 48 pound feet.

The line C—C² shows the action with the set screws 49—49 set to take up the bushing 15 at 10 degrees of relative movement. In this case the movement of 10 degrees is accomplished with a tension of 16 pound feet, and the full movement of 23 degrees with a tension of approximately 41 pound feet.

The line C—C³ shows the action with the set screws 49—49 set to take up the bushing 15 at 15 degrees of relative movement. In this case the movement of 15 degrees is accomplished with a tension of 18½ pound feet, and the full movement of 23 degrees with a tension of 34 pound feet.

The chair iron, according to the illustrated embodiment of my invention gives full floating resilient support to the chair seat by the interposing of the compressed tensioned rubber elements 17, 18 and 19 between the outer, intermediate, and inner joint members 14, 15 and 16, and by the disposition of the rubber ends 17^a, 18^a and 19^a between the sides of the spider arms and the outer and intermediate members 14 and 15, so that in sitting in the chair there is a distinct cushioning effect. When the seat is tilted the building up of tension in the rubber, while permitting an easy tilting action, prevents sudden or hard tilting to the limit positions of the initial and secondary tilting ranges. By adjustment the chair iron may be made to properly accommodate any desired amount and disposition of weight.

As no lubrication is required the device will remain in perfect working order indefinitely without attention. It has been found that the high compression rubber will not deteriorate, even after very long, and excessive use, and as only the surfaces of the ends 17^a, 18^a and 19^a are exposed to air or moisture deterioration due to these causes is negligible.

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, a tiltable member mounted upon said supporting member for tilting movement about a fixed axis relative to said supporting member, said mounting including resilient joint means comprising a plurality of resilient elements adapted to be tensioned upon relative movement

between spaced surfaces thereof and separating means connected to a surface of each of said resilient elements and disposed between said resilient elements, one of said resilient elements being connected at its other surface to said tiltable member and another of said resilient elements being connected at its other surface to said supporting member, whereby the tilting of said tiltable member relatively to said supporting member is adapted to tension said resilient elements, and cooperating stop means on said separating means and on one of said members arranged to engage upon tilting to a predetermined position, whereby relative movement between said separating means and said member is arrested and further tension upon the resilient element between them thereby prevented, another of said elements having tension applied thereto upon tilting beyond said predetermined position, whereby pressure in excess of a predetermined pressure is only applied to said other element.

2. In a tilting mechanism, a supporting member, a tilting member mounted upon said supporting member for tilting movement about a fixed axis relative to said supporting member, said mounting including resilient joint means comprising a plurality of resilient elements adapted to be tensioned upon relative movement between spaced surfaces thereof and separating means connected to a surface of each of said resilient elements and disposed between said resilient elements, one of said resilient elements being connected at its other surface to said tiltable member and another of said resilient elements being connected at its other surface to said supporting member, said resilient elements being under initial tension in a direction to force said tiltable member in one direction, stop means adapted to limit the movement of said tilting member in said one direction, whereby the tilting of said tiltable member in the other direction relatively to said supporting member is adapted to further tension said resilient elements, and cooperating stop means on said separating means and on one of said members arranged to engage upon tilting to a predetermined position, whereby relative movement between said separating means and said member is arrested and further tension upon the resilient element between them thereby prevented, another of said elements having further tension applied thereto upon tilting beyond said predetermined position, whereby pressure in excess of a predetermined pressure is only applied to said other element.

3. In a tilting mechanism, a supporting member, a tilting member mounted upon said supporting member for tilting movement about a fixed axis relative to said supporting member, said mounting including resilient joint means comprising a plurality of resilient elements adapted to be tensioned upon relative movement between spaced surfaces thereof and separating means connected to a surface of each of said resilient elements and disposed between said resilient elements, one of said resilient elements being connected at its other surface to said tiltable member and another of said resilient elements being connected at its other surface to said supporting member, whereby the tilting of said tiltable member relatively to said supporting member is adapted to tension said resilient elements, and adjustable cooperating stop means on said separating means and on one of said members arranged to engage upon tilting to a pre-

determined position, whereby relative movement between said separating means and said member is arrested and further tension upon the resilient element between them thereby prevented, another of said elements having tension applied thereto upon tilting beyond said predetermined position, whereby pressure in excess of a predetermined pressure is only applied to said other element.

5
10
15
20
25
30
35

4. In a tilting mechanism, a supporting member, a tilting member mounted upon said supporting member for tilting movement about a fixed axis relative to said supporting member, said mounting including resilient joint means comprising a plurality of resilient elements adapted to be tensioned upon relative movement between spaced surfaces thereof and separating means connected to a surface of each of said resilient elements and disposed between said resilient elements, one of said resilient elements being connected at its other surface to said tiltable member and another of said resilient elements being connected at its other surface to said supporting member, said resilient elements being under initial tension in a direction to force said tiltable member in one direction, stop means adapted to limit the movement of said tilting member in said one direction, adjustment means arranged to vary said initial tension, whereby the tilting of said tiltable member in the other direction relatively to said supporting member is adapted to further tension said resilient elements, and cooperating stop means on said separating means and on one of said members arranged to engage upon tilting to a predetermined position, whereby relative movement between said separating means and said member is ar-

rested and further tension upon the resilient element between them thereby prevented, another of said elements having further tension applied thereto upon tilting beyond said predetermined position, whereby pressure in excess of a predetermined pressure is only applied to said other element.

5
10
15
20
25
30
35

5. In a tilting mechanism, a supporting member, a tiltable member mounted upon said supporting member for tilting movement about a fixed axis relative to said supporting member, said mounting including resilient joint means comprising a plurality of resilient elements of compressed rubber adapted to be tensioned upon relative movement between spaced surfaces thereof and separating means connected to a surface of each of said resilient elements and disposed between said resilient elements, one of said resilient elements being connected at its other surface to said tiltable member and another of said resilient elements being connected at its other surface to said supporting member, whereby the tilting of said tiltable member relatively to said supporting member is adapted to tension said resilient elements, and cooperating stop means on said separating means and on one of said members arranged to engage upon tilting to a predetermined position, whereby relative movement between said separating means and said member is arrested and further tension upon the resilient element between them thereby prevented, another of said elements having tension applied thereto upon tilting beyond said predetermined position, whereby pressure in excess of a predetermined pressure is only applied to said other element.

WALTER F. HEROLD.