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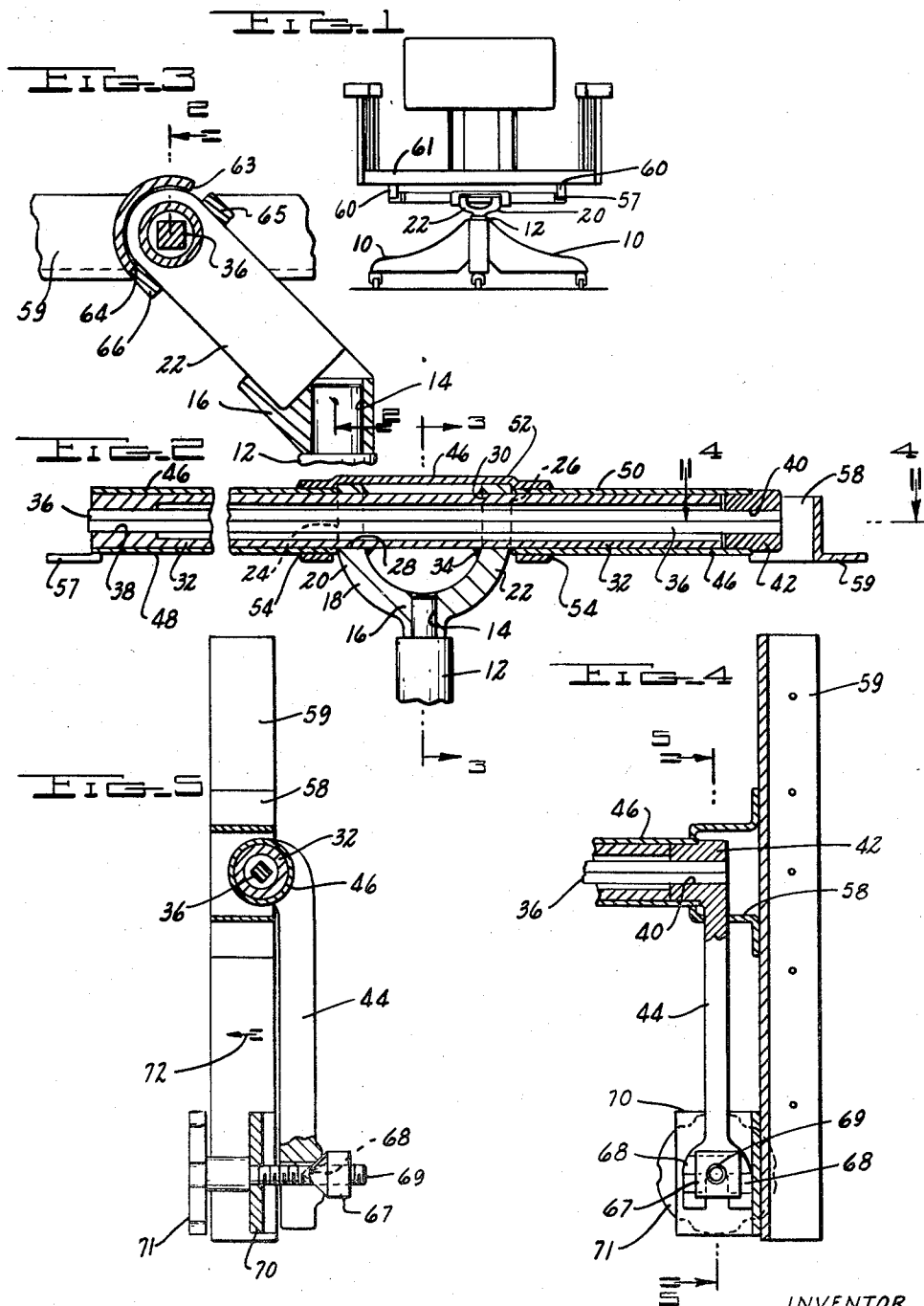
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TILTING CHAIR RESTRAINING MECHANISM

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2 Sheets-Sheet 1



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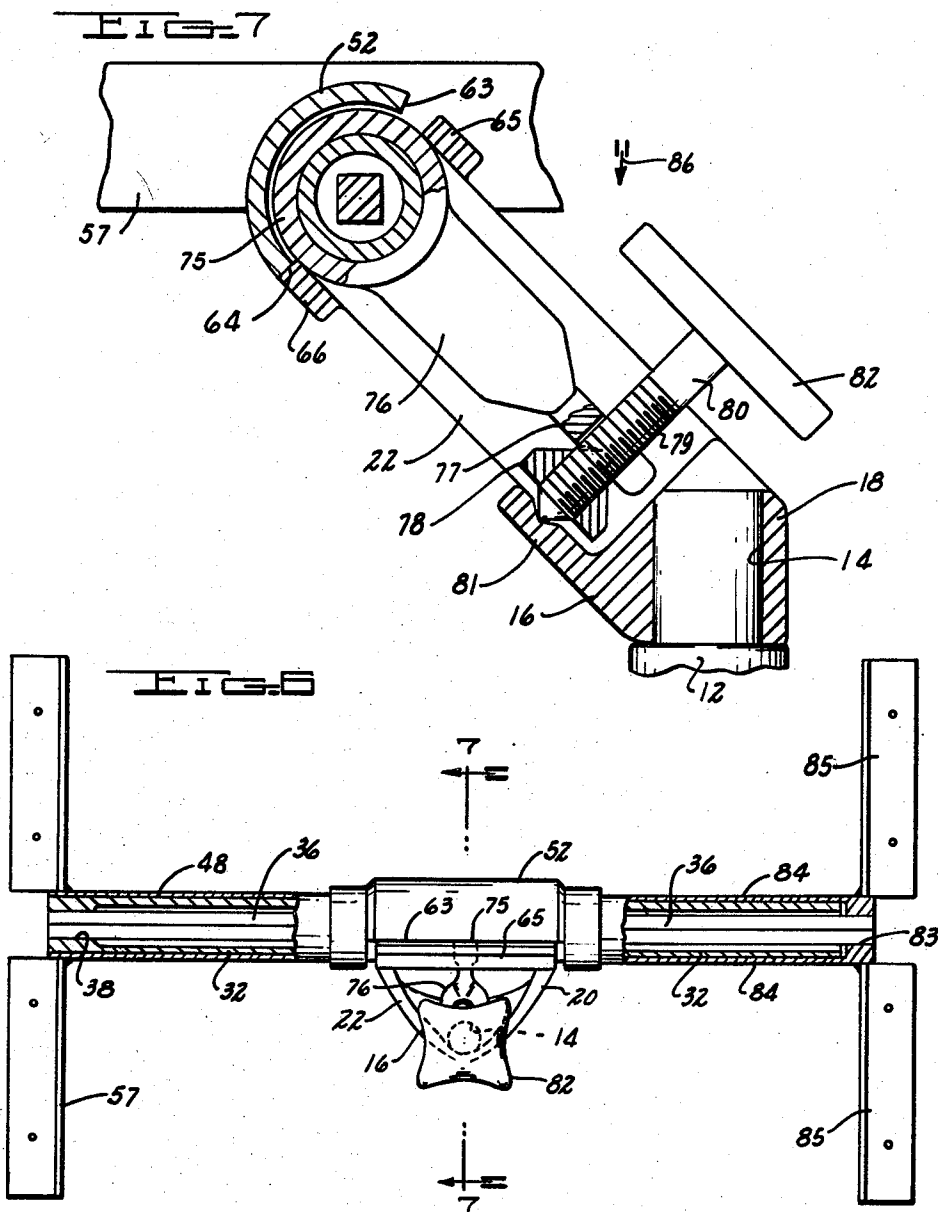
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TILTING CHAIR RESTRAINING MECHANISM

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7 Claims. (Cl. 155-77)

This invention relates to chairs having tilting seats, as for example, office chairs incorporating a torsion bar resilient restraining mechanism for resisting and cushioning the force imposed on the chair seat as the occupant shifts his weight to tilt the seat back.

Objects of the invention are to provide a tilting chair construction having a torsion bar cushioning mechanism wherein:

(1) The seat tilting axis is located at an elevated point closely adjacent the underside of the seat so as to make the tilting mechanism as inconspicuous as possible,

(2) The seat tilting axis is so located with relation to the points of body support that a comparatively large tilting of the seat is required to topple the chair, it being appreciated that limiting mechanism can be provided for preventing tilt of the seat beyond the "toppling" point without restricting the user to an undesirably small seat-tilt movement,

(3) The seat tilting axis is located forwardly of the floor connection point so that rearward tilting of the seat does not tend to "shoot" the chair base forwardly in such manner as to upset the chair occupant,

(4) The tilting mechanism is supported by a strong yoke shaped element which provides two laterally spaced points of support for the tilting mechanism, whereby to prevent vertical wobble and give the chair a long useful service life, and

(5) The tilting mechanism includes a strong, unitary sleeve member which interconnects opposite frame portions of the seat frame, said sleeve member being provided with integrally formed abutment surfaces for limiting the tilting movement, the construction of said sleeve member being such as to provide optimum strength and twist resistance in a comparatively low cost structure.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is an elevational view of an office chair incorporating one embodiment of the invention,

Fig. 2 is an enlarged view of a resilient cushioning mechanism employed in the Fig. 1 structure, with parts broken away along line 2-2 in Fig. 3,

Fig. 3 is a sectional view on line 3-3 in Fig. 2,

Fig. 4 is a sectional view taken substantially on line 4-4 in Fig. 2,

Fig. 5 is a sectional view taken on line 5-5 in Fig. 4,

Fig. 6 is a top plan view of a resilient cushioning mechanism which may be employed in lieu of the Fig. 2 construction, parts of the Fig. 6 structure being broken away for illustration purposes, and

Fig. 7 is a sectional view on line 7-7 in Fig. 6.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and

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of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In Figs. 1 through 5 there is shown a chair construction which includes a floor-engaging base 10 provided with an upstanding spindle 12 which projects into a socket or bore 14 formed in the central wall portion 16 of a yoke member 18, the arrangement being such that member 18 is free to rotate in a horizontal plane around the axis of spindle 12.

Yoke member 18 includes two arm portions 20 and 22 which diverge from wall portion 16 and then turn into parallelism with one another at 24 and 26. As shown in Fig. 3 arm portions 20 and 22 angle upwardly and forwardly from the axis of bore 14 so as to put the "seat tilt axis" at a point forwardly of the spindle axis; this arrangement tends to prevent the chair from "shooting" forwardly when the chair occupant shifts his weight rearwardly to tilt the seat.

Arm portions 20 and 22 are provided with aligned openings 28 and 30 in which is carried a cylindrical tube 32 secured to the arm portions by welds 34. One end of tube 32 is provided with a square-shaped opening 38 which non-rotatably receives one end of a square-shaped torsion bar 36. The other end of bar 36 is non-rotatably anchored in a square-shaped opening 40 formed in the hub 42 of a lever 44.

Hub 42 is rotatably mounted in one end of a sleeve 46. This sleeve includes two end sections 48 and 50, and a central section 52. Section 52 telescopes over the end sections and is welded thereto at 54 so as to provide the single unitary sleeve element 46. One end of sleeve 46 is welded to angle iron frame element 57, and the other end of sleeve 46 is welded to a bracket 58 fixedly carried by frame element 59. Frame elements 57 and 59 act as mounting members for wooden bars 60 carried on the underside of seat member 61 (Fig. 1).

The central portion of sleeve 46 is cut away for a circumferential distance of about two hundred radial degrees so as to form two abutment surfaces 63 and 64 which register with two bars 65 and 66 fixedly extending across the upper and lower surfaces of arm portions 20 and 22. Bars 65 and 66 rigidify the yoke member and serve as stop elements for limiting rotary movement of sleeve 46 around the axis of torsion bar 36.

In order to vary the preload torsional stress on bar 36 and thereby control the resilient restraining force there is provided a nut 67 which is seated in aligned notches 68 formed in the bifurcated end of lever 44 (Figs. 4 and 5). Nut 67 meshes with a rotatable screw 69 which extends through a plate 70 fixedly carried by frame element 59. A manually engageable knob 71 is provided on the lower end of screw 69 to effect screw rotation. Manual rotation of knob 71 in one direction causes nut 67 to move down on screw 69 so as to move lever 44 in the arrow 72 direction and thereby increase the preload torsional stress on bar 36. Manual rotation of knob 71 in the opposite direction causes nut 67 to move up on screw 69 so as to decrease the preload torsional stress on bar 36. High preload stresses on bar 36 result in relatively stiff tilting actions with a comparatively small tilting movement per unit "occupant weight" before build up of the resilient restraining force to a seat limiting position; such high preload stresses accommodate persons of heavy weight. Low preload stresses result in relatively "springy" tilting actions so as to accommodate the chair to persons of light weight.

The arrangement of torsion bar 36 is such that its left end (Fig. 2) is fixedly anchored at 38. Its right end is fixedly connected to lever 44, and as the chair occupant

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shifts his weight rearwardly frame elements 57 and 59 are moved about the torsion bar axis in the arrow 72 direction. Lever 44 is stressed by nut 68 to oppose this movement, the arrangement being such that continued movement of frame elements 57 and 59 in the arrow 72 direction tends to build up this stress so as to cushion or resiliently restrain the tilting movement. The arrangement of yoke member 18 with respect to sleeve sections 48 and 50 is such as to prevent any lateral play of the seat member, the side faces of arm portions 24 and 26 engaging the inner ends of sections 48 and 50 to prevent any such movement.

The Fig. 6 embodiment includes some component parts which are similar to corresponding parts in the Fig. 2 structure, and similar reference numerals are employed wherever applicable.

In the Fig. 6 embodiment sleeve 32 is rotatably received in the aligned openings in arms 20 and 22, there being no welds corresponding to welds 34. Sleeve 32 fixedly carries a collar 75 which is integrally formed with a lever 76 having a bifurcated free end 77. A nut 78 is seated in a notch 79 in lever 76, and a screw 80 meshingly extends through nut 78 into pressure engagement with a wall 81 of yoke member 18. Screw 80 is provided with a manually engageable knob 82 for effecting screw rotation. Manual rotation of knob 82 in one direction causes nut 78 to travel up screw 80 so as to increase the preload torsional stress on lever 76 and tube 32.

Tube 32 is fixedly connected at 38 to the left end of torsion bar 36. The right end of bar 36 is rigidly anchored in a square-shaped opening 83 in the outer end of a sleeve section 84. Section 84 cooperates with sleeve sections 48 and 52 to form a unitary sleeve which is similar to the corresponding sleeve in the Fig. 2 embodiment. Sections 48 and 84 are rigidly secured on the adjacent frame elements 57 and 85, and these frame elements are in turn secured on seat member bars similar to bars 60 in the Fig. 1 embodiment.

In operation of the Fig. 6 embodiment, when the chair occupant shifts his weight rearwardly the frame elements 57 and 85 are moved about the axis of torsion bar 36 in the arrow 86 direction. Bar 36 moves in the arrow 86 direction so as to act through connection 38 to put a rotational force onto tube 32. Lever 76 is thereby given a force in the arrow 86 direction, but since nut 77 prevents any arrow 86 movement of the lever the bar 36 is caused to resiliently react on the sleeve assembly 48, 52, 84 to cushion the movement of the frame elements 57 and 85. The initial adjustment of knob 82 will determine the initial position of lever 76 so as to determine the point in the tilting movement at which the resilient restraining force is effective to limit the tilting motion.

In both the Fig. 2 and Fig. 6 embodiments the cushioning mechanism is located closely adjacent the underside of the chair seat so as to be relatively inconspicuous to view. The construction of yoke 18 is such as to put the tilt axis at a forward point for preventing the chair from "shooting out" beneath the occupant. Arms 20, 22 provide widely spaced points of support for the restraining mechanism while preventing any lateral play of the seat.

I claim:

1. In a tilting chair construction the combination comprising a seat member having two laterally spaced frame elements; a floor-engaging base; a yoke member mounted atop said base; said yoke member including a central wall portion engaging the base, and two arm portions diverging from said central portion and then turning into parallelism with one another; aligned openings in the parallel sections of the arm portions; a tube extending through said aligned openings; a torsion bar extending longitudinally within said tube and having one of its ends anchored at the corresponding end of the tube; a sleeve rotatably encircling and extending along the length of the tube; said sleeve being rigidly anchored at its ends to the frame elements; the other end of the torsion bar being connected for movement with the adjacent frame element; the central section

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of the sleeve being cut away around a portion of its circumference to define two abutment surfaces; and two bar members extending between the arm portions at the upper and lower surfaces thereof for engagement with the abutment surfaces to limit rotary movement of the sleeve around the axis of the aligned openings; whereby as the occupant tilts the seat member around the axis of the torsion bar the bar will twist and exert a resilient restraining force against further tilting of the seat member.

2. The combination of claim 1 wherein central portions of the tube are fixedly secured to the yoke arm; the combination further comprising a lever rigidly connected to said other end of the torsion bar and extending at right angles to the torsion bar axis; and manually adjustable pressure means interconnecting the free end of the lever with the adjacent frame element so as to adjust the position of the lever and thereby provide a controlled preloading of the bar, whereby to vary the resilient restraining force which opposes seat-tilting movement.

3. The combination of claim 1 wherein central portions of the tube are rotatably positioned in the aligned openings; the combination further comprising a lever fixedly secured to the tube central portion and extending right angularly from the tube to a point adjacent the yoke central wall portion; and manually adjustable pressure means operatively connecting the lever free end and yoke central wall portion so as to adjust the position of the lever and thereby provide a controlled preloading of the bar, whereby to vary the resilient restraining force which opposes seat-tilting movement.

4. In a tilting chair construction the combination comprising a seat member having two laterally spaced frame elements; a floor-engaging base; a yoke member mounted atop said base; said yoke member including a central wall portion engaging the base, and two arm portions diverging from said central portion and then turning into parallelism with one another; aligned openings in the parallel sections of the arm portions; a tube extending through said aligned openings; a torsion bar extending longitudinally within said tube and having one of its ends anchored at the corresponding end of the tube; the other end of the torsion bar being connected for movement with the adjacent frame element; a pair of end sleeve sections rotatably encircling opposite end portions of the tube; said sleeve sections being rigidly anchored to the frame elements; a central sleeve section telescopically interconnecting the end sleeve sections and being fixedly secured thereto; said central sleeve section being cut away around a portion of its circumference to define two abutment surfaces; and two bar members extending between the arm portions at the upper and lower surfaces thereof for engagement with the abutment surfaces to limit rotary movement of the sleeve sections around the axis of the aligned openings; whereby as the occupant tilts the seat member around the axis of the torsion bar the bar will twist and exert a resilient restraining force against further tilting of the seat member.

5. In a tilting chair construction the combination comprising a seat member having two laterally spaced frame elements; a floor-engaging base; a yoke member mounted atop said base; said yoke member including a central wall portion engaging the base, and two arm portions diverging from said central portion and then turning into parallelism with one another; said arm portions angling upwardly and forwardly from said central wall portion; aligned openings in the parallel sections of the arm portions; a tube extending through said aligned openings; a torsion bar extending longitudinally within said tube and having one of its ends anchored at the corresponding end of the tube; the other end of the torsion bar being connected for movement with the adjacent frame element; a sleeve rotatably encircling and extending along the length of the tube; said sleeve being rigidly anchored at its opposite ends to the frame elements; the central section of said sleeve being cut away around a portion of its circumference to define

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two abutment surfaces; and stop elements carried by the arm portions for engagement with the abutment surfaces to limit rotary movement of the sleeve around the axis of the aligned openings; whereby as the occupant tilts the seat member around the axis of the torsion bar the bar will twist and exert a resilient restraining force against further tilting of the seat member.

6. In a tilting chair construction the combination comprising a seat-member having two laterally spaced frame elements; a floor-engaging base; a yoke member mounted atop said base; said yoke member including a central wall portion engaging the base, and two arm portions diverging from said central portion and then turning into parallelism with one another; aligned openings in the parallel sections of the arm portions; a tube extending through said aligned openings; a torsion bar extending longitudinally within said tube and having one of its ends anchored at the corresponding end of the tube; the other end of the torsion bar being connected for movement with the adjacent frame element; a sleeve rotatably encircling the tube; said sleeve being rigidly anchored at its opposite ends to the frame elements; the central section of said sleeve being cut away around a portion of its circumference to define two abutment surfaces; and stop elements carried by the arm portions for engagement with the abutment surfaces to limit rotary movement of the sleeve around the axis of the aligned openings; whereby as the occupant tilts the seat member around the axis of the tor-

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sion bar the bar will twist and exert a resilient restraining force against further tilting of the seat member.

7. In a tilting chair construction the combination comprising a yoke member including a central wall portion and two spaced arm portions having sections thereof in parallelism with one another; aligned openings in the parallel sections of the arm portions; a tube extending through said aligned openings; a torsion bar extending longitudinally within said tube and having one of its ends anchored at the corresponding end of the tube; a sleeve structure rotatably encircling and extending along the length of the tube; seat structure carried on said sleeve; the other end of the torsion bar being connected for movement with said seat structure; the central section of said sleeve structure being cut away around a portion of its circumference to define two abutment surfaces; and stop elements carried by the arm portions for engagement with the abutment surfaces to limit rotary movement of the sleeve structure around the axis of the aligned openings.

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