July 3, 1962 E. F. HAMILTON 3,042,448

CHAIR

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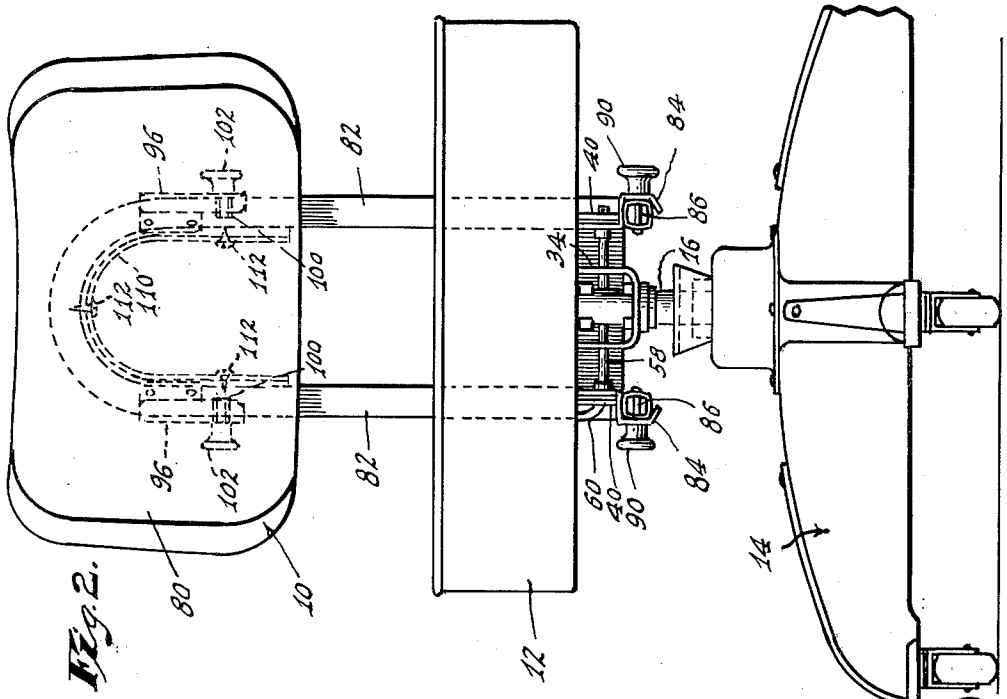


Fig. 2.

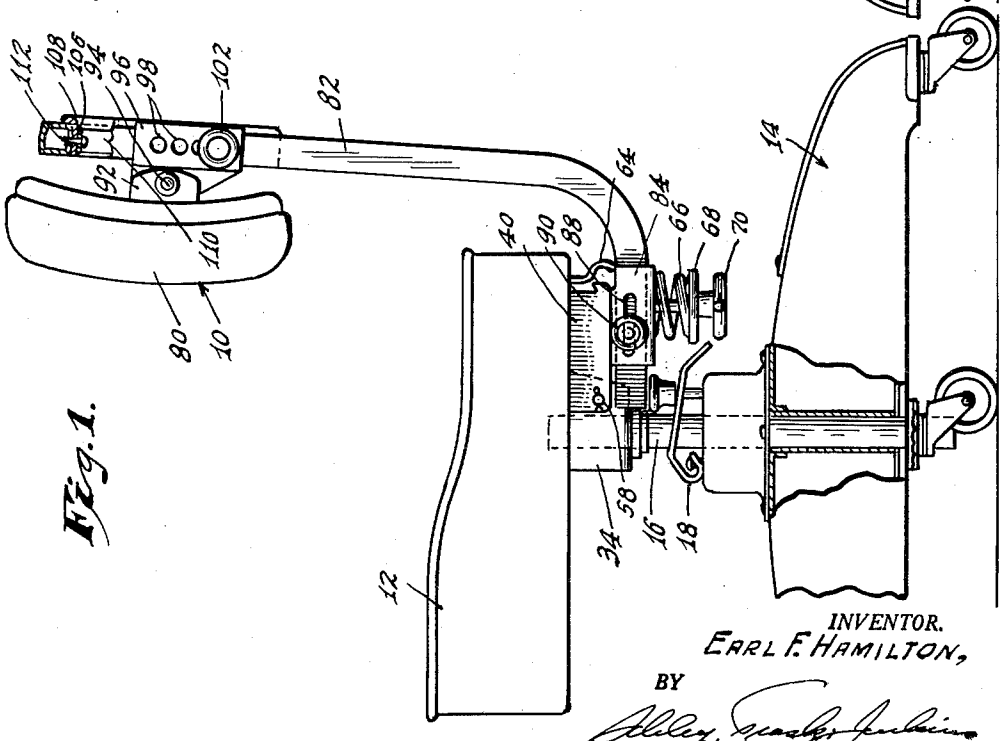


Fig. 1.

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Fig. 3.

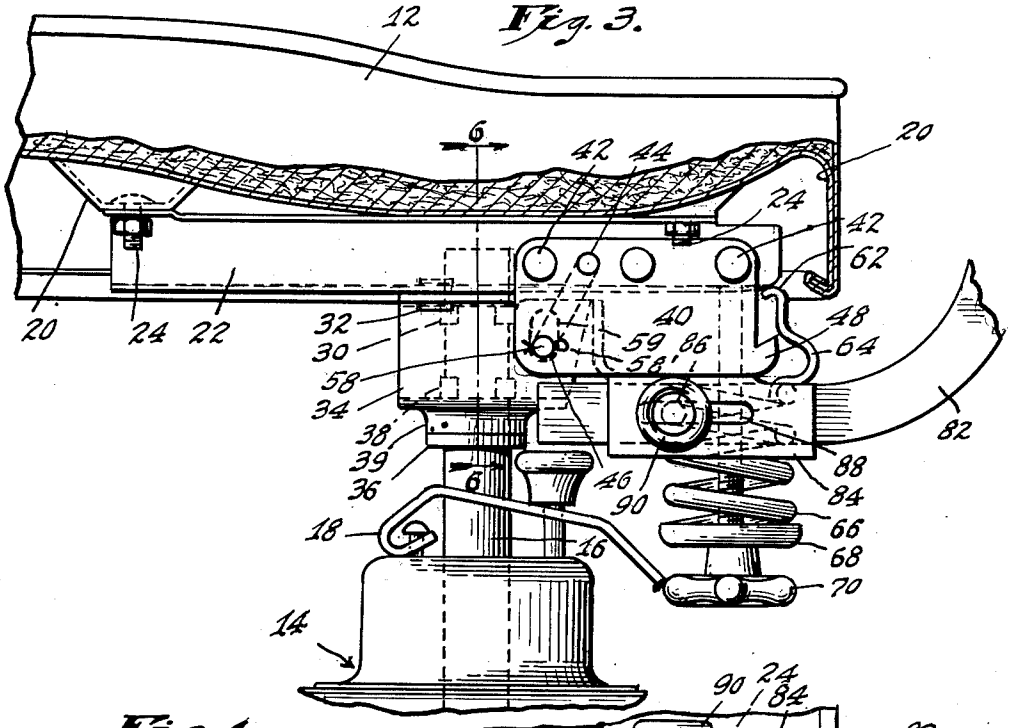
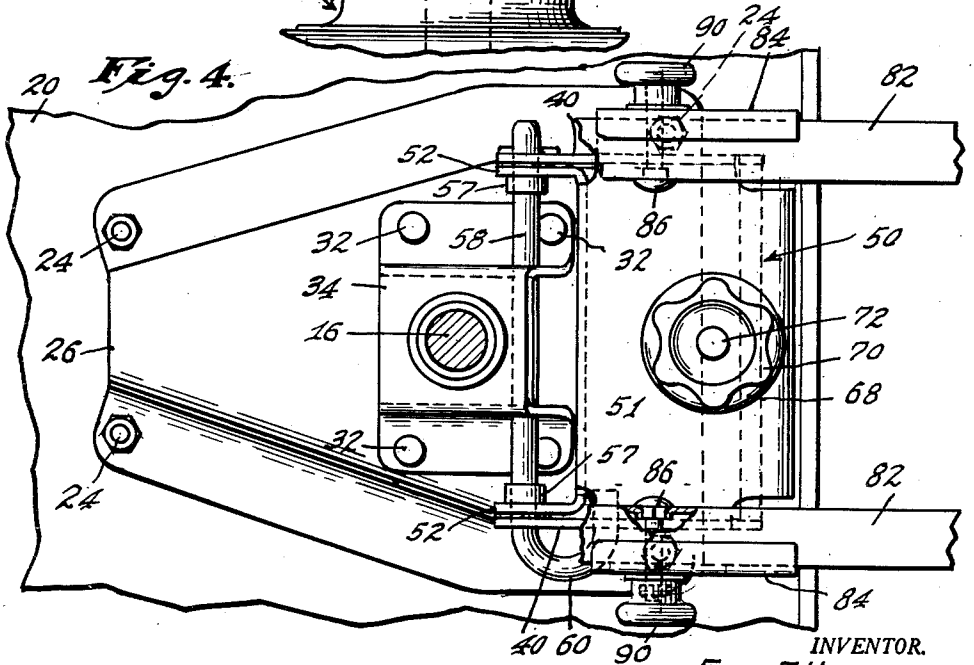


Fig. 4.



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Fig. 5.

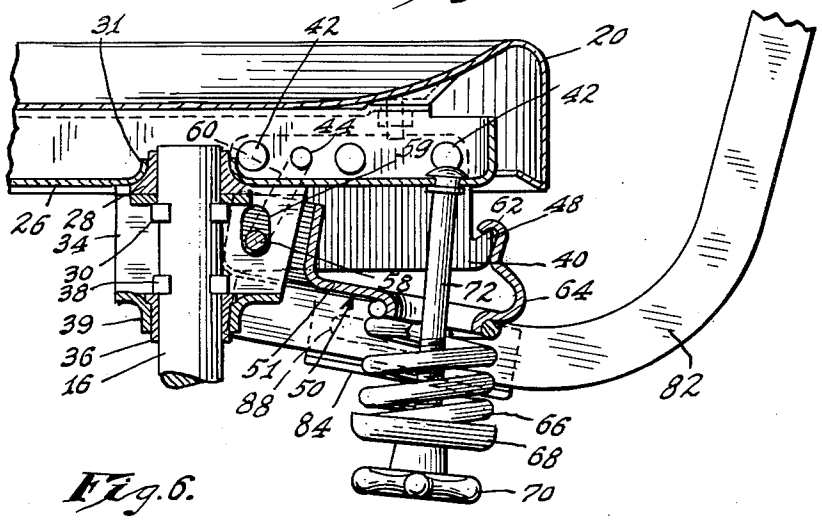


Fig. 6.

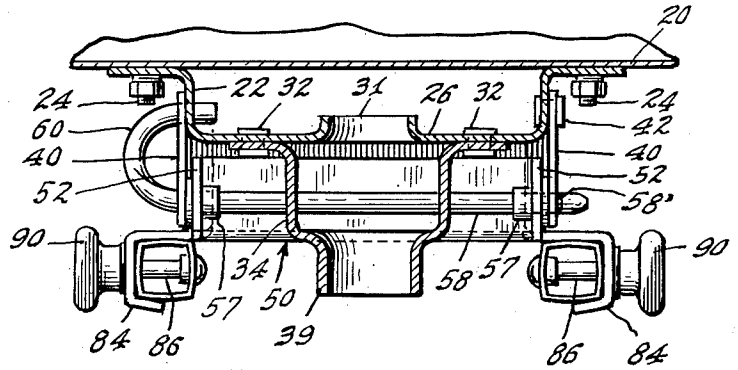
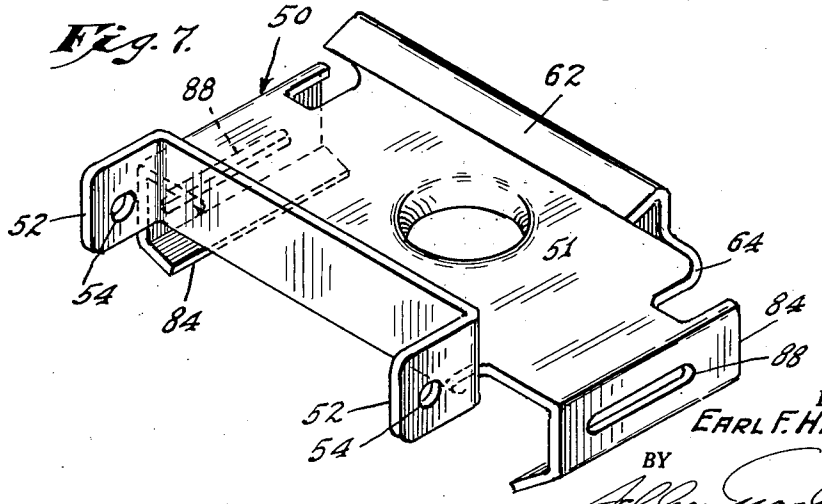


Fig. 7.



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Fig. 8.

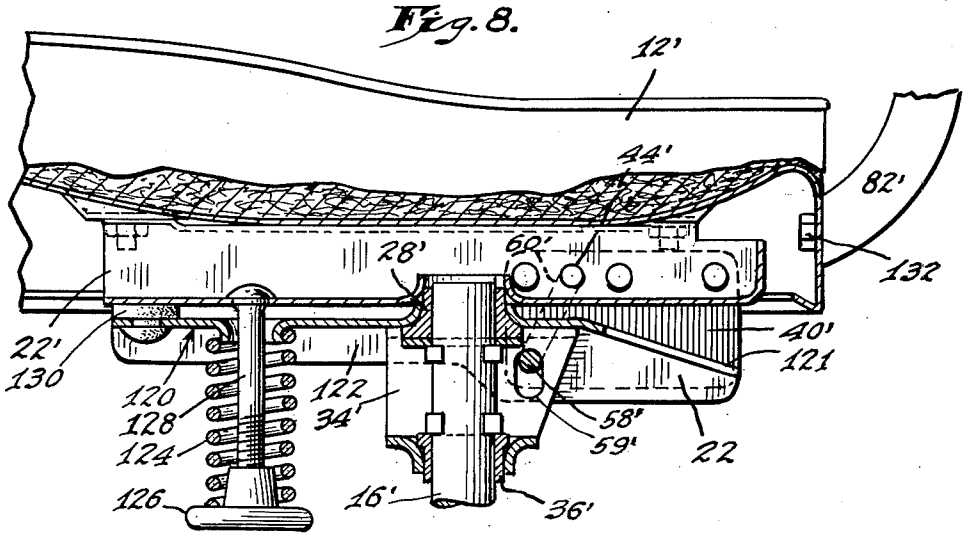


Fig. 9.

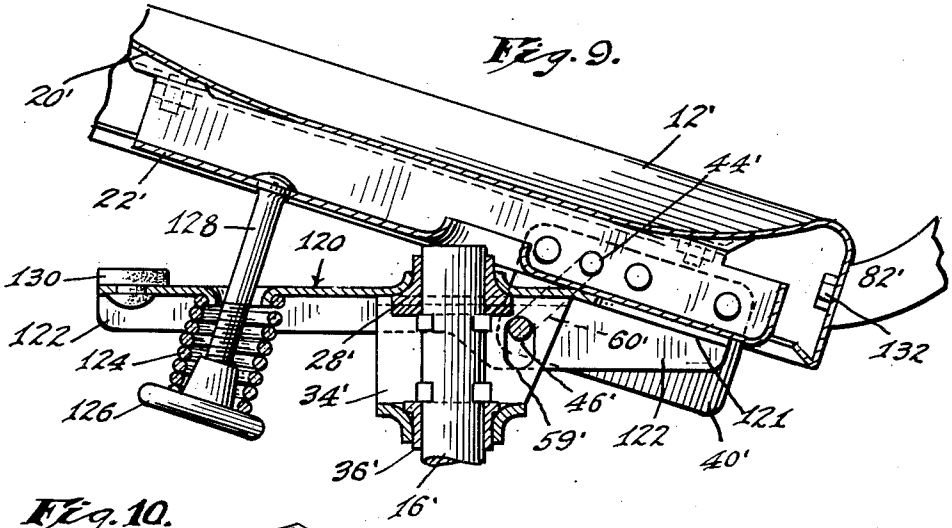
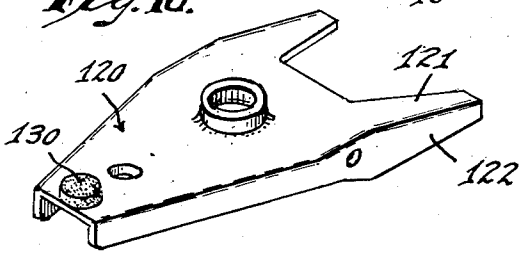


Fig. 10.



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3,042,448

CHAIR

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16 Claims. (Cl. 297—301)

This invention relates to office chairs and the like, and more particularly to office chairs of the type having a tiltable back or seat.

It is an object of my invention to reduce the cost of manufacturing this type of chair, and to improve and simplify its construction. A further object is to provide such a chair of sturdy construction and made largely of economical sheet-metal. A still further object of my invention is the provision of a chair having a tilting mechanism that can be easily adapted for use in either a back-tilting chair or a seat-tilting chair. It is another object of my invention to provide improved means for supporting a chair seat upon a tiltable axis.

In carrying out the preferred form of my invention, I provide a chair base having a vertical supporting rod, preferably adjustable vertically in the base, upon the upper end of which the chair seat is swiveled. To the under side of the chair seat I secure a relatively heavy sheet-metal bracket of channel section having an opening adapted to receive, desirably through an interposed bearing bushing, the upper end of the aforesaid rod. Plates secured to opposite sides of said bracket project downwardly therefrom in parallel relation, and a pivot pin extends horizontally between and through said plates. Below the bracket, there is rotatably mounted on the rod, again preferably through the medium of a bearing bushing, a U-shaped yoke having its upper ends bent outwardly into coplanar relationship for attachment to another chair element. An upper abutment on the rod receives the load on the seat, while a lower abutment cooperates with the yoke to limit its upward movement on the rod.

In the case of a tilt-back chair, the yoke is secured to the seat-bracket, a tilting plate is pivoted on the aforesaid pin, a rigid back is secured to such tilting plate, and a spring is provided between the seat-bracket and the tilting plate to resist rearward tilting of the back. Desirably, the back includes a support having a pair of parallel legs which project forwardly in parallel relation below the seat, and means is provided for securing such legs to the tilting plate in various positions of fore-and-aft adjustment.

In the case of a tilt-seat chair, a relatively heavy sheet-metal shoe is swiveled on the upper end of the vertical rod above the upper abutment thereon, the aforesaid pivot pin is rotatably received in said shoe, and a spring acting between the shoe and the seat bracket is provided to oppose rearward tilting of the seat. In this instance, the back is rigidly secured to the seat.

Other objects and features of the invention will become apparent from the following more detailed description and from the accompanying drawings, in which:

FIG. 1 is a side elevation of a back-tilting office chair embodying my invention;

FIG. 2 is a front elevation of the chair shown in FIG. 1;

FIG. 3 is an enlarged longitudinal section of the tilting mechanism of the chair shown in FIG. 1;

FIG. 4 is a bottom plan of the tilting mechanism shown in FIG. 3;

FIG. 5 is a view similar to FIG. 3 but with parts broken away and showing the back in a tilted position;

FIG. 6 is a vertical transverse section taken on the line 6—6 of FIG. 3;

FIG. 7 is an isometric view of the tilting plate used in the back-tilting chair;

FIG. 8 is a longitudinal section of a modified form of my invention used in a seat-tilting chair;

FIG. 9 is a view similar to FIG. 8 but showing the parts in a position wherein the seat is tilted; and

FIG. 10 is an isometric view of the rocker shoe used in the seat-tilting chair.

The tilt-back chair shown in FIGS. 1 to 7 of the drawings comprises a back 10, a seat 12, and a pedestal base 14 from which extends a vertical seat-supporting rod 16 vertically adjustable by means of any convenient mechanism, such as that indicated at 18. The seat 12 is rotatably mounted at the upper end of the rod 16 and comprises a seat-pan 20 desirably formed from a sheet-metal stamping which serves as the structural frame for the seat.

Support for the chair seat is provided by a bracket 22 desirably of relatively heavy sheet-metal and secured to the seat-pan 20 by means of bolts 24. The bracket 22 is formed in a channel or U-shape in cross-section to provide a bottom web 26 well spaced from the pan 20 and having an opening to receive the upper end of the support rod 16. The bracket 12 is positioned on the support rod 16 by means of a bushing 28 whose shank is received in an opening in the bracket 22 and whose flange or base rests on a washer supported by bosses 30 adjacent the top of the supporting rod 16. Desirably, the metal at the edge of the bushing-receiving opening in the bracket-web 26 is extended upwardly to form a flange 31 providing extended axial support for the bushing.

Rigidly mounted to the lower face of the bracket-web 26, as by rivets 32, is a yoke 34 having an opening in its lower wall to receive a bushing 36 bearing on the support rod 16. Conveniently, the rod 16 is provided above the bushing 36 with a second set of bosses 38 which limit upward movement of the seat on the rod in the same way that the bosses 30 limit downward movement. As shown, the bushing 36 has a flange at its upper end to engage the bosses 38, and the metal of the yoke is extended downwardly to form a flange 39 providing extended support for the bushing.

Disposed adjacent the rear of the bracket 22 and on opposite sides thereof is a pair of downwardly extending plates 40 rigidly mounted to the bracket 22 by rivets 42 and having a pair of aligned apertures 44. Each of the plates 40 is further provided with an aperture 46 disposed toward its forward lower corner whose function will become more apparent hereinafter. A lip 48 extends rearwardly from each of the plates 40 to limit the tilting movement of the chair back.

A back-tilting plate 50 having a transversely extending web 51, and secured to the back 10 by means hereinafter described, is disposed below the bracket 22 and rearwardly of the yoke 34 constitutes a part of means providing for tilting movement of the chair back 10. The plate 50 is provided with a pair of ears 52 forwardly directed from the web 51 and disposed immediately adjacent the

inner faces of the plates 40. Each of the ears 52 has an opening 54 adjacent its forward edge which receives a pivot pin 58 extending transversely of the bracket 22 through slots 59 cut in the yoke 34 and defines the axis of tilting movement. Conveniently, the pivot pin 58 is journaled in a nylon bushing 57 press fit in the opening 54 of each of the ears 52 to reduce frictional wear during tilting. The ends of the pin 58 extend through the openings 46 in the pair of bracket plates 40 to operatively interconnect the tilting plate 50 to said pair of plates, thus permitting the back 10 to be tilted with respect to the seat 12. Desirably, one end of the pin 58 is hooked, as at 60, with the end of said hook being received in one of the plate apertures 44 so that the pin at its hooked end is received in two apertures in one of the side plates 40 to prevent the pin from rotating in the holes 46. Conveniently, the opposite end of the pin 58 is provided with a cotter key 58'' or other means to retain the pin in a fixed axial position and prevent its axial movement when the chair back 10 is tilted.

The rear of the plate 50 is struck upwardly and is provided at its upper end with a forwardly directed flange 62 adapted to engage the plate lips 48 upon rearward tilting of the chair back 10 to limit the tilting movement of the chair back, and to bear against the bracket 22 in a normal upright position to position the chair back 10 substantially vertically. Desirably, the medial portion of the upwardly struck portion of the plate 50 is offset rearwardly, as at 64, to prevent it from bearing against the plate lips 48 and thus precluding the chair back 10 from assuming a normal upright position.

Opposing rearward tilting of the chair back 10 about the axis of the pivot pin 58 is a compression spring 66 which acts between the lower face of the tilt plate 50 and a spring-retainer cup 68 surmounting a nut 70 threaded onto the lower end of a bolt 72 extending axially through the spring 66 and through openings in the plate 50 and bracket 22 to disposed its head between the bracket 22 and the seat-pan 20. Forward swinging movement of the chair back 10 under the influence of the spring 66 is limited by the flange 62 bearing against the bracket 22 or by the central web 51 of the tilt plate engaging the lower edges of the vertical plate 40.

As shown in FIG. 1, the chair back 10 comprises a back rest 80 vertically adjustable on a generally U-shaped frame having a pair of parallel leg members 82 whose lower ends are bent forwardly below the chair seat 12 and are received in C-shaped extensions 84 provided on opposite sides of the tilt plate 50. The legs 82 are connected to the plate extensions 84 by bolts 86 extending through suitable openings in the legs 82 and longitudinal slots 88 cut in the extensions 84. Each of the bolts 86 includes a nut 90 which upon tightening secures the legs 82 within the extensions 84 to releasably hold the chair back 10 in the desired position. Thus, when the binding force of the bolts 86 and their handles 90 is released, the legs 82 can be moved longitudinally of the slots 88 to adjust the back 10 forwardly and rearwardly with respect to the chair seat 12. Desirably, each extension 84 is so shaped that its upper and lower walls diverge toward the center of the seat so that as the bolts 86—90 are tightened the legs 82 will bind between such upper and lower walls and prevent any lost motion between the back 10 and the plate 50. To further this binding action the legs 82 may have convex side surfaces, as shown in FIG. 6.

Rigidly secured to the back-rest 80 are a pair of brackets 92 pivotally secured, as by rivets 94, to mounting members 96 to permit the user to tilt the back-rest 80 to the desired angle. The mounting members 96 are channeled to partially circumscribe the legs 82, and are provided with a plurality of vertically aligned openings 98 adapted to receive a screw 100 having a head 102; said screw being received in a tapped opening provided in each of the leg members 82. Thus, by passing the screws 100 through properly selected ones of the openings 98, the user can adjust the vertical height of the back-rest 80 with respect to the chair seat 12.

A U-shaped bumper 106 having a rearwardly extending bead 108 and conveniently formed of rubber or any other resilient material is disposed at the closed upper end of the chair back frame. The bumper 106 is rigidly held in place against the back frame by a metal strap 110 overlying the bumper and retained thereon by a plurality of screws 112, screw-threadedly received in openings in the chair back frame. This bumper construction is extremely desirable in preventing damage to the chair or a wall when the chair is tilted rearwardly against such a wall or other obstruction.

One of the principal advantages in my tilting mechanism is its adaptability to be easily converted from a back-tilting mechanism into a seat-tilting mechanism by the interchange of a few components. As shown in FIG. 8, in a seat-tilting chair the pivot plate 50 is replaced by a rocker shoe 120 disposed immediately below the bracket 22' and secured to the yoke 34' which in combination with the bushings 28' and 36' rotatably supports the shoe 120 on the vertical support rod 16'. The rear portion 121 of the shoe 120 is angled downwardly to permit the seat 12' and its seat bracket 22' to be tilted rearwardly through the angle defined by that downwardly angled rear shoe portion 121.

Each longitudinal side of the rocker shoe 120 is provided with a depending flange 122 having an aperture therein to receive the pivot pin 58' which extends transversely across the shoe through the slot in the yoke 34'. The ends of the pin 58' extend through the openings 46' in the pair of bracket plates 40' to operatively interconnect the shoe 120 to the plates and the bracket 22', thus permitting the seat 12' to be tilted about the axis of the pin 58'. As shown in FIG. 8, the pin 58' is retained in fixed position relative to the bracket 22' by having its hooked end 60' received in one of the seat-bracket plate openings 44'.

Opposing the rearward tilting of the seat 12' about the axis of the pivot pin 58' is a compression spring 124 similar in construction and operation to the spring 66 used in the chair back tilting mechanism, but disposed forwardly of the pivotal axis of the pin 58'. The spring 124 acts between the lower face of the shoe 120 and a nut 126 threaded onto the lower end of a bolt 128 extending axially through the spring 124 and through openings in the shoe 120 and bracket 22' to position its head between the seat-bracket 22' and the seat-pan 20'. To limit forward tilting movement of the chair seat 12' under the influence of the spring 126 the front end of the shoe 120 may be provided with a bumper or snubber 130 formed of any resilient material such as rubber or the like.

In the chair of FIGS. 8 to 10, the back may be attached to the seat by forming the legs 82' so that their ends abut against the rear flange of the seat-pan and are secured thereto by means including screws 132 extending through such flange.

It will be noted that the bracket 22 of FIGS. 1–6 is essentially identical with the bracket 22' of FIGS. 8 and 9, the only difference between the brackets, as shown, lying in the location of the hole which receives the bolt 72 or 128. In quantity production, the barcket can be provided with two selectively usable bolt-receiving holes, thus making it possible to use the same bracket in both the tilting-back chair and the tilting-seat chair. Although the pivot pin 58 is disposed somewhat higher in the chair of FIGS. 1–7 than in the chair of FIGS. 8–10, the slot 59 may be made long enough to accommodate the pin in either location, thus making it possible for the yoke 34 to be identical in both chairs. The pivot pin 58 likewise may be used in either construction. The possibility of using the same parts, such as the parts 22, 34, and 58,

in both tilting-seat and tilting-back chairs reduces the cost of manufacture.

I claim as my invention:

1. A swivel chair, comprising in combination with a back and seat assembly, a bracket mounted on the underside of said seat assembly, and a pair of plates rigidly mounted on said bracket adjacent the rear thereof; a supporting member disposed between said plates, a base having a vertically extending rod, a yoke rotatably carried in fixed axial position on said rod for supporting said back and seat assembly, a pivot pin extending through said yoke, plates, and supporting member rearwardly of said rod and defining a pivot axis for effecting relative tilting movement between said supporting member and one of said seat assembly and back, and yielding means acting between one of said back and seat assembly and supporting member to oppose said tilting movement.

2. A swivel chair as defined in claim 1 in which said supporting member comprises a tilting plate connected to the chair back to permit said back to tilt with respect to the chair seat assembly and base.

3. A swivel chair as set forth in claim 2 with the addition that said tilting plate is provided with a flange engageable with said pair of plates to limit rearward tilting movement of the chair back.

4. A swivel chair as set forth in claim 2 with the addition that said tilting plate is provided with a transversely extending web engageable with said pair of plates to limit the forward tilting movement of the chair back.

5. A swivel chair as set forth in claim 2 with the addition that said tilting plate is provided with means engageable with said pair of plates to limit the forward and rearward tilting movements of the chair back.

6. A swivel chair as defined in claim 1 in which said supporting member comprises a tilting plate rigidly connected to the chair back to permit said back to tilt with respect to the chair seat assembly and base, said tilting plate being engaged by said yielding means rearwardly of said pivot pin whereby said yielding means opposes the rearward tilting movement of the chair back.

7. A swivel chair as defined in claim 1 in which said supporting member comprises a shoe rotatably received on said vertical rod and pivotally connected to said pair of plates by said pivot pin to permit the chair seat assembly to be tilted with respect to the chair base.

8. A swivel chair as set forth in claim 7 with the addition that the rearward portion of said shoe is angulated to engage said seat-supporting bracket upon rearward tilting of the chair seat assembly to limit said rearward tilting movement.

9. A swivel chair as set forth in claim 7 with the addition that said shoe is provided with stop means adjacent its forward end to limit the forward tilting movement of the chair seat assembly.

10. A swivel chair as set forth in claim 7 with the addition that said shoe is rigidly mounted on said yoke and said yoke is engageable with a plurality of bosses on said rod for positioning the seat assembly and back on said rod.

11. A swivel chair as defined in claim 1 in which said supporting member comprises a shoe rotatably received on said vertical rod and pivotally connected to said pair of plates by said pivot pin to permit the chair seat assembly to be tilted with respect to the chair base, said shoe being engaged by said yielding means forwardly of said pivot pin whereby said yielding means opposes the rearward tilting movement of the seat assembly.

12. A swivel chair, comprising in combination with a rigidly interconnected seat and back, a base having an upwardly extending rod for rotatably supporting a seat thereon, a yoke rotatably carried in a fixed axial position on said rod, a channeled seat bracket mounted on the under side of said seat, a shoe fixedly carried on the yoke and interposed between said yoke and said seat bracket and supporting the chair seat in tilted and non-tilted positions, said shoe having an angulated configuration and extending fore and aft of the yoke to engage said seat bracket during chair tilting and limit the forward and rearward tilting movements of said chair seat, pivot means tiltably interconnecting said seat-bracket to said shoe rearwardly of said rod to permit the chair seat and back to be tilted with respect to the base, and yielding means operatively interconnecting said shoe and seat to oppose said tilting movement.

13. A swivel chair, comprising a seat, a back rigidly connected thereto, a base having an upwardly projecting seat-supporting rod, a shoe rotatably disposed around the upper end of said rod and provided with a downwardly angled rear portion and a pair of vertically extending laterally spaced flanges, said flanges having aligned openings formed therein forwardly of said rear portion, a bracket mounted on the underside of said seat, a pivot pin extending through the openings in said shoe and tiltably interconnecting said bracket and shoe to permit the chair seat and back to be tilted with respect to the base, said shoe being operatively engageable with said bracket to limit the forward and rearward tilting movements of said seat and back and to support said seat and back on the base in a non-tilted position, and yieldable means operatively interconnecting said bracket and shoe to oppose rearward tilting of the seat and back.

14. A swivel chair having a base and a swivel rod extending vertically upward from said base; a sub-assembly rotatably supported from said rod for swivelling movement about the axis thereof, said sub-assembly comprising a seat, a bracket, and a pair of plates, said bracket being formed of sheet metal and having a horizontal web and parallel, spaced flanges projecting upwardly from said web and rigidly secured to the lower side of said seat, said plates being rigidly secured to said flanges and projecting downwardly below said web; said plates below said web being provided respectively with aligned openings; a pivot pin received in said openings and rigid with said plates; a supporting member of sheet metal disposed between said plates, said supporting member having a pair of spaced flanges lying closely adjacent the opposed faces of said plates and provided with aligned openings pivotally receiving said pivot pin below the plane of said bracket and rearwardly of said swivel rod to permit relative tilting movement of the supporting member and sub-assembly about the axis of the pivot pin, and yielding means opposing said tilting movement.

15. A swivel chair, comprising in combination with a back and seat assembly, a bracket mounted on the underside of said seat assembly, and means on said bracket extending downwardly below said seat assembly adjacent the rear thereof and movable therewith; a supporting member operatively associated with one of said back and seat assembly, a base having a vertically extending rod, a yoke rotatably carried in fixed axial position on said rod for supporting said back and seat assembly and having a vertically extending slot formed therein rearwardly of said rod, a pivot pin extending through said yoke slot, said means on said bracket, and said supporting member defining a pivot axis for effecting relative tilting movement between said supporting member and one of said back and seat assembly, means for adjusting the vertical positioning of said pivot pin in said yoke slot for adjusting the vertical positioning of said pivot axis, and yielding means acting between one of said back and seat assembly and supporting member to oppose said tilting movement.

16. A swivel chair, comprising in combination with a back and seat assembly, a bracket mounted on the underside of said seat assembly, and means on said bracket extending downwardly below said seat assembly adjacent the rear thereof and movable therewith; a supporting member disposed between said means, a base having a vertically extending rod, a yoke rotatably carried in fixed axial position on said rod for supporting said back and seat assembly, a pivot pin extending through said yoke, said means, and said supporting member rearwardly of said rod and

defining a pivot axis for effecting relative tilting movement between said supporting member and one of said back and seat assembly, and yielding means acting between one of said back and seat assembly and supporting member to oppose said tilting movement.

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