United States Patent

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[54] CHAIR CONTROL AND SUPPORT

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[52] **U.S. Cl.**.....**297/302,** 248/381

[51] **Int. Cl.**.....**A47c 3/00**

[58] **Field of Search**.....297/300, 301, 302, 303, 304; 248/381, 379, 380; 85/35

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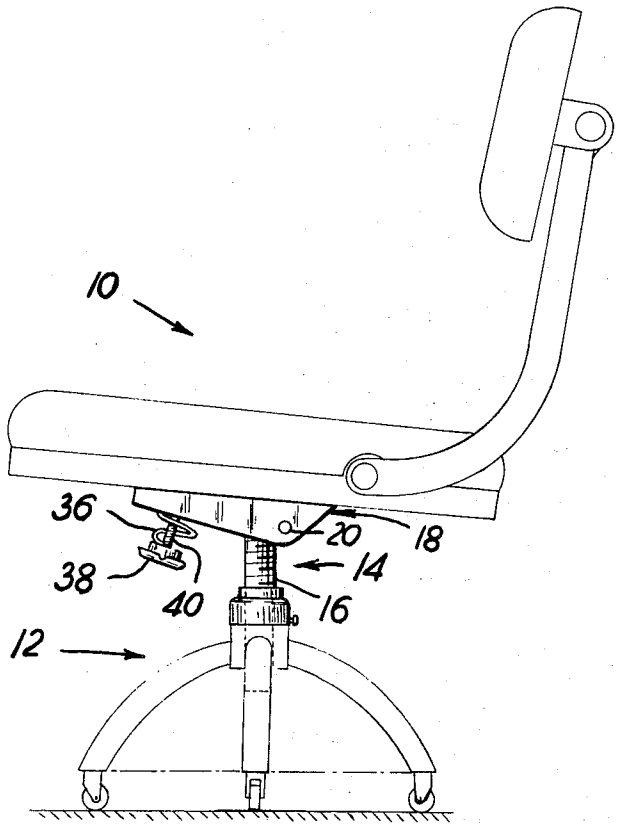
Primary Examiner—James T. McCall

Attorney—March, Le Fever & Wyatt

[57] **ABSTRACT**

An improved tilt control and support mechanism for a chair seat assembly utilizing a simplified sturdy construction wherein a single plate-like element functions to support the seat assembly and, in cooperation with an adjustable compression spring, yieldably restrains the tilt movement of the chair seat in a uniform and controlled manner to permit the occupant to bring the chair seat to a comfortable tilted rest position and return it to a substantially horizontal position.

6 Claims, 7 Drawing Figures



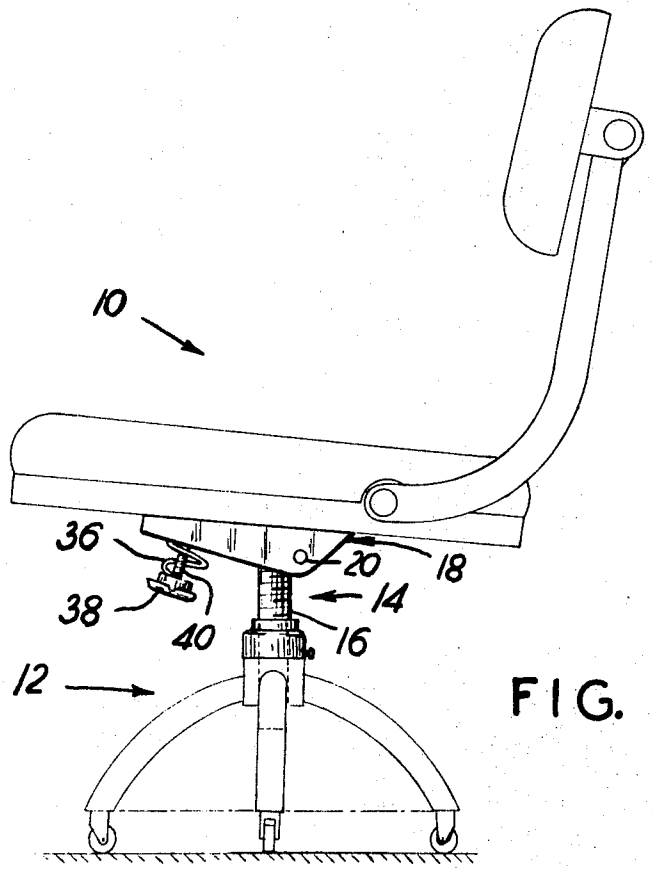


FIG. 1

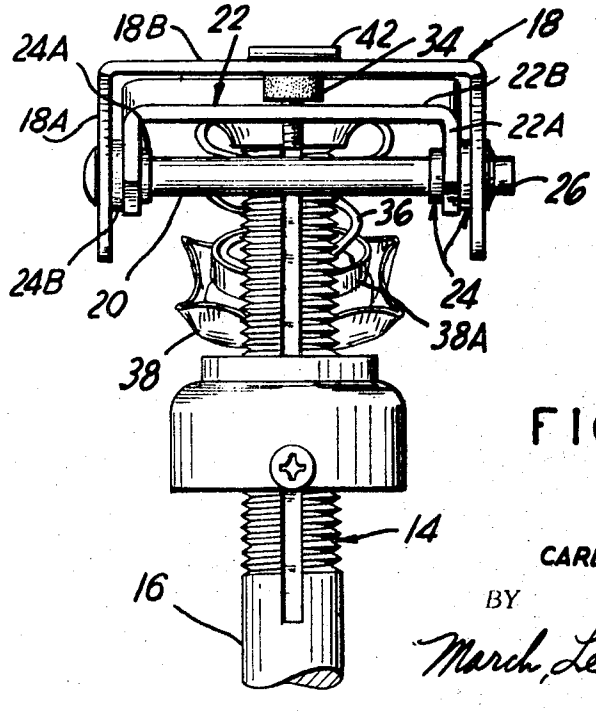


FIG. 2

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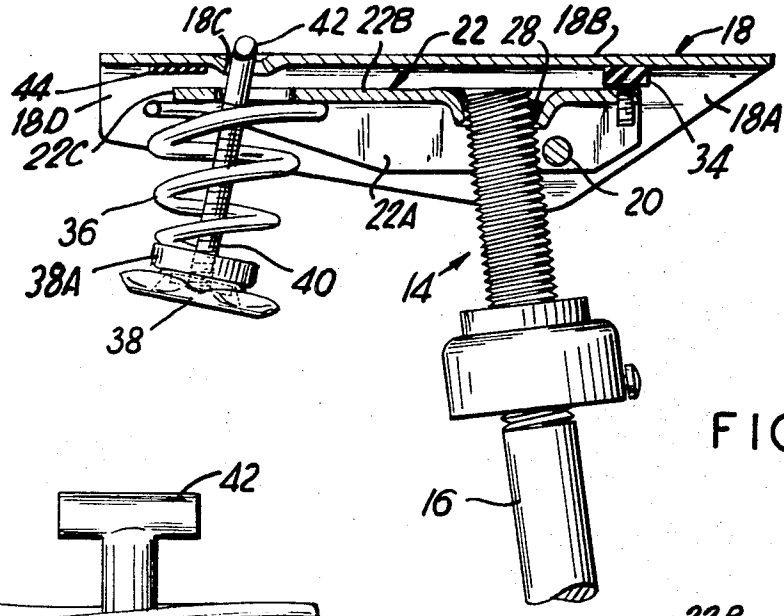


FIG. 3

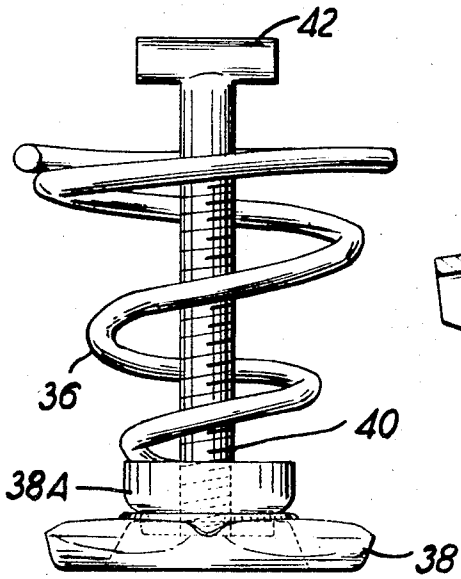


FIG. 4

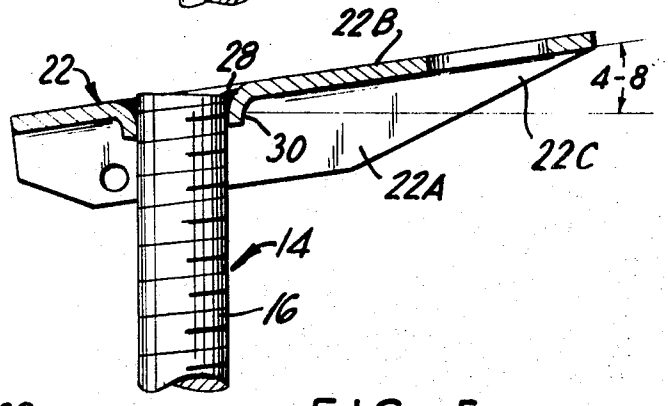


FIG. 5

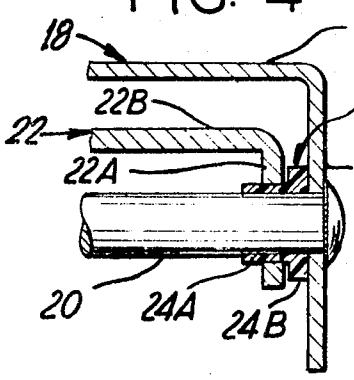


FIG. 6

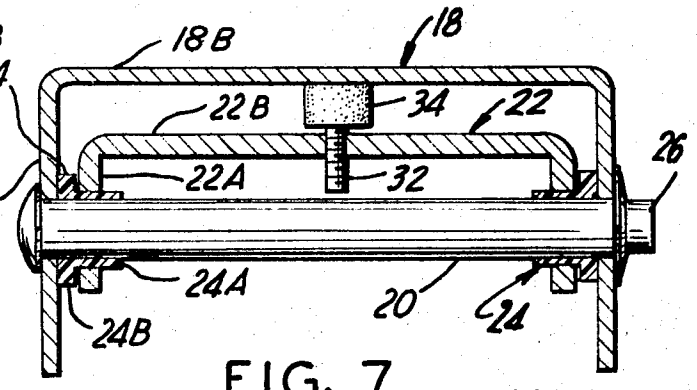


FIG. 7

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CHAIR CONTROL AND SUPPORT

SUMMARY OF THE INVENTION

This invention relates to a chair having a tiltable seat and more particularly to a chair seat tilt control and support, more commonly referred to as a chair iron. Specifically, the invention is concerned with a chair control and support for providing an adjustable degree of backward tilt to a chair seat assembly wherein the magnitude of the tilt and the ease with which the tilting movement is effected, is readily adjustable by the occupant of the chair by means of a simple single manually controlled member. An essential feature of the invention resides in the design of the mechanism wherein it may be used with a chair seat height adjusting member which permits the chair seat to pivot or turn horizontally relative to the chair base, as well as with a chair seat height adjustable support member not incorporating this feature.

Additionally, the chair control embodiment of this invention is adaptable for use with chairs having a back assembly integrally formed with, rigidly attached to, the seat assembly or with chairs designed and constructed with an independent mechanism for providing controlled back assembly tilt movement.

In contrast to the chair support and control mechanisms of known design which, for the most part, are of heavy cast iron construction, complicated in design, expensive, and limited for use with a specific type of chair furniture, the chair control of this invention is distinguished by its relatively simple design, economic and fool-proof construction and broad application to a wide variety of chair designs.

Accordingly, among the objects of this invention is a chair control and support mechanism which permits of convenient and economical manufacture, which combines simple design features with great strength, and which lends itself to be utilized with a wide variety of chair designs.

A more specific object of the invention is improvement in known chair controls of the prior art in regard to strength and price and in regard to simplicity of design and of manufacturing and assembly procedures.

A feature of the invention resides in the compactness of the structure wherein fewer and less complicated parts are employed than are found in comparable chair controls of the prior art.

An important feature of the invention is the uniform, yieldably restraining action of the chair control mechanism to safely and comfortably provided a tilting movement for the chair seat assembly as it is urged by the occupant from a horizontal position to a comfortable backward tilt rest attitude.

Another feature of the invention involves the design of the spring and the spring compression adjustment control whereby selective adjustment of the yieldable restraint to backward tilt of the chair seat is attained by a minimal amount of torque applied to a hand-manipulated spindle.

Still another feature of the invention resides in the provision of a resilient, adjustable member to limit the backward tilt of the chair seat and, in cooperation with the compression spring, to bring the chair seat to a safe, cushioned stop from its backward tilt motion.

Additionally, the invention features a chair tilt control mechanism which has the distinct advantage of versatile utility of use with a chair of the type with back and seat portions rigidly attached and which move together as a unit into the tilt position or with a chair wherein the back portion is independently tilt-adjustable.

Finally, the chair control mechanism of this invention is equally adaptable to a chair with or without a revolving seat relative to the base and to chairs with or without independent seat height adjustments.

Briefly stated, the objects of this invention are accomplished with a simplified construction which has for its essential elements a bracket designed to be attached to under side of a chair seat and pivotly engaged to the depending flanges of a substantially horizontal plate which is rigidly mounted on a vertical support post. An adjustable compression spring acting between the bracket and the plate yieldably opposes the tilting movement of the bracket about the pivotal axis whereby a safe, limited degree of chair seat tilt is effected.

These and further objects, features, and advantages of this invention will become more fully apparent from or be disclosed in the following detailed description of the construction when taken in consideration with the figures of the drawing wherein like reference characters are employed to designate like parts in the specification and throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the chair control and support mechanism shown supporting a chair seat assembly in the non-tilt position and illustrating the method of mounting the chair control and support device on a vertical adjustable post supported by the chair base.

FIG. 2 is an end elevation view of the chair control and support mechanism of FIG. 1 as viewed from the rear of the chair (not shown).

FIG. 3 is a side elevation view of the chair control and support mechanism of FIG. 2 shown in the tilted position partly in section.

FIG. 4 is an enlarged view of the compression spring assembly.

FIG. 5 is an enlarged sectional view of the engagement of the plate with the vertical post.

FIG. 6 is an enlarged view of a pivotal axis arrangement detailing the bushing construction and assembly.

FIG. 7 is an enlarged rear view of a portion of the chair control and support illustrating the adjustable screw stop assembly partly in section.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a chair seat assembly **10** is supported by a chair control and support mechanism **14** mounted to the top of a vertical post **16** rising from and supported by a chair pedestal base **12**.

The chair control and support mechanism **14**, as shown, is comprised of a bracket **18** secured, as by means of screws or other suitable fastening means to the underside of the chair seat assembly **10**. The bracket **18** is formed of a single sheet of metal so as to have downturned side portions **18A** and is drilled with a suitable number of spaced apertures in its web section **18B** to accommodate the screws, bolts or other suitable means for attachment to the under side of the seat assembly. The downturned side portions of the bracket serve to greatly increase the structural strength of the bracket member and are configurated to accommodate a bolt **20** which extends horizontally between and through the downturned side portions **18A** beneath and transverse to the web section **18B** of the bracket **18** and is disposed adjacent the vertical post **16**.

A plate member **22**, also formed from a single sheet of metal and also having downturned side portions **22A**, is positioned in spaced relation within and beneath the bracket **18**. As shown in FIG. **2**, the plate **22** has a configuration similar to that of the bracket **18** but has smaller dimensions whereby a clearance is provided between each of the outer surfaces of the downturned side portions **22A** of the plate **22** and each of the inner surfaces of the downturned portions **18A** of the overlying bracket member **18**.

The bolt **20** which extends horizontally through the downturned side portions **18A** of the bracket **18** also extends through the downturned side portions **22A** of the plate **22** and effects a pivotal engagement of the bracket with the plate.

FIG. **6** depicts the manner in which the two bushings **24** of nylon, or similar compressive material nor requiring lubrication, about which the bolt **20** is journaled, are employed to maintain the space relationship between the downturned side portions **18A** of the bracket **18** and the downturned side por-

tions 22A of the plate 22. The shank 24A of each of the bushings is tightly fitted into the aperture in the plate and the flange portion 24B of each bushing maintains the space relation between the bracket and the plate side portions and reduces frictional wear of the bracket as it moves about the defined pivotal axis. The bolt 20 is held in position with a spring-steel fastener 26 of the "push-on" type. This method of securing the bolt avoids axial movement and the possibility of disengagement of the bolt caused by tilting motion of the bracket which could occur if a threadably engaged nut were used.

The apertures in the side portions of the bracket and the apertures in the side portions of the plate for accommodating the bolt are positioned and aligned to provide a space relation between the web of the plate 22B and the bracket web portion 18B in the general area above the pivotal axis, thus permitting the bracket tilting movement about the pivotal axis defined by the bolt 20 as is best illustrated in FIG. 2.

Again referring to FIG. 1, the plate 22 is shown mounted on the top of the vertical post 16 at an acute angle with the horizontal. Preferably the plate is mounted on the vertical post so as to have an angle of approximately 8° – 10° with the horizontal. As shown in FIG. 1, the web portion of the plate and the web portion of the bracket distal from the pivotal axis converge when the chair seat is in the non-tilting position. As may readily be seen, the arrangement effects a slight backward pitch to the bracket (and the chair seat) and positions the chair seat with a comfortable forward incline of about 4°–5° when in the non-tilting position.

As shown (FIGS. 1 and 3), the pivotal engagement of the bracket 18 and the plate 22 is immediately rearward of the vertical post 16. This arrangement provides optimal structural strength to the mechanism when the chair is occupied and is in an operative tilting position (FIG. 3) due to the fact the occupant load forces, which are borne by the pivotal axis, are translated to the vertical post with a minimum of angular force resolution form the downward vertical direction.

Since the pivotal axis is not in true vertical alignment with the vertical post 16, a certain amount of torque or bending moment is experienced by the plate 22. As shown in FIG. 5, a structural stable engagement of the plate with the vertical post is effected to accommodate any operative bending moment of the plate, thereby assuring a sturdy and safe mechanism. The plate 22, as shown in FIG. 5, is pierced and broached to receive the vertical post 16 in a press fit and the connection of the plate to the vertical post is further strengthened with a circumferential fillet weld 28 about the post and the collar 30 formed by the downward extending metal of the broached plate 22.

As illustrated in FIGS. 1 and 3, the portion of the plate to the rear of the pivotal axis is of shorter length than the bracket to allow for the desired full operative tilting movement of the bracket. As shown in FIG. 7, an adjustable screw 32 with a cap 34 of resilient rubber-like material is threadably engaged to the plate 22 for limiting the backward tilting movement of the bracket 18 by making contact with the bracket web 18B at the extreme backward tilt position of the bracket, thus affording a cushioned stop for the bracket (and the chair seat assembly attached thereto).

Preferably, the bracket of the chair control and support mechanism has about a 14° angle of tilt relative to the horizontal when it contacts the cap 34 of the adjustable screw 32 threadably engaged to the plate. As may readily be observed, however, a larger or smaller angle of tilt of the bracket may be effected by a suitable adjustment of the screw. Alternatively, in place of the adjustable screw, a fixed bumper of resilient rubber-like material attached to the plate (or bracket) can be used to limit the backward tilt of the bracket and bring the bracket to a cushioned stop.

Resilient means are incorporated in the structure of the invention and arranged so as to react between the fixed plate member 22 and the bracket member 18 to oppose the tilting movement of the bracket. As shown in FIGS, 1 and 3, a helical spring 36 having a frustoconical configuration is positioned beneath the fixed plate 22 adjacent to the forward end of the plate 22C. One end of the spring 36 is compressively engaged with the underside of the plate 22 and the lower end of the spring is retained by a spindle 38 which is threadably engaged to the lower end of a bolt 40 anchored to the bracket 18 and extending axially through the spring whereby the spring urges the forward portion of the plate and the bracket into a contact relationship and opposes a tilting motion of the bracket relative to the fixed plate.

As illustrated in better detail in FIG. 3, the bolt 40 slidably extends through a slot in the plate and through a circular hole in the bracket and is anchored to the bracket by means of a short cross bar member 42 welded to the upper end of the bolt. A shallow slot or indentation 18C in the upper surface of the bracket conforming to the cross bar 42 geometry is provided to retain the short cross bar and thus prevent the bolt 40 from turning when the spindle is manipulated to adjust the spring compression.

The frustoconical formation of the helical compression spring 36 permits the spring to "nest" when the chair seat (and the bracket) is tilted backward and thus the use of a shorter length of compression spring can be employed than if the spring had a helical formation of uniform diameter throughout. Additionally, the frustoconical configuration of the spring permits the use of a smaller diameter spindle collar 38A to retain the spring and thus minimizes the contact area of spring with spindle assembly. This arrangement produces small frictional forces which facilitate operation of the spindle by requiring a relative small amount of torque to bring about the selected degree of spring compression for selecting the desired amount of biasing force opposing the tilting motion.

A safety feature of considerable importance is incorporated in the structure of this invention by having the bolt 40 securing the spring 36 and to which the spindle 38 is threadably engaged, swaged to prevent the spindle from being removed from the end of the bolt.

A bumper 44 of resilient material is interposed between the forward portion of the bracket 18D and the forward portion of the plate 22C (FIG. 3) in order to prevent metal to metal contact when the bracket is in the non-tilt position. The bumper serves to dampen or cushion the bracket stop against the forward portion of the plate as the chair seat is returned from a tilt position by the action of the compression spring.

The construction of the chair control and support is such that it may be plated with facility if desired, unlike items of the prior art whose design was such that it was practically impossible to plate. Plating, of course, would add not only to the attractiveness but also the longevity of the chair control.

The chair control and support of this invention is shown in the preferred embodiment mounted on a vertical post which is both height adjustable and which provides a swivel action to the chair control and support. Understandably, the chair control and support may be mounted on any convenient mechanism, such as a vertical post, which is not height adjustable and/or not rotated.

Recapitulating, the structural embodiment of the invention advantageously maximizes the functional capabilities of a select limited number of components to effect a unique chair control and support which has the attributes of more effective and safer utility, greater versatility, and lower cost when compared to chair irons of known design.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the constructions are, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular forms of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

What is claimed is:

1. In a chair having a base, a vertical post supported by said base and a seat assembly, a chair control and support mechanism comprising;

a. A bracket secured to the underside of said seat assembly,
b. a plate rigidly mounted on the top of the vertical post for supporting said bracket, said plate and said bracket each formed of a single sheet of metal downturned side portions,
c. a horizontal pivot bolt extending through the downturned side portions of said bracket and the downturned side portions of said plate rearwardly of said vertical post and defining a pivot axis for achieving relative tilting movement between said bracket and said plate, and
d. resilient compressible means acting between said bracket and said plate to yieldably resist said tilting movement.

2. The invention of claim 1 wherein the plate rigidly mounted on the top of the vertical post has an angle of tilt of about 4° – 8° with the horizontal whereby the forward end of the plate is higher in elevation than the rear portion of the plate.

3. The invention o claim 1 wherein the cap of the screw threadably engaged to the web of the plate rearwardly of the vertical post acts as a stop to limit the backward tilting movement of the bracket secured to the underside of the seat assembly.

4. The invention of claim 1 wherein a bumper of resilient material mounted on the underside of the web portion of the bracket contacts the web portion of the plate to the rear of the vertical post mounting so as to limit the backward tilting movement of the bracket secured to the underside of the seat assembly.

5. The invention of claim 1 wherein the resilient compressible means acting between said bracket and said plate comprises a helical spring having a frustoconical configuration, the end of the spring having the larger diameter compressively the spring having the larger diameter compressively engaged to the bottom surface of the web portion of the plate forward of the vertical post mounting, and the end of the spring having a smaller diameter retained by a spindle threadably engaged to a bolt, said bolt passing axially through the spring, the plate, and anchored to the bracket.

6. The invention of claim 1 wherein a bumper of resilient material interposed between the web portion of the bracket and the web portion of the plate forward of the vertical post mounting acts to cushion the bracket stop against the plate as the chair seat is returned from the tilt position by the action of the compression spring.

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