March 12, 1957 G. A. SODERBERG 2,784,767

CONTROL FOR TILTING SEAT AND BACK OF POSTURE CHAIRS

Filed April 28, 1955 2 Sheets-Sheet 1

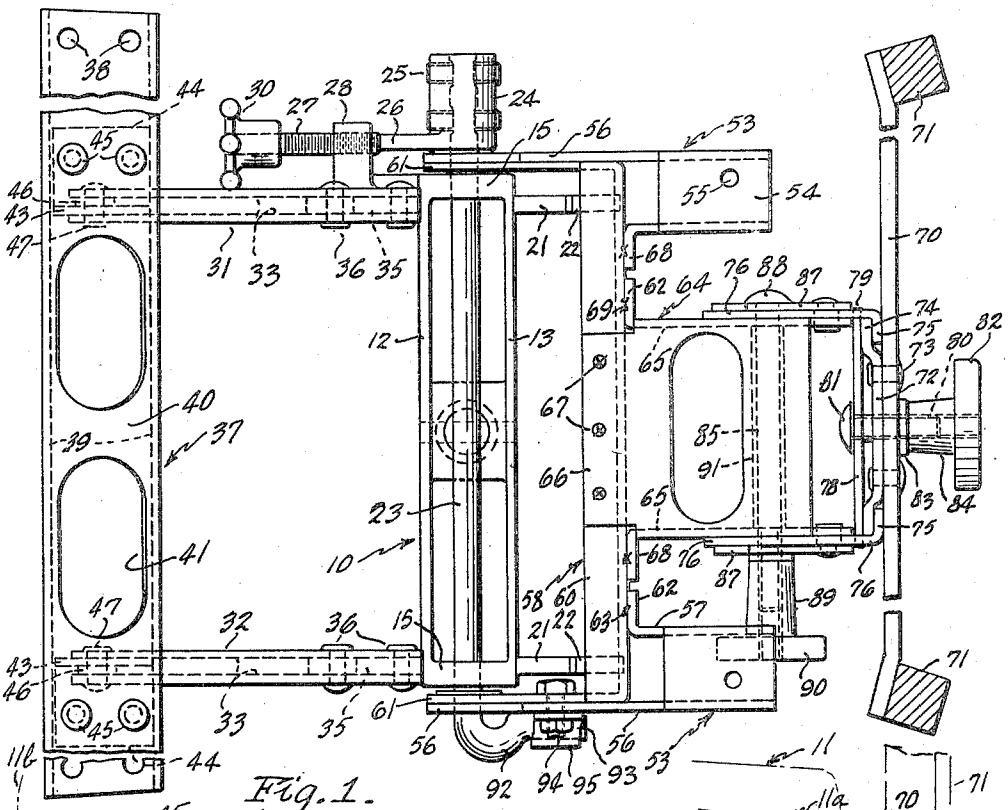


Fig. 1.

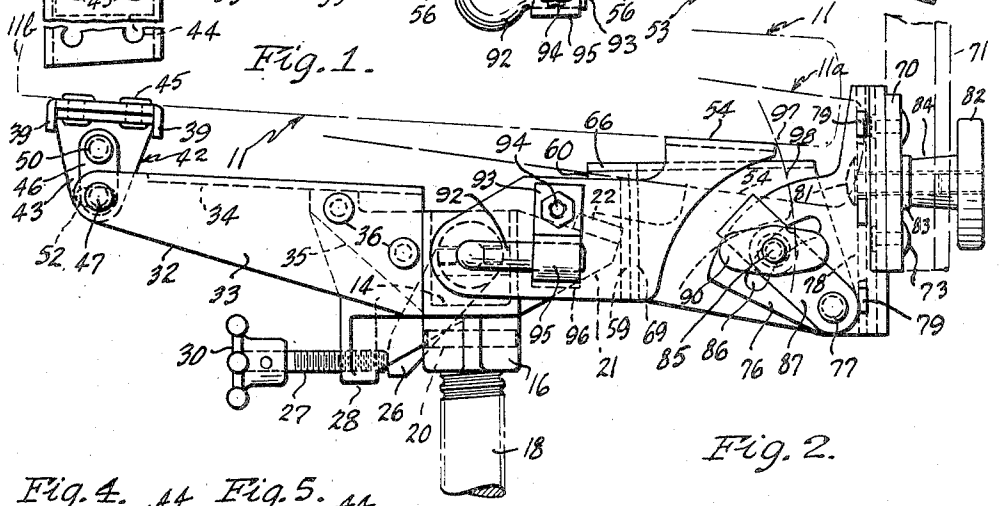


Fig. 2.

Fig. 4.

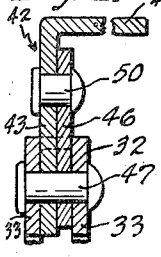


Fig. 5.

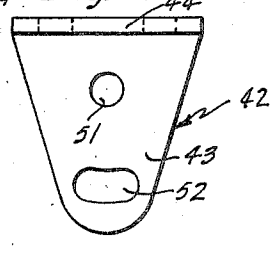
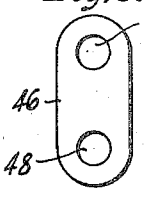


Fig. 6.



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CONTROL FOR TILTING SEAT AND BACK OF POSTURE CHAIRS

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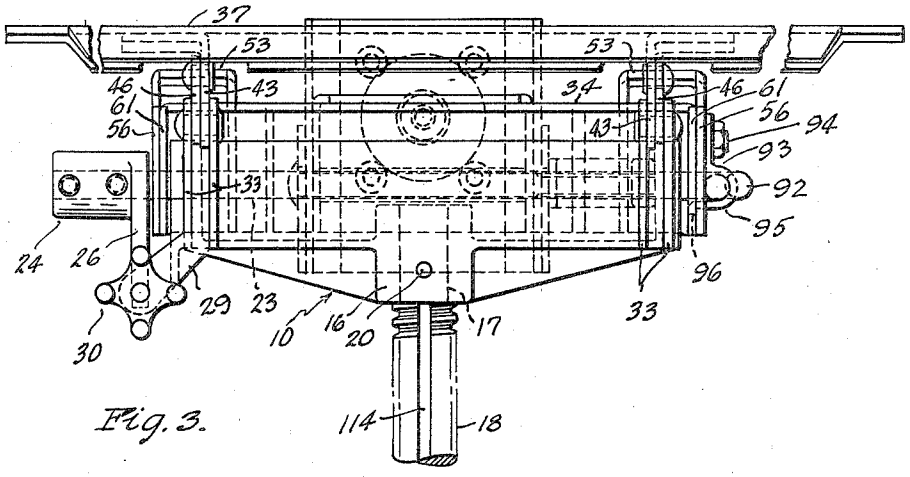

Fig. 3.

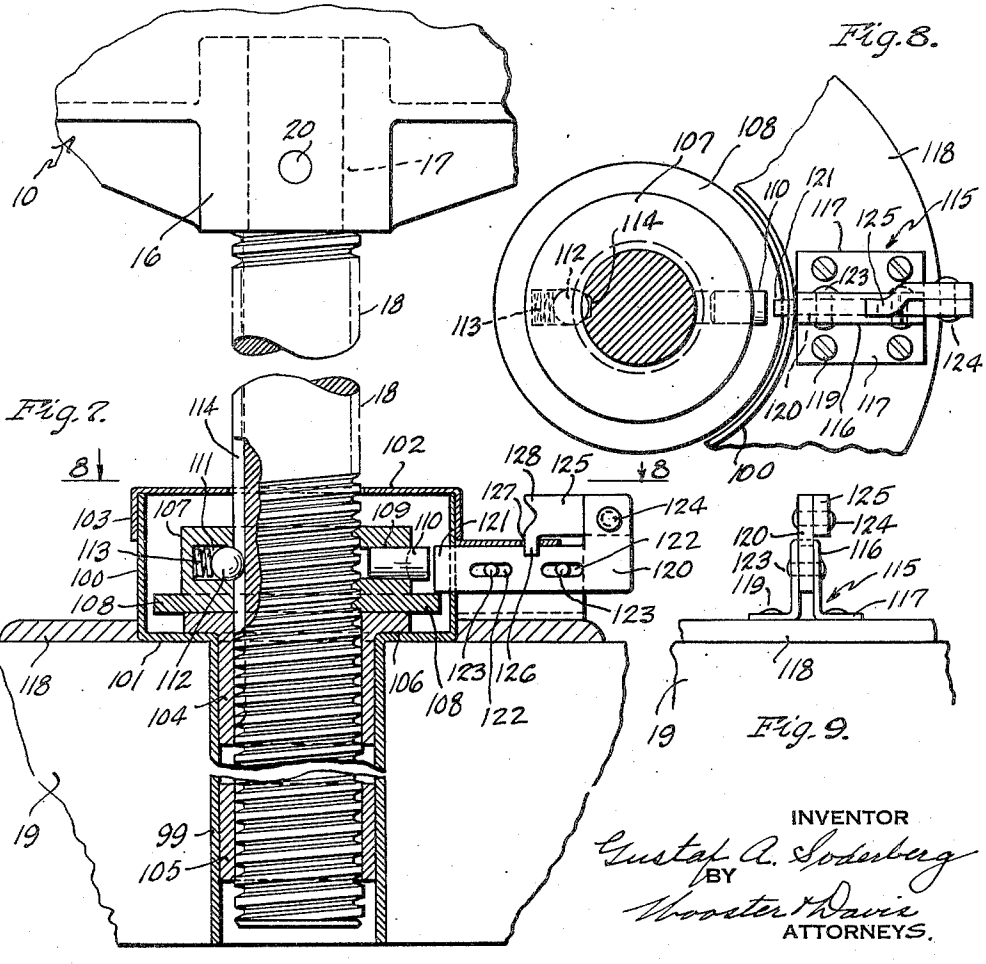

Fig. 7.

Fig. 8.

Fig. 9.

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CONTROL FOR TILTING SEAT AND BACK OF POSTURE CHAIRS

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Application April 28, 1955, Serial No. 504,477

9 Claims. (Cl. 155—77)

This invention relates to a control or iron for office chairs, particularly to a control for the tilting seat and back of the so-called posture chairs, and has for an object to provide an improved construction of control for the tilting seat and back of this type of chair which will use a torque bar formed of a heat-treated steel alloy to control the action instead of the usual coil springs or rubber cylinders.

Another object is to provide a construction which will permit the rear edge or rear part of the seat to be lowered or tilted downwardly about a pivot at or near the front edge of the seat, and the back rest may be tilted backwardly without relative vertical or up and down movement between the back and the seat which would tend to cause disarrangement or untidiness of the garments of the user of the chair.

It is a further object to provide a construction and arragement in which the height of the front edge of the seat does not vary or change materially during tilting movement, so that when the back and seat are tilted backwardly the user's feet can maintain the usual and comfortable position on the floor. Also, although the back is pivoted to tilt on a pivot at substantially the center of the seat, it and the seat can tilt backwardly without changing the height of the front edge of the seat; or in other words, the rear edge of the seat can tilt or shift downwardly with the back but the front edge of the seat remains at the same height.

It is also an object to provide a control construction of this type with means whereby the angular position of the back rest with respect to the seat and its height above the seat may be readily adjusted.

A further object is to provide simple and improved means whereby the height of the chair seat may be readily and easily adjusted.

With the foregoing and other objects in view, I have devised the construction illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is a top plan view of this control;

Fig. 2 is a side view looking toward the bottom of Fig. 1;

Fig. 3 is a front view looking from the left of Figs. 1 and 2;

Fig. 4 is a detail section of a portion of the support for the front edge portion of the seat;

Fig. 5 is a side view of one of the elements of the support;

Fig. 6 is a side view of another element of the support;

Fig. 7 is a partial elevation and partial vertical section of the height adjusting means for the chair seat;

Fig. 8 is a transverse section substantially on line 8—8 of Fig. 7 with the cover for the supporting hub removed, and

Fig. 9 is an end view of the release looking from the right of Fig. 7.

This control device or iron for a posture type chair comprises a body member 10 extending transversely from left to right under the seat shown in dot-and-dash lines 11. This body member may be of different forms, but as shown is preferably of substantially U-shaped cross section including spaced upright longitudinal side walls 12 and 13 connected by a transverse bottom wall 14, and these walls are connected at their opposite ends by the upright end transverse walls 15, and at the center the body member has a downwardly extending lug or extension 16 having a socket 17 to receive the upper reduced end of the screw post 18 for supporting the chair seat and back on the usual type of base support or feet 19. This body may be secured to the upper end of this post by any suitable means, such, for example, as the transverse pin 20. The body member is provided with backwardly extending arms 21 adjacent its opposite ends forming bumper supports for suitable bumpers 22 of any suitable material, such, for example, as soft rubber, and located in a proper position to engage a part of the tilting support for the back and rear portion of the seat to limit the tilting movement of these members, as will later be described.

Extending longitudinally in the body member 10 between the side walls 12 and 13, and passing through openings in the end walls 15 providing a bearing therefor, is a torque bar 23 which is preferably formed of heat-treated alloy steel so as to have the required strength and resiliency to control the tilting movements of the seat and back, and to return and maintain them in the forward and normal positions when the tilting pressure is released. At its right hand end this bar projects from the end of the body 10, and mounted on it is a torque bar adjustment holder 24 secured to the bar by any suitable means, such as set screws 25. This holder includes a forwardly and downwardly projecting arm 26 engaging the free end of an adjusting screw 27 threaded for adjustment in the supporting lug 28 on a laterally extending bracket arm 29 of the body 10. This screw is provided with a hand wheel 30 for operating it to shift the position of the arm 26 to adjust the torsional tension in the bar 20, as will later be described.

Extending forwardly from the body 10 are right and left front carriers 31 and 32. These carriers are of inverted U shape in cross section comprising laterally spaced upright side walls 33 connected by a transverse top wall 34, and they are secured to body member 10 adjacent the opposite ends thereof by upright forwardly extending arms 35 located between the side walls 33 and secured to them by suitable means, such, for example, as the transverse rivets 36. At their forward or free ends these carriers support the front spider arm 37 extending across under the front portion of the seat 11 fom left to right, and the seat is secured thereto by any suitable means, such, for example, as screws (not shown) through openings 38 in this arm. This spider arm is preferably of channel shape in cross section to secure strength and stiffness in proportion to the amount of metal in it, and it includes the spaced upright flanges 39 connected by the transverse top wall 40, and this top wall may be cut away or provided with elongated openings 41 to reduce its weight. This spider arm 37 is connected with the front carriers 31 and 32 so as to be supported thereby, by upright angular members 42 including a tapered upright body portion 43 with a laterally extending horizontal flange 44 at its upper end. This flange seats at the under side of the top wall 40 of the bar 37 between the flanges 39 and is secured thereto by any suitable means, such, for example, as the rivets 45. These supports or angular members 42 are connected one to each

of the carriers 31 and 32 by means of an upright link 46 pivoted adjacent its lower end to the forward ends of the carriers 31 and 32 by a transverse pivot rivet 47 passing through the side members of the carrier and the opening 48 in this link. This thus forms a pivotal connection between this link and its supporting carrier 31 or 32, and the link is located between the side walls 33. Adjacent its upper end the links 46 are each provided with an opening 49 by means of which this upper end of the link is pivotally connected to the member 42 by the rivet 50 passing through an opening 51 in the upright portion 43 of this member. Adjacent its lower end member 43 is provided with an elongated curved opening 52 struck about the center of the opening 51 as a center. Thus the member 42 has limited movement relative to its carrier 31 and 32 by swinging movement of the link 46 about its pivotal connection 47 to the carrier, but it also has relative longitudinal movement with respect to the carrier which is permitted by the elongated opening 52 through which the rivet 47 extends. This movement is provided for a purpose presently to be described.

Mounted on the projecting end portions of the torque bar 23 is means for supporting the rear edge portion of the seat 11 and also the back rest associated therewith. This support includes a pair of laterally spaced rear chair seat holders 53 including wall 54 on which the seat rests and to which it may be secured by suitable screws in openings 55 in this wall. This wall connects laterally spaced upright supporting walls 56 and 57 preferably in the form of upright plates, the walls 56 extending forwardly and having openings at their forward ends through which the torque bar 23 extends and by which the plates 56 are supported on this bar. Extending transversely between and secured to these plates 56 is a tilting rear frame 58 comprising an angle member including an upright flange 59 and a forwardly extending flange 60 at its upper edge, and at its opposite ends this frame includes forwardly extending end walls 61 located at the inner sides of the plates 56 and may be secured thereto by any suitable means, such, for example, as welding. The torque bar 23 also extends through openings in these end walls 61 to provide a wider bearing support for the rear frame and rear chair seat holder on this bar. The walls 57 are provided with laterally extending flanges 62 connected to the upright flange 59 of the frame 58 by any suitable means, such, for example, as welding 63.

Also mounted on the tilting rear frame 58 is a rear frame support 64 comprising laterally spaced upright plates or end walls 65 and a connecting top wall 66 resting at its front end portion on top of the flange 60 of the tilting frame member 58 and secured thereto by any suitable means, such, for example, as welding 67. The upright end walls 65 are provided with laterally extending flanges 68 at their forward edges resting against the rear side of the upright wall or flange 59 of the frame member 58 and secured thereto by any suitable means such as welding 69.

The support for the back rest (not shown) but which may be the regular or suitable support or back rest for this type of chair, is supported by the transversely extending back plate 70 on suitable upright supporting bars 71 secured to the opposite ends of this plate. This plate and therefore, the back, including the back rest, are mounted on the rear frame support 64 for both tilting adjustment with respect to this support and also adjustment up and down for height with respect to this support and the chair seat. For this purpose there is secured to the forward side of the plate 70 a lock plate 72, this plate 72 being secured to the plate 70 by any suitable means, such, for example, as rivets 73. The opposite ends 74 of the plate 72 are bent or offset forwardly so as to be spaced from the plate 70 to receive between these plates the upright laterally extending flanges 75 of a pair of side tilt carriers 76 which are located at

the outer side of the upright wall 65 and are pivotally connected thereto by the pivot studs 77 passing through the members 76 and the walls 65. The side tilt carriers 76 are connected by the back plate support 78 extending between these members 76 at the forward side of the offset ends 74 of the plate 72, and this plate 78 is connected at its opposite end edges to the members 76 by lugs 79 extending through openings in the members 76 and riveted over to provide a rigid connection between them. Thus the plates 70 and 72 carrying the supports 71 for the back rest may be adjusted vertically or up and down on the flanges 75 of the side tilt carriers 76, and they may be locked in adjusted position by the locking bolt 80 passing through an upright elongated slot in the plate 78 and having a head 81 at the forward side thereof, the bolt also passing through plates 72 and 70 and threaded into a hand wheel 82 with a washer 83 between the inner end of the hub 84 of this wheel and the plate 70. It will be clear that after adjustment of the plates 70 and 72 the back rest may be secured in adjusted positions by tightening up the locking hand wheel 82.

The side tilt carriers 76 may be shifted to different angular positions on the rear frame support 64 by shifting them about the pivot 77. They may be secured in different angular positions by a transverse clamping or locking bolt 85 extending through the end walls 65 of the support, and elongated curved slots 86 in the walls 76 struck about the pivot 77 as a center. Side clamps 87 are also located on the outer side of the walls 76 on the pivots 77, and the bolt 85 extends through these clamps. At one end the bolt includes a head 88 and at its opposite end it is threaded into the hub or shank of a T-handle 90. A sleeve or tube 91 embraces the bolt 85 and extends between the side walls 65 of the frame support. Thus, after adjustment, by tightening up of the T-handle 90 the clamps 87 in the walls 76 are clamped by the bolt against the side walls 65 to lock the members 76 and therefore the plate 70 in different angular positions.

To control the tilting movements of the chair seat and the back the free end of the torque bar 23 opposite the control 24 is bent laterally as indicated at 92 at the outer side of the side wall 56 of the seat holder 53, and its free end is secured or locked thereto by the torque bar lock 93. In the form shown this comprises a flat bar secured adjacent one end to the plate 56 by the bolt 94 and having a looped portion 95 embracing the free end of the laterally extending portion 92 of the bar and having the free end of this loop extending through a slot in the wall 56 and bent downwardly on the inner side thereof to form a locking flange 96 to securely secure and lock this member 93 as well as the free end of the laterally bent portion 92 of the torque bar to the member 56, and therefore to the rear chair seat holder 53 and the rear frame support 64 carrying the back and back rest.

The seat and its support, together with the support for the back, are shown in their normal positions in Figs. 1 and 2. The body member 10 and the forwardly extending carriers and supports for the front spider arm 37 are stationary on the screw post 18, while the rear chair seat holders 53 and the rear frame support 64 carrying the rear edge portion of the seat and the back rest are tiltable downwardly and backwardly about the torque bar 23 as a pivot, and this downward movement of these members is limited by the forwardly extending flange 60 engaging the bumpers 22. Substantially the position of the rear edge portion of the seat 11 is indicated in Fig. 2 by the broken lines 11*a*. During this downward or tilting movement the free end of the laterally bent end 92 of the torque bar is swung downwardly, thus placing a torsional strain on this bar which tends to return these supports 63 and 64 to their upward or normal position of Fig. 2, and therefore of course carry with them the rear edge portion of the chair seat and the back. Therefore, when backward tilting pressure to the chair

seat and the back is applied by a person sitting in the chair and leaning backwardly, a torsional strain is placed on the torque bar, but as the person leans forward or gets up from the chair, thus releasing the backwardly tilting pressure on the seat and back, they are returned to the normal position by torsional tension or stress in the torque bar. This stress may be adjusted by means of the screw 27 acting against the arm 26 connected to the torque bar, it being increased by shifting the screw 27 backwardly or to the right as viewed in Fig. 2. As this bar is of considerable length and the movement of the free end 92 during the tilting operation is relatively small, there is very little, if any, increase in stress built up in the bar during the tilting movement, and therefore the stress in the bar is substantially uniform for all positions of the tilting support.

It will be seen from Fig. 2 that as the rear edge portion of the chair seat is lowered or tilted downwardly, as well as the back support tilted rearwardly, the movement is on an arc about the center axis of the torque bar 23. Thus, as indicated in Fig. 2, the rear edge, indicated by the rear edge 97 of the support 54 will move on the arc 98 struck from the center of this bar. This will mean that this point and therefore the seat during the downward tilting movement must shift or move bodily rearward a certain amount. Therefore, the front end spider arm 37 must move rearwardly. In other words, the rivet 50 on each supporting member 42 for the front spider arm 37 swings to the right or rearwardly with the upper end of the link 46 about its pivotal connection 47 to the supporting arms 31 and 32. As the rivet 50 is fixed in the member 42, this member must also shift to the right or rearwardly as viewed in Fig. 2, and this movement is permitted by the elongated opening of slot 52 embracing the lower pivot rivet 47 of the link 46. However, the height of the rivet 50 above the floor varies only very slightly and therefore this movement does not vary the height of the forward end edge 11*b* of the chair seat above the floor. Therefore, with this construction the downward movement of the rear end portion of the chair or the tilting movement of the chair seat and the back is effected without changing the height of the forward edge portion of the chair seat above the floor, so that when these parts are tilted as the user's feet can still maintain their normal and comfortable position on the floor. Also during the tilting movements of the chair seat and back there is no vertical or up and down relative movement between the rear edge portion of the seat and the back which would tend to cause disarrangement or untidiness of the garments of the user of the chair.

An improved means for adjusting the height of the chair is shown in Figs. 7 to 9. Any suitable or usual type of base or supporting legs is employed, the top or upper portion of which is partially shown at 19 provided with an opening in which is seated a tubular hub 99 provided with an enlarged hollow head portion 100, thus providing a laterally extending flange or shoulder 101 seating on the top of the base 19. This hollow head is open at the top but is closed by a cover or closure 102 having side walls 103 telescoping with the head 10. Mounted within this tubular hub are upper and lower bearings 104 and 105 respectively for the screw post 18. These bearings can be a tight fit in the sleeve 99, and the upper bearing is provided with a laterally extending flange 106 at its upper end resting on the offset 101 of the tubular hub. Resting on the top of this flange 106, and therefore having a supporting thrust bearing thereon, is a nut 107 having threaded engagement with the screw post 18, and therefore by rotating this nut the height of the post in the base 19 may be adjusted, or, more correctly, if the nut is held stationary and the post 18 is rotated, the height of the chair seat may be adjusted. This nut is provided with an outwardly extending flange 108 at its lower end, and the nut has a laterally extending opening 109 in one side wall in which is mounted the stop pin 110 having its free end projecting outwardly a certain distance beyond the outer wall of the nut. This pin may be a drive or force fit in the nut. At the opposite side of the nut it is provided with a recess 111 extending outwardly from the threaded opening through the nut, and in this recess is a steel ball 112 in back of which is a spring 113 tending to force this ball inwardly and normally keep it seated in a longitudinally extending channel or groove 114 in one side of the screw post 18. This spring-pressed ball cooperating with this groove or channel provides a yieldable connection between the post 18 and the nut 107, which will normally cause the nut to rotate with the post unless it is held stationary by some other means, and thus the nut will provide a supporting thrust bearing for the post and will rotatably support the post and the chair seat with its control carried thereby on the lower flange bearing 106 and on the base 19. While the nut is free to turn, rotation of the chair seat and therefore the post 18 will rotate the nut and therefore permit swivel or turning movements of the chair seat without varying the height of the seat.

However, means is provided whereby the nut may be held stationary so that turning movements of the chair and therefore the post 18 may be employed to adjust the height of the chair above the base 19, and therefore, of course the floor. For this purpose there is mounted on the base 19 at one side of the head 100 of the tubular hub a bracket 115, in this case comprising a strip of metal having its intermediate portion 116 bent to substantially inverted U shape and laterally extending flanges forming feet 117 resting on the top of the flat metal ring 118 on top of the base 19, and the bracket may be secured to this ring by any suitable means such as the screws 119. Mounted in this bracket between the side walls 116 is a slide 120 having its inner end 121 projecting through an opening in the side wall of the head 100. This slide is mounted for lateral in and out movements in the bracket 115. In the arrangement shown it is provided with a pair of elongated slots 122 through which are transversely extending guide pins 123. Pivoted to the outer head portion of the slide 120 at 124 is a lock finger or catch 125 having a downwardly extending lug 126 at its free end adapted to seat in an opening 127 in the top wall of the bracket 115 to hold the slide 120 in the normal position shown in Fig. 7, which is an intermediate position for this slide, with its inner end 121 overlapping the top of the flange 108 on the nut 107, as shown. In this position this slide cooperates with this flange to prevent the nut 107 being lifted off its bearing support 106. Therefore, this provides a connection between the chair seat and the base to prevent lifting the chair seat from the base.

The catch 125 has an overhanging finger grip 128 at its free end by which it may be lifted to remove the lug 128 from the opening 127. This will release the slide 120 and permit it to be shifted either inwardly or outwardly from the position shown in Fig. 7. If it is shifted outwardly, or to the right as viewed in this figure, this movement will shift its inner end 121 away from its overhanging position with respect to the flange 108 on the nut 107 and therefore will release it and permit lifting of the chair seat and the supporting control carried by the post 18, separating them from the base 19. If the slide 120 is shifted inwardly from the position of Fig. 7, its inner end 121 may be shifted inwardly beyond the free end of the stop pin 110. Then if the chair seat and the post 18 are rotated, this pin 110 will engage the inner end 121 of the slide and hold the nut 107 against rotation. Then the spring-pressed ball 112 will yield and permit the chair seat and the post 18 to be rotated with respect to this stationary held nut and adjust the height of the chair seat either upwardly or downwardly, as desired. After the proper adjustment has been secured, shifting of the slide 120 back to its intermediate position will release the nut 107 and prevent relative turning movement between the post and this nut, and prevent further adjustment. Slide 120, however, being in this position, with

its inner end overhanging the flange 108, will prevent separation of the nut post and therefore the chair seat from the base. This provides a simple and effective means for connecting the chair seat to the base, and one which may be readily manipulated with a simple operation to permit adjustment of the height of the chair seat, and then after the proper adjustment has been secured, may be easily reset to permit swivelling of the chair seat without causing height adjustment, and at the same time will secure the post and the seat and other construction carried thereby to the base.

Having thus set forth the nature of my invention, I claim:

1. In a chair control of the character described, an elongated transversely extending body member, a supporting post on which the body is mounted, supporting arms extending forwardly from the body, a transversely extending seat supporting spider arm at the forward ends of said supporting arms, means mounting the spider arm on the supporting arms for forward and back horizontal movement as well as pivotal movement, a longitudinally extending torque bar mounted in the body member, a rearwardly extending chair seat holder pivotally mounted on the body for backward tilting movement, a back rest support mounted on said holder, means holding one end of the torque bar stationary, the other end of the torque bar being bent laterally forming a laterally extending arm, and means anchoring said latter arm to the rear chair seat holder to place torque stress on the bar as the holder is tilted backwardly.

2. In a chair control of the character described, an elongated transversely extending body member including upright end walls, a support for the body, supporting arms extending forwardly from the body, a transversely extending seat supporting spider arm at the forward ends of said arms, upright links pivotally connected to said spider arm and the supporting arms mounting the spider arm on the supporting arms for pivotal movement and horizontal back and forth movement, a longitudinally extending torque bar in the body and mounted in said end walls, a rearwardly extending chair seat holder pivotally mounted on said bar for backward tilting movement, means holding one end of the torque bar stationary, the other end of this bar including a laterally extending arm, and means locking this latter arm to the rear chair seat holder to place torque stress on the bar as the holder is tilted backwardly.

3. In a chair control of the character described, an elongated transversely extending body member, forwardly extending supporting arms on the body, a chair seat above the body, pivotal means connecting the front edge portion of the seat to said arms for back and forth horizontal movement, a rearwardly extending chair seat support for the rear edge portion of the seat pivotally connected to the body for rearward and downward tilting movement, and resilient means on the body connected to the rearwardly extending seat support to resist said tilting movement.

4. In a chair control of the character described, a body member, a chair seat, means mounting the forward edge portion of the seat on the body for pivotal as well as horizontal forward and backward movement, a support for the rear edge portion of the seat pivotally connected to the body for up and down tilting movement, and resilient means on the body connected to the rear seat support and resisting downward tilting movement of said support.

5. In a chair control of the character described, a body member, a chair seat, means mounting the forward edge portion of the seat on the body for pivotal as well as horizontal forward and backward movement, a support for the rear edge portion of the seat pivotally connected to the body for up and down tilting movement, a longitudinally extending torque bar mounted in the body, means holding one end of the bar stationary, a laterally extending arm at the other end of the bar, and means locking said arm to the rear seat support to place torque stress on the bar by downward tilting movement of said support.

6. In a chair control of the character described, an elongated transversely extending body member including upright end walls, a support for the body, supporting arms extending forwardly from the body, a chair seat, downwardly extending support members for the front edge portion of the seat, means pivotally connecting said supporting members to the forward ends of said arms and permitting back and forth horizontal movement of these members on the arms, a support for the rear edge portion of the seat pivotally mounted on and extending backwardly from the body for up and down tilting movement, and yieldable resilient means mounted on the body and connected to said rear support to resist said tilting movement.

7. In a chair control of the character described, an elongated transversely extending body member including upright end walls, a support for the body, supporting arms extending forwardly from the body, a chair seat, downwardly extending supporting members for the front edge portion of the seat, upright links pivotally connected at their opposite ends to the supporting members and the supporting arms, a support for the rear edge portion of the seat pivotally mounted on and extending backwardly from the body for up and down tilting movement, a longitudinally extending torque bar mounted in said end walls, means holding one end of the bar against turning, a laterally extending arm at the other end of the bar, and means locking said arm to the rear seat support to place a torque stress on the bar by downward tilting movement of said support.

8. In a chair control of the character described, a transversely extending body member, a support for the body member, supporting arms extending forwardly from the body, a chair seat, downwardly extending supporting members for the front edge portion of the seat, upright links pivotally connected at their opposite ends to said supporting members and said arms to permit forward and backward movement of the seat, a support for the rear edge portion of the seat pivotally mounted on and extending backwardly from the body for up and down tilting movement, and yieldable resilient means resisting said tilting movement.

9. In a chair control of the character described, a transversely extending body member, a support for the body member, supporting arms extending forwardly from the body, a chair seat, downwardly extending supporting members for the front edge portion of the seat, upright links, pivot means connecting the upper ends of the links to said supporting members and the lower ends of said links to the supporting arms, said supporting members being provided with longitudinally extending elongated slots embracing said lower pivot means permitting backward movement of the seat, a support for the rear edge portion of the seat pivotally mounted on and extending rearwardly from the body for up and down tilting movement, and yieldable resilient means resisting downwardly tilting movements.

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