Dec. 1, 1970 H. ANDERSSON 3,544,159

TILTABLE CHAIR CONSTRUCTION

Filed May 10, 1968 2 Sheets-Sheet 1

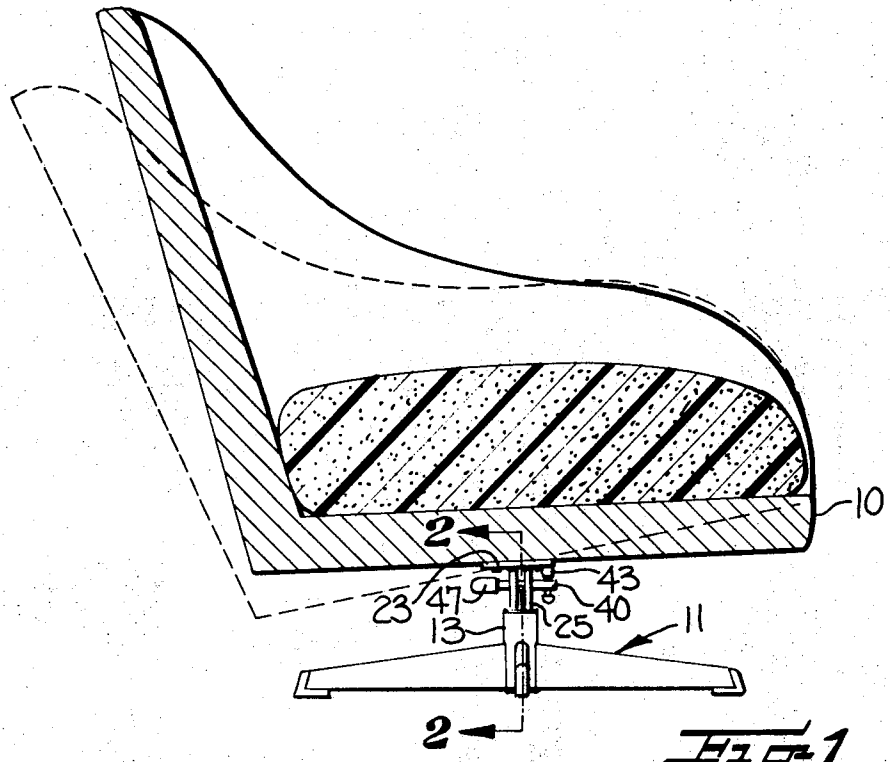


Fig-1

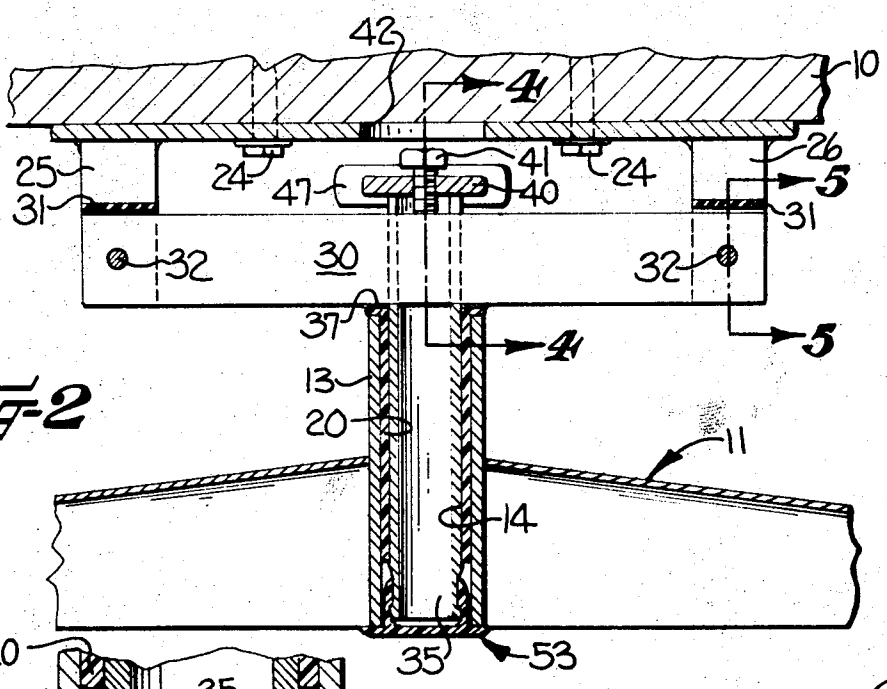


Fig-2

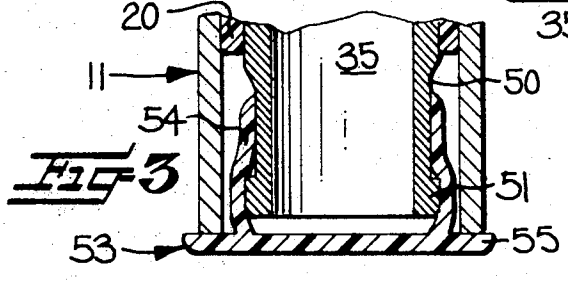


Fig-3

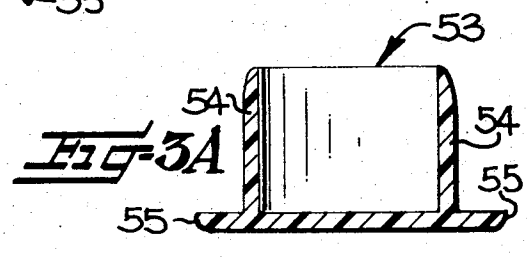


Fig-3A

Dec. 1, 1970 H. ANDERSSON 3,544,159

TILTABLE CHAIR CONSTRUCTION

Filed May 10, 1968 2 Sheets-Sheet 2

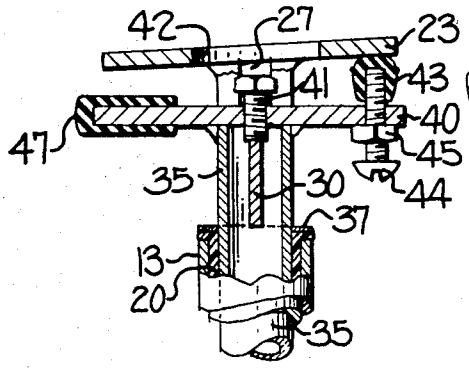


Fig-4

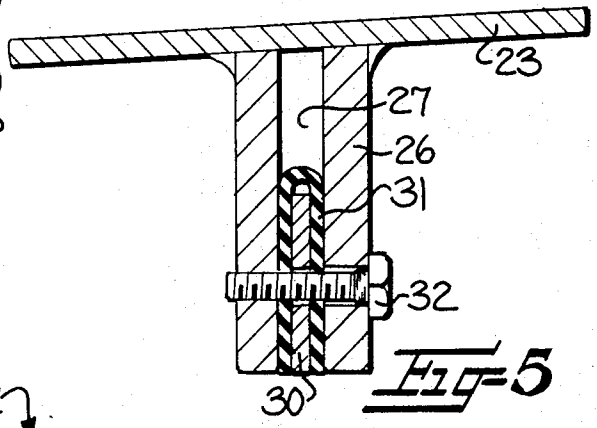


Fig-5

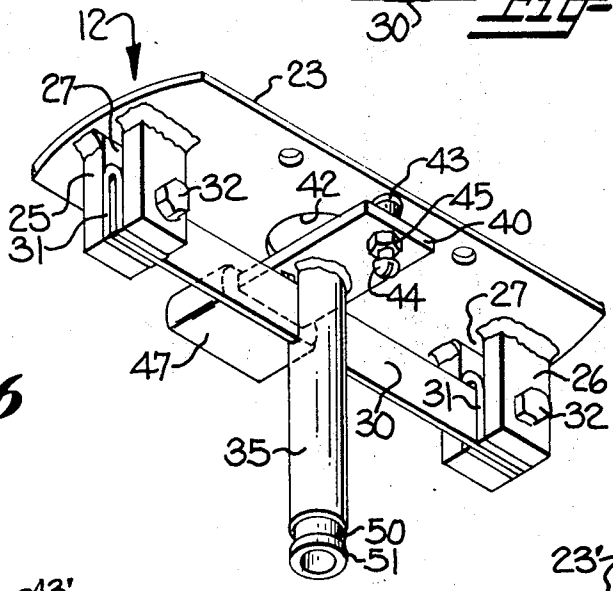


Fig-6

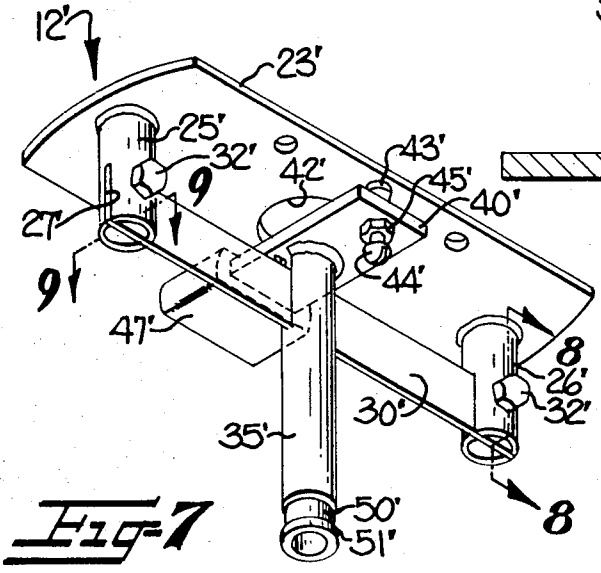


Fig-7

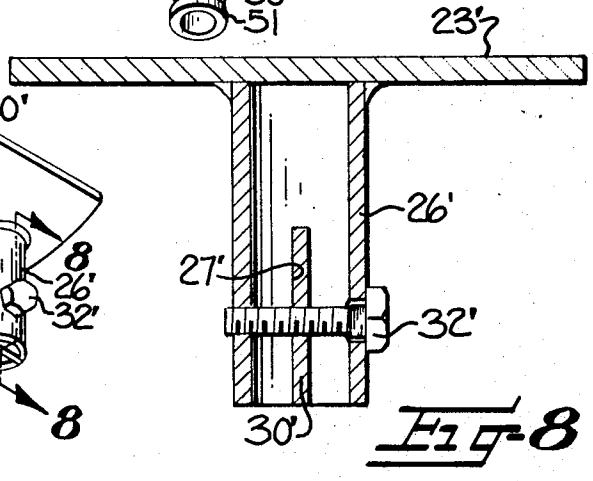


Fig-8

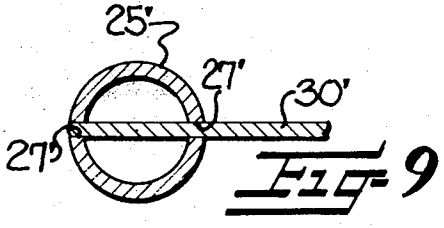


Fig-9

INVENTORS:
HERBERT ANDERSSON

BY Parrott, Bell, Seltzer, Park & Gibson

ATTORNEYS

United States Patent Office 3,544,159 Patented Dec. 1, 1970

3,544,159

TILTABLE CHAIR CONSTRUCTION

Herbert Andersson, Dalum, Sweden, assignor, by mesne assignments, to Consolidated Burris International, Ltd., Lincolnton, N.C., a corporation of North Carolina

Filed May 10, 1968, Ser. No. 728,187
Int. Cl. A47c 3/18
U.S. Cl. 297—303 10 Claims

ABSTRACT OF THE DISCLOSURE

A supporting structure for a tiltable chair seat in which a frame secured to the seat bottom has laterally spaced depending post means thereon in which opposite end portions of a torsion bar are secured for resiliently resisting tilting movement of the chair seat. A shaft is penetrated by a medial portion of the torsion bar, and the shaft is adapted to be mounted in an upright position in a mating bore in a chair base or pedestal, preferably for swivel movement therein.

This invention relates to tiltable chairs and more particularly to an improved structure utilizing a torsion bar for supporting a chair seat for tilting or rocking motion upon a chair base or pedestal.

Various forms of chair seat supporting structures have been proposed heretofore in which torsion bars have been employed to permit rocking or tilting the chair seat while torsionally resisting such tilting. The prior art forms of supporting structures have had various disadvantages in that they have included many intricate parts of expensive manufacture, such parts have been large, cumbersome and relatively heavy, thereby adding undesirably excessive weight to the chair construction, and/or they have been of unsightly construction detracting from what might have been an otherwise aesthetic appearance to the chair.

It is an object of this invention to provide an improved supporting structure for a tiltable chair seat which structure is of simple, relatively lightweight and compact construction, includes relatively few parts, and will not impart an undesirable appearance to the chair, and wherein the supporting structure includes a torsion bar which tends to maintain the chair seat in a generally horizontal position, but is bendable to permit tilting the chair seat while torsionallly resisting such tilting.

It is a more specific object to provide a chair seat supporting structure including a frame adapted for securement to the bottom of the chair seat and having a pair of laterally spaced depending post means thereon in which opposite ends of a torsion bar are secured, and wherein a shaft is penetrated by a medial portion of the torsion bar. The shaft is adapted to fit in a vertical bore in a chair base or pedestal with the torsion bar supported by the chair base so that the torsion bar supports the chair seat and permits tilting or rocking of the chair seat relative to the shaft and the chair base while torsionally resisting such tilting or rocking.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation of a tiltable chair construction providing one embodiment of chair seat supporting structure according to this invention;

FIG. 2 is an enlarged fragmentary vertical sectional view looking rearwardly substantially along line 2—2 in FIG. 1;

FIG. 3 is an enlarged fragmentary vertical sectional view similar to the lower central portion of FIG. 2 and showing an improved means for retaining the upright

shaft of the instant supporting structure in the vertically extending bore of the chair base or pedestal;

FIG. 3A is a sectional view of the retaining cap of FIG. 3 removed from the shaft;

FIGS. 4 and 5 are fragmentary vertical sectional views taken substantially along lines 4—4 and 5—5 in FIG. 2;

FIG. 6 is a perspective view looking upwardly at the improved supporting structure shown in FIGS. 1–5, but showing the upright shaft thereof removed from the chair base;

FIG. 7 is a view similar to FIG. 6, but showing a second embodiment of the chair seat supporting structure of the instant invention;

FIG. 8 is an enlarged fragmentary vertical sectional view taken substantially along line 8—8 in FIG. 7; and

FIG. 9 is an enlarged fragmentary sectional plan view taken substantially along line 9—9 in FIG. 7.

Referring more specifically to the drawings, a tiltable swivel chair comprising a chair seat **10** and a chair base or pedestal **11** is shown in FIG. 1 provided with one embodiment of the improved chair seat supporting structure of this invention which is broadly designated at **12**. Chair base **11** may be of conventional or other construction and, as shown, chair base **11** includes an upstanding central body **13** having a substantially vertically extending bore or cavity **14** therethrough. Leg members **15** are suitably connected to and extend substantially radially from body **13**, and suitable foot members **16** may be secured to the outer lower end portions of leg members **15**. If desired, a tubular bushing **20** may be pressed into bore **14**, with a radial flange **21** on the upper end of bushing **20** bearing against the upper surface of body **13**. Bushing **20** may be made from any suitable bearing material, such as plastic, brass, etc.

The chair seat supporting structure **12** comprises a frame which preferably is in the form of a relatively thin substantially rectangular base plate member **23** adapted to be secured in a generally horizontal position to the bottom of chair seat **11**, as by means of screws **24** (FIG 2). Connected to opposed end portions of plate member **23**, and depending therefrom, is a pair of suitable post means **25, 26** which are laterally spaced apart from each other with respect to chair seat **10**. Post means **25, 26** may be formed integral with plate member **23** or they may be fixedly secured to plate member **23**. As shown in FIGS. 2, 4, 5 and 6, post means **25, 26** are welded to the lower surface of plate member **23**.

In the first embodiment of the invention, each post means **25, 26** is shown in the form of a pair of blocks so that, in effect, the post means **25, 26** are bifurcated to provide aligned slots **27** therethrough for receiving therein opposite end portions of a horizontally disposed, elongate, relatively thin metallic torsion bar **30**. Torsion bar **30** extends horizontally with its widthwise dimension extending vertically; i.e., with its widthwise dimension extending substantially perpendicular to the upper surface of plate member **23** and substantially parallel to the axis of a shaft or spindle **35**, as will be later described.

The width of slots **27** in post means **25, 26** should be such as to maintain torsion bar **30** with its widthwise dimension in substantially perpendicular relation to plate member **23** and also to minimize relative movement between torsion bar **30** and post means **25, 26** when torsion bar **30** is subjected to a longitudinally bending or twisting force, as will be later explained, so as to avoid producing squeaking sounds by the torsion bar **30** rubbing against the walls of slots **27**.

As a further precaution against producing such squeaking sounds, a cushon member **31** is positioned between each side of torsion bar **30** and the corresponding wall of each slot **27**. Cushion members **31** may be made from

rubber or any other suitable resilient material. As shown, the two cushion members **31** adjacent each end of torsion bar **30** may be formed collectively of substantially U-shaped one-piece construction (FIGS. 5 and 6). Opposed ends of torsion bar **30** may be further rigidly secured in the desired position, spaced below plate member **23**, by means of screws **32**. As shown, one of the screws **32** penetrates one block of the corresponding post means **25** or **26**, as the case may be, and also loosely penetrates the two corresponding cushion members **31** and the corresponding end portion of torsion bar **30**, but the corresponding screw is threaded into the other block of the corresponding post means. Thus, the two blocks of each post means clampingly secure opposite ends of torsion bar **30** in fixed relation to plate member **23** and in spaced relation below plate member **23**. It is believed that cushion members **31** serve an additional useful function in that the bending stresses applied to torsion bar **30** appear to be effective over the full length of the torsion bar as opposed to only that portion of its length between the post means **25, 26**.

A medial portion of torsion bar **30** extends through the slotted or bifurcated upper end portion of the shaft or spindle **35** whose transverse slot is indicated at **36** and is of such width that opposite sidewalls thereof firmly engage opposite side surfaces of torsion bar **30**. Shaft **35** may be of tubular form and is of such diameter as to fit in the body **13** of chair base **11**; i.e., within flanged bushing **20**, so that the supporting structure **12** and chair seat **10** may be swiveled or rotated relative to chair base **11**. A metallic washer **37** (FIGS. 2 and 4) may be provided on shaft **35** and positioned between the lower surface of torsion bar **30** and the upper surface of bushing flange **21** for supporting the torsion bar **30**, the post means **25, 26**, the base plate member **23**, and the chair seat **10** upon the tubular body **13** of chair base **11**.

From the foregoing description, it is apparent that the torsion bar normally maintains chair seat **10** in a substantially horizontal or slightly tilted position, and that the chair seat **10** may be rocked or tilted relative to shaft **35**, during which the opposite end portions of torsion bar **30** move with the post means **25, 26** while the medial portiton of torsion bar **30** remains with its widthwise dimension occupying a substantially vertical position in the upper portion of shaft **35**. Thus, torsion bar **30** is twisted during the tilting of the chair seat **10** while it resists such tilting motion and tends to return the chair seat to the normal position. If so desired, plate member **23** may be positioned at a slight angle of about 8° out of right angular relation to shaft **35** so that the chair seat may normally occupy a slightly backward tilted position as shown in FIG. 1 while torsion bar **30** is in relaxed condition.

Novel means are provided for limiting the extent to which the chair seat **10** may be titled out of its normal substantially horizontal position. To this end, it will be observed in FIGS. 3 and 6 that the slotted upper end of shaft **35** extends a relatively short distance upwardly above the upper edge of torsion bar **30** and has a transverse tilt-limiting bar **40** fixed thereon, as by welding. Bar **40** is spaced below plate member **23** and its medial portion is threadedly penetrated by a set screw **41** whose lower end bears against the upper edge of torsion bar **30** for maintaining the lower edge of torsion bar **30** in engagement with the bottom of the slot **36** through shaft **35**. Plate member **23** may be have an opening **42** therethrough to facilitate access to screw **41** and to reduce the weight of plate member **23**.

Tilt-limiting bar **40** is preferably of a length about equal to or somewhat greater than the width of plate member **23**, and the forward porton of tilt-limiting bar **40** has a vertically adjustable abutment thereon, such as a resilient cap **43** mounted on the upper end of an adjustment screw **44**. Screw **44** threadedly penetrates the forward portion of tilt-limiting bar **40** and is locked in the desired adjusted position by means of a lock nut **45**. Thus, resilient cap **43** may be adjusted relative to tilt-limiting bar **40** such as to permit a relatively small extent of forward tilting motion of chair seat **10**, if desired, it being noted that the abutment or cap **43** is disposed in close proximity to the front lower surface portion of plate member **23** in FIG. 4.

It is apparent that the rear end portion of tilt-limiting member **40** is normally spaced a substantial distance below the rearmost portion of plate **23** as compared to the relationship between abutment **43** and the plate member **23**, thus permitting substantial rearward tilting motion to be imparted to chair seat **10** before the rear portion of plate member **23** may engage tilt-limiting bar **40**. A suitable cushion member **47**, which may be made from rubber or any other suitable resilient material, may be mounted on the rear portion of tilt-limiting bar **40** for cushioning the movement of plate member **23** toward tilt-limiting bar **40** and also for preventing the occurrence of an undesirable sound upon impact of plate member **23** with tilt-limiting bar **40**.

It will be observed in FIGS. 2 and 3 that the lower end of shaft **35** terminates adjacent the lower end of tubular body **13** of chair base **11**. It is desirable that the lower end of post member **35** does not protrude below the lower end of tubular body **13** for the sake of good appearance. Moreover, the lower end of body **13** may be located so close to the floor upon which the chair base rests that only a short protruding length of post member **35**, if any, could be accommodated below body **13**. Thus, it has been customary heretofore to retain an upright shaft or spindle in the tubular body **13** by inserting a metal snap ring or flexible split collar in a peripheral groove in the lower portion of the spindle so that such snap ring could engage the lower end of the bushing **20** and thereby restrain the post member from being lifted out of the chair base. It is apparent that the insertion of such a metal snap ring or flexible split collar in a peripheral groove of a shaft housed within the tubular body **13** is quite difficult and has required special tools, since the lower portion of the shaft **25** is practically inaccessible.

Accordingly, novel means is provided, as shown in FIGS. 2, 3 and 3A, for retaining shaft **35** in tubular body **13**. To accommodate the novel shaft retaining means, the lower end of bushing **20** is spaced a substantial distance above the lower extremity of tubular body **13**, and the lower portion of shaft **35**, below the lower end of bushing **20**, is provided with a peripheral groove **50** therein defining, at the lower extremity of shaft **35**, an annular shoulder **51**. The shaft retaining means comprises a retaining cap, broadly designated at **53**, including a deformable flexible wall **54** of an elastic synthetic plastic material. In its relaxed state, the inner surface of annular wall **54** may be of substantially uniform diameter throughout its length and may be of from about .010 to .030 inch lesser diameter than the external diameter of shoulder **51** so that the annular wall **54** of retaining cap **53** is stretched and enlarged as it is manually forced over shoulder **51**, but as the annular wall is being forced beyond the shoulder **51**, it tends to resume its original internal diameter, thus entering the annular groove **50** and locking retaining cap **53** on the lower end portion of shaft **35**.

It is apparent that the external diameter of annular wall **54** should be substantially less than the internal diameter of the bore **14** of tubular member **13**. The lower portion of annular wall **54** is provided with a radially outwardly projecting flange **55** which seats against the lower end of tubular body **13** when the annular wall **54** is properly installed on the lower end portion of shaft **35**.

The inherent elasticity of annular wall **54**, and the relationship of its internal diameter to the external diameter of shoulder **51** should be sufficient to ensure that shaft **35** will not be pulled out of tubular body **13** when the chair is lifted to move the same from place to place. On the other hand, it is to be understood that the elastic

nature of annular wall **54** of retaining cap **53** may be such that cap member **53** may be removed from the lower end portion of shaft **35** by inserting the end of a screw driver or other suitable implement between flange **55** and the lower end of tubular body **13**, if desired. To facilitate installation of cap member **53** on the lower end of shaft **35** in the manner hereinbefore described, the lower outer peripheral edge of shoulder **51** may be rounded or beveled, as desired. To lend rigidity to the lower portion of cap **53**, flange **55** may be in the form of a disc which entirely closes the bottom of annular wall **54**. Also, it is preferred that flange or disc **55** is formed of the same material as and is integral with the annular wall **54**.

The second embodiment of the chair seat supporting structure shown in FIGS. 7, 8 and 9 is quite similar to the first embodiment, with the exception of the form of post means in which opposite ends of the torsion bar are mounted, and with the exception that the frame or base plate member is shown extending at right angles to the shaft **35**. Therefore, the parts shown in FIGS. 7, 8 and 9 will bear the same reference characters as similar parts shown in FIGS. 1–6, where applicable, with the prime notation added, to avoid repetitive description.

Although plate member **23** extends downwardly and rearwardly at a shallow angle in FIGS. 1, 4 and 5 relative to shaft **35**, it is apparent that it may extend perpendicular or at a right angle with respect to shaft **35**. Also, although plate member **23'** is shown in FIG. 8 extending perpendicular or at a right angle to the shaft **35'**, it is apparent that plate member **23'** also may extend downwardly and rearwardly at an angle in a manner similar to that at which plate member **23** is shown in FIG. 5, if desired.

As shown in FIGS. 7, 8 and 9, each post means **25'**, **26'** may be of tubular form and the transverse slots **27'** therethrough are shown as being of about the same depth as the width of torsion bar **30'**. Thus, post means **25'**, **26'** may retain torsion bar **30'** in the desired spaced relation below plate member **23'** without relying solely upon the screws **32'** or the clamping effect produced by tightening screws **32'** in post means **25'**, **26'**. Cushion members such as are indicated at **31** in FIGS. 2, 5 and 6 are not used in the second embodiment of the invention, but may be used, if desired.

It is thus seen that I have provided an improved supporting structure for mounting a tiltable chair seat on a chair base, wherein the torsion bar extends through and is substantially axially aligned with the spindle with its opposite ends being secured within post means carried by a plate member secured to the bottom of the chair seat, thus providing a simple, compact, easily assembled and economical unit which will not detract from the desired aesthetic appearance of the chair.

In the drawings and specification there have been set forth preferred embodiments of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

What is claimed is:

1. A supporting structure for tiltably mounting a chair seat on a pedestal having a vertically extending shaft-receiving cavity therein; said supporting structure comprising a frame adapted for securement to the bottom of the chair seat and having a pair of laterally spaced post means fixedly connected thereto and depending therefrom, a shaft adapted for insertion into the shaft-receiving cavity of the pedestal, an elongate horizontally disposed torsion bar having opposite ends thereof extending substantially through and secured to said pair of post means, said torsion bar also having a medial portion thereof penetrating said shaft and restrained from turning movement therein, said torsion bar being bendable about its longitudinal axis relative to said post means and said shaft, by tilting said frame relative to said shaft, while torsionally resisting such tilting, and means for limiting the extent to which said frame may be tilted relative to said shaft.

2. A supporting structure for tiltably mounting a chair seat on a pedestal having a vertically extending shaft-receiving cavity therein; said supporting structure comprising a pair of post means, base means for rigidly securing said post means in fixed laterally spaced relationship to the bottom of the chair seat, a shaft adapted for insertion into the shaft-receiving cavity of the pedestal, a horizontally disposed, elongate, relatively thin metallic torsion bar having opposite end portions thereof extending substantially through said pair of post means and being secured to said post means, a medial portion of said torsion bar penetrating and secured to said shaft with the widthwise dimension of said torsion bar extending substantially parallel to said shaft, and said torsion bar being adapted to bend about its longitudinal axis relative to said post means and said shaft, by tilting said post means relative to said shaft, while torsionally resisting such tilting.

3. A structure according to claim **2**, in which said base means comprises a plate member to which said post means are attached, wherein the upper edge of said torsion bar is spaced below said plate member, and means limiting the extent to which said post means may be tilted, said limiting means comprising a second bar connected in fixed relation to the upper end of said shaft and extending over and transversely of said torsion bar, said second bar normally being spaced below and out of engagement with said plate member, and a resilient covering means on at least one end of said second bar being engageable by said plate member upon predetermined tilting of said post means and said plate member relative to said shaft.

4. A structure according to claim **3**, including abutment means carried by the other end of said second bar and also being engageable by said plate member when said plate member occupies a normal substantially horizontal position.

5. A structure according to claim **4**, wherein said abutment means comprises an element vertically adjustable relative to said second bar and having a resilient member on its upper end for engaging said plate member.

6. A structure according to claim **3**, in which said shaft is fixed to said torsion bar by means of a set screw threaded through said second bar and engaging the upper surface of said torsion bar.

7. A structure according to claim **2**, including a thin resilient pad between each side of said torsion bar and the respective post means for cushioning the mounting of said torsion bar in said post means.

8. A structure according to claim **2**, in which said post means are each provided with a slot through which a corresponding end portion of said torsion bar extends, and a cushion member of resilient material positioned between each side of said bar and the corresponding wall defining each slot.

9. A supporting structure for tiltably mounting a chair seat on a pedestal having a vertically extending post-receiving bore therethrough; said supporting structure comprising a frame adapted for securement to the bottom of said chair seat and being provided with a pair of laterally spaced depending post means thereon, an elongate, horizontally disposed, torsion bar having opposite end portions thereof secured to said post means, a shaft of circular cross-section having its upper end penetrated by and secured to a medial portion of said torsion bar and adapted to fit in said bore for rotational movement therein, said shaft having a peripheral groove therein spaced from its lower end and defining an annular shoulder adjacent the lower end of said post, a retaining cap having an elastic annular wall adapted to snugly engage said shoulder and the bottom of said annular groove, and said retaining cap having a flange thereon adapted to engage the lower surface of said pedestal adjacent said bore when said annular wall is in engagement with said shoulder and the bottom of said annular groove to prevent said shaft from being pulled out of said bore when a lifting force is applied to said chair seat.

10. In a chair construction including a chair base having a substantially vertically extending shaft-receiving bore therethrough, a chair seat, and a supporting structure for the chair seat including a substantially vertically disposed shaft positioned for rotary movement in said shaft-receiving bore, said shaft terminating at its lower end within said bore and having an annular shoulder on its lower end; the combination therewith of means for securing said shaft against axial upward movement in said bore and comprising a retaining cap having an annular wall of elastic synthetic material, said annular wall having an internal diameter which is less than the diameter of said shoulder when the annular wall is in relaxed condition, said annular wall being positioned around and stretched by said shoulder on said shaft and extending upwardly beyond said shoulder whereby said annular wall grippingly engages said shoulder, and said cap including an annular flange engageable with the lower surface of said chair base adjacent the perimeter of said bore when said annular wall is engaging said shoulder to prevent said shaft from being pulled out of said bore when a lifting force is applied to the chair seat.

References Cited

UNITED STATES PATENTS

5,345	4/1873	Teal	292—350
193,433	7/1877	White	248—373
2,424,753	7/1947	Herold	248—753
2,464,300	3/1949	Fox	297—301 XR
2,711,211	6/1955	Tidcombe	297—291
2,760,553	8/1956	Lie	297—303
2,935,119	5/1960	Lie	297—303 XR
3,131,904	5/1964	Lie	248—373
3,162,420	12/1964	Lie	248—373
3,185,429	5/1965	Meinhardt	248—373
3,240,528	3/1966	Ciuffini	297—303

BOBBY R. GAY, Primary Examiner

G. O. FINCH, Assistant Examiner

U.S. Cl. X.R.

248—373