A torsion bar chair iron in which a tubular housing member of rectangular cross section is secured to the spindle of a chair base. The spindle passes laterally through the tubular housing and is secured at the top and bottom thereof. A torsion bar passes longitudinally through the housing member, passing adjacent the spindle. It is fixed in one end of the housing but is rotatable in the other end thereof. At the rotatable end, outside of the housing, a lever is fixedly secured to the torsion bar. Chair support members are rotably secured to the ends of the torsion bar and a chair is secured to the chair support members.

7 Claims, 4 Drawing Figures
3,788,586

TORSION ROD CHAIR IRON

BACKGROUND OF THE INVENTION

This invention relates to a torsion bar chair iron. There are basically two types of chair irons, coil spring and torsion bar. From an economic standpoint, torsion bar chair irons are somewhat more desirable since they can be more simply constructed.

One of the most economical and popular torsion bar chair iron constructions is that comprising a longitudinal housing for the torsion bar with the chair spindle being secured to the bottom thereof. The housing is generally a flat dish-like construction in which the torsion bar is fixed at one end but freely rotatable at the other. A fairly long torsion bar must be used in order to obtain the requisite amount of flexibility. Thus, the housing in such a construction must correspondingly be quite long. When the chair mounted on such an iron is tilted backwards, considerable force is put on the housing member about the mounting between the stationary spindle and the housing with the result that considerable distortion or warpage takes place in the housing. This distortion is a detriment both to the durability and to the safety of the chair iron.

As an example, I have discovered one chair mounted on one such chair iron will tilt through 18° to its stops when a minimum of tilting force is applied. If a person sits in the chair and tilts it backwards, it will tilt through 22° to its stops simply because of the distortion that takes place in the chair iron. Eventually, this distortion will become permanent and the chair will begin to tip even farther backwards. It is even possible that warpage in the chair housing will allow sufficient tilting that the torsion bar will snap and the person sitting in the chair will go over backwards.

In order to aid large scale purchasers in avoiding such undesirable torsion bar chair irons, Buyers Laboratories, Inc. has devised tests which are standard in the office furniture industry. They apply 300 pounds of pull at the top of the back of a chair and if the chair "sets" one-quarter of an inch or more, it fails the test. The torsion bar chair iron discussed above fails this test and, hence, is generally undesirable to the consumers and manufacturers of office furniture.

One obvious way to avoid warpage in the long torsion bar housing member is to secure the spindle of the chair base to a separate member or housing rather than to the same member in which the torsion bar is housed. However, this eliminates the simplicity and economy and, hence, the general desirability of a torsion bar chair iron and does not provide an acceptable solution to the problem.

This invention is a torsion bar chair iron for a chair having a spindle type base. It comprises a rigid housing member secured to the chair spindle, with the housing member comprising a top, a bottom, a first end and a second end. The spindle extends through and is rigidly secured to the bottom and the top of the housing member. A torsion bar is mounted in the housing member such that its longitudinal axis does not intersect the vertical axis of the spindle. It passes through the first end of the housing member and is in fixed rotational relationship thereto. It also passes through the second end of the housing member but is rotatable with respect thereto. A lever means is operably connected to the torsion bar and is in fixed rotational relationship to it.

Finally, chair support means are operably connected to the housing member and are freely rotatable with respect thereto, such that the chair support means operably engage the lever means when the chair is tilted.

This chair iron provides a simple and economical construction wherein no special spindle housing or fixture is necessary as an addition to that member which houses the torsion bar. At the same time, the unique arrangement of the spindle and the torsion bar in the unique housing structure provides a chair iron which is sufficiently strong and which uniquely distributes the loads applied to the housing and tilting that this chair iron will pass the BLI torsion bar chair iron tests. Distortion and warpage of the chair iron housing are substantially eliminated. The danger of snapping a torsion bar because of distortion in the housing is substantially eliminated. Even if a bar should snap, the tubular shaped housing constitutes an important safety feature by containing any flying bar fragments which might otherwise prove injurious. Finally, these ends are achieved by using a single housing structure to which and in which both the chair spindle and the torsion bar are mounted.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the invention can be seen by reference to the preferred embodiment and appended drawings wherein:

FIG. 1 is a perspective view of the chair iron mounted on a chair spindle with a portion of the housing member being broken away;
FIG. 2 is a bottom plan view of the chair iron;
FIG. 3 is a cross section taken along III—III of FIG. 1;
FIG. 4 is a cross section taken along IV—IV of FIG. 1.

PREFERRED EMBODIMENT OF THE INVENTION

The torsion bar chair iron 1 is designed for mounting atop a spindle 2 and comprises the following basic members: housing member 10, torsion bar 30 and chair support members 40a and 40b (FIG. 1).

Housing 10 comprises a tubular member of rectangular cross section defining top 11, bottom 12 and sides 13 (FIGS. 3 and 4), which is sealed off by first end 14 and second end 15 being welded to the ends of tubular housing member 10 (FIG. 2). It is preferably made of cold roll steel about 0.180 inches thick.

Approximately equidistant between first end 14 and second end 15, but offset from the lateral center of tubular housing 10, are parallel apertures 16 and 17 in the bottom 12 and top 11 of housing 10, respectively (FIG. 1). Spindle 2 is of a narrower diameter at its top 3 such that the latter passes through apertures 16 and 17 while the rest of spindle 2 does not (FIGS. 1, 3 and 4). It is securely fastened in place in these apertures.

In first end 14, there is a square aperture 18 which bevels inwardly (FIGS. 2 and 3). Second end 15 has a round aperture 19 (FIGS. 2 and 4) which is opposite square aperture 18.

First end 14 is slightly longer than second end 15 and extends rearwardly of housing 10 to form chair stop 20 (FIG. 3) which limits the extent to which a chair can be tilted backwardly with this chair iron 1. Both first and second ends 14 and 15 define forward stops 21 (FIGS. 3 and 4) which limit the extent to which the chair can be tilted forward.
Torsion rod 30 is generally of a square cross section (FIGS. 3 and 4) and extends through and snugly fits in square aperture 18 in first end (FIGS. 2 and 3). Hence, torsion rod 30 is maintained in fixed rotational relationship with respect to first end 14. Torsion rod 30 also passes through aperture 19 in second end 15 and is rotatably mounted in that aperture by means of nylon bushing 31 which is slipped over the end of torsion rod 30 and which has a flange such that it will not pass completely through aperture 19 (FIG. 2).

Lever 32 is operably connected to torsion rod 30 adjacent second end 15 (FIG. 2). It has a square aperture corresponding roughly to the square cross section of rod 30 and is passed over the end of rod 30, thereby being maintained in fixed rotational relationship with respect thereto (FIG. 2). Located in the end of lever 32 is an adjusting screw 34 (FIGS. 1 and 4).

A chair support member 40a is a rotatably mounted on one end of torsion rod 30 while a comparable support member 40b is designed for rotatable mounting on the other end thereof. Each has a side 41 and a flat top 42 (FIG. 1). Each side 41 has a round aperture defined by a metal bushing 44 which is rigidly secured to side 41 (FIG. 2). A nylon bushing 45 (only partially visible) having a square aperture and being comparable to nylon bushing 31 is fitted over each end of torsion rod 30 with its flange portion to the inside and the metal bushing 44 of a chair support member 40a or 40b is slipped over nylon bushing 45 and rotates thereon. Nylon washers 46 are then slipped over the end of torsion rod 30 and the entire assembly is then locked in place by lock washers 48 which are slipped over the ends of torsion rod 30 and snapped in place in grooves in the ends of rod 30.

Finally, the tops 42 have holes thereon to which a seat can be mounted (FIGS. 1 and 2).

**OPERATION**

As a chair which is mounted on members 40a and 40b is tilted backwards, support members 40a and 40b rotate on the nylon bushings at the ends of torsion rod 30. Support member 40b engages the end of lever 32 or screw 34 and as it tilts backwardly, a force is applied to the end of lever 32. In turn, a rotational force is applied to torsion rod 30 since it and lever 32 are in fixed rotational relativity. One end of torsion rod 30 is free to rotate since it is rotatably mounted in second end 15 of housing 10. The other end, however, is in fixed rotational relationship to first end 14 of housing 10 which in turn is rigidly secured to spindle 2 which will not rotate about a horizontal axis. Thus, torsion rod 30 begins to twist. It is sufficiently flexible that it allows a chair to be tilted backwardly when the person occupying the chair so desires, but it is sufficiently stiff that it resists the tendency of the chair to tilt backwardly on its own or when such tilting is not desired.

The relative ease of difficulty with which a chair can be tilted, i.e., the load or force necessary to cause it to tilt, can be varied by turning adjustment screw 34. By turning the latter upwardly, lever 32 is forced away from support member 40b and an initial torque is applied to torsion rod 30. The farther adjustment screw 34 is turned upwardly, the greater the initial torque implied to torsion rod 30 and the greater the initial force required to tilt a chair rearwardly. The adjustment of screw 34 downwardly results in less initial tension in torsion rod 30.

The rearward tilting of a chair is stopped when support member 40a contacts first end chair stop 20 and when support member 40b contacts the edge housing 10. Second end 15 preferentially does not extend rearwardly of housing member 10 lest it interfere with the action of lever 32. The extent of forward movement of the chair is limited by forward stops 21 which are defined by both first end 14 and second end 15. Support member 40b does not sit squarely over second end 15 as does support member 40a over first end 14 because lever 32 and an additional nylon bushing 31 must be placed on that end of torsion rod 30 which is operably connected to second end 15.

The tendency of housing member 10 to distort or warp is effectively eliminated by a unique distribution of stresses. The rigid securing of spindle 2 to top 11 and bottom 12, these being spaced apart from each other and being rigid with respect to each other, effectively distributes the stress between the two separated members. Furthermore, the stress on each top and bottom member 11 and 12 has been found to be less where those members are spaced farther apart. Of course, there are practical design limitations on the extent to which these two members can be separated. An inch to an inch and a half has been found to be sufficient.

The distribution of stresses is further achieved by rigidly interconnecting top and bottom members 11 and 12 along their longitudinal side edges as well as at their ends. In the preferred embodiment, this is achieved by using a tubular housing member 10, in this case, of rectangular cross section. The side walls 13 of the tubular member 10 act to give rigidity to housing 10 and thereby resist the tendency of housing 10 to distort and warp.

The unique location of torsion rod 30 within housing 10 further acts to distribute stresses therein. In the old torsion bar chair lots of the unitary housing type, the torsion bar is located directly over the mounting of the spindle in the housing such that it intersects the vertical axis of the spindle. By arranging torsion bar 30 such that it does not intersect the vertical axis of spindle 2, less stress is placed on housing 10 in the area where spindle 2 is secured to housing 10. These stresses can be further decreased by further increasing the distance between torsion bar 30 and spindle 10. In the preferred embodiment, torsion rod 30 is indeed set apart from spindle 2 rather than being set such that it abuts spindle 2. As with varying the distances between top and bottom members 11 and 12, there are practical design limitations on the spacing between torsion rod 30 and spindle 2. It has been found that even a spacing of % inches on the perpendicular between torsion rod 30 and spindle 2 reduces the tendency of housing 10 to "oil can," i.e. warp and distort.

The result of this invention is a simple but efficient torsion bar chair iron. It can be easily and economically constructed. Furthermore, it can be of a clean-cut and slim, trim design such that it does not detract from the beauty of the chair on which it is mounted. No bushing or other special structure is required to operably secure the spindle to the torsion bar housing. The offset arrangement of the spindle and torsion bar also facilitates the removal of the spindle for field service purposes since it is more readily accessible than are spindles which are mounted directly below the torsion bar. On the other hand, because of the strength achieved by its design and because of the distribution of stresses
achieved through its unique design, the housing of this torsion bar chair iron will not warp and distort in operation or under the conditions imposed by the Buyers Laboratories, Inc. tests for torsion bar chair irons.

It is understood that the above is merely a preferred embodiment of this invention and that a number of changes and alterations can be made thereof without departing from the broader aspects and spirit of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows.

1. In a chair having a spindle, a torsion bar chair iron comprising: an elongated rigid housing member secured to said chair spindle, said housing member comprising a bottom, a first end and a second end; said spindle being mounted directly to said bottom of said housing member; a torsion bar being mounted in said housing member, offset from the axis of said spindle; said housing member and said torsion bar being of comparable length; said torsion bar passing through said first end of said housing member and being fixed thereto; said torsion bar passing through said second end of said housing member and being rotatable with respect thereto; lever means being operatively connected to said torsion bar and being fixed thereto; chair support means being operably connected to said housing member and being rotatable with respect thereto; said chair support means operably engaging said lever means when said chair is tilted.

2. In a chair having a spindle, a torsion bar chair iron comprising: an elongated rigid housing member secured to said chair spindle, said housing member comprising a top, a bottom, a first end and a second end; said top and bottom having longitudinal side edges; means rigidly interconnecting said side edges; said spindle passing through said housing and being rigidly secured to said top and said bottom; a torsion bar having a first end and a second end being mounted in said housing, and being offset from said spindle passing through said housing; said torsion bar and said housing being of comparable length; said first end of said torsion bar being operably connected to said first end of said housing member and being in fixed rotational relationship thereto; said second end of said torsion bar being operably connected to said second end of said housing member and being rotatable with respect thereto; lever means being operably connected to said torsion bar and being in fixed rotational relationship thereto; chair support means being operably connected to said housing member and being rotatable with respect thereto; said chair support means operably engaging said lever means when said chair is tilted.

3. The chair iron of claim 3 which also comprises said lever being secured to said second end of said torsion bar to the outside of said second end of said housing member.

4. The chair iron of claim 2 wherein said top, bottom and means interconnecting said side edges thereof define a solid wall tubular member, of rectilinear lateral cross section.

5. The chair iron of claim 4 which also comprises: said chair support means being rotatably mounted on said torsion bar.

6. A chair control adapted to be carried by a post for use with an office-type chair utilizing spider arms for carrying a seat and back, the improvement comprising a support body having top and bottom walls integrally interconnected with each other, and end plate fixed to each end of said top and bottom walls, a torsion bar intermediate said top and bottom walls, means for securing said torsion bar adjacent one end in nonrotatable relationship to one of said end plates, means adjacent the other end plate for securing one of said spiders in nonrotatable relationship to said torsion bar adjacent the end of said torsion bar opposite said one end, and a post support member engaging both said top and bottom walls for securing said post along an axis displaced from the axis of said torsion bar to enable said support body to resist stress at two spaced positions adjacent said bar axis.

7. The improvement claimed in claim 6 in which said means securing said torsion bar to said one plate includes a boss on said plate extending along the axis of said bar and defining a passageway having a cross section and dimension corresponding to said bar to prevent rotation of said bar in said passageway.
UNIVERSAL STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,788,586 Dated January 29, 1974

Inventor(s) Donald E. McNally

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 35;
"thereon" should read ---therein---.

Column 6, line 10;
"3" should read ---2---.

Signed and sealed this 9th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR. C. MARSHALL DANN
Attesting Officer Commissioner of Patents