This invention provides a fulcrum mechanism developed primarily as a tiltable support for a chair seat. The nature of this mechanism is such that it can be placed with the pivot axis close enough to the center of gravity of the occupied chair to eliminate the need for return springs. To provide a feeling of security, a brake system is incorporated for restraining the rotation of the seat with respect to the base; and in the preferred form of the invention, the intensity of the braking action is made a function of the degree of tilt.

The invention also provides a footstool moving in conjunction with the chair seat so that the stool and chair together form a support for the various portions of the body in proper relationship over the full range of title of the chair seat.

The several features of the invention will be analyzed in detail through a discussion of the particular embodiments illustrated in the accompanying drawings. In the drawings:

FIGURE 1 is a perspective view of a chair and footstool disconnected from each other.

FIGURE 2 is a perspective view showing the chair in the upright position, and with the footstool connected to it.

FIGURE 3 shows the tilted position of the chair seat, with the top of the footstool following it through the effect of the connection.

FIGURE 4 is a plan view on an enlarged scale showing the preferred form of connection between the footstool and the chair seat.

FIGURE 5 is a side elevation on the scale of FIGURE 4, indicating the connection means of FIGURE 4.

FIGURE 6 is a sectional elevation of the brake unit used in the chair shown in the preceding figures, with the position of the mechanism corresponding to the chair position shown in FIGURES 1 and 2.

FIGURE 7 is a sectional elevation of the mechanism of FIGURE 6 shown in the tilted position.

FIGURE 8 is a top view of the brake unit as shown in FIGURE 7.

FIGURE 9 is a perspective view of the fulcrum unit of the chair shown in FIGURES 6, 7, and 8.

FIGURE 10 is a perspective view of a modified form of the fulcrum mechanism.

FIGURE 11 is a top view of the mechanism shown in FIGURE 9.

FIGURE 12 is a sectional elevation through the mechanism shown in FIGURE 9, with the device in a position corresponding to the upright position of the chair.

Referring to FIGURES 1–5, the chair generally indicated at 20 includes a seat 21 and a base 22. The fulcrum brake mechanism 23 is mounted at the junction of the structural members 24 and 25 of the base 22.

The members 24 and 25 are disposed in planes approximately 90° apart, with the mechanism 23 located in the sector between them. The footstool generally indicated at 26 has a top 27 hinged to the base 28 somewhat to the left of the center of the base 28 as shown in the drawings. The underside of the top 27, at the underside, is equipped with the ring fitting 29 engageable with the hook 30 secured to the underside of the seat 20 at the front. Tilting of the seat 20 backward from the erect position (shown in FIGURE 2) to the tilted position shown in FIGURE 3 will cause the top 27 of the footstool to follow the movement of the seat, and provide a support for the legs of the occupant of the chair in a position appropriate to the position of the seat. The top of the footstool will thus follow the chair movement as long as it remains connected as shown in FIGURES 2 and 3. It may be disconnected as shown in FIGURE 1 either when the presence of the footstool is not desired by the occupant of the chair, or when it is preferable to have the stool placed in some position out of the way.

Referring to FIGURES 6, 7, 8, and 9, the fulcrum brake device 23 includes a base member 31 formed by a sheet metal structure providing a support for the block 32 carrying the layer of bearing material 33. The block 32, and consequently the layer of material 33, are curved to provide a bearing surface 34 which has a center of curvature displaced from the axis of the pivot connection of the seat 21 to the base 22.

The sheet metal frame structure 31 appears most clearly in FIGURE 9. Opposite side portions are formed by the normally vertical panels 35 and 36 which are joined, respectively, to the parallel horizontal panels 37–38 and 39–40.

This arrangement produces a U-shaped configuration on each side that is connected to the central plate 41 by screws or rivets 42–43 engaging tabs as shown at 44 bent from the material of the horizontal panels. The two side portions meet at the apex 45, which makes it possible for the entire assembly (with the exception of the central plate 41) to be blanked out from a single piece of sheet steel. The triangular configuration lends itself particularly well to mounting in the sector between the intersecting structural members 24 and 25 of the base shown in FIGURE 1. Holes in the position shown at 46 and 47 (and at corresponding positions on the opposite side of the sheet metal structure) may be provided to receive fastenings engaging the members 24 and 25.

The block 32 may be of wood or any other convenient material, and is preferably notched out to fit over the central plate 41 as a means of locating the block with respect to the sheet metal framework. A pair of guide plates 48 and 49 are arranged in parallel relationship, and secured in any convenient manner to the opposite sides of the block 32. Preferably, the guide plates have their edges notched to receive the plate 41 in the same arrangement as the block 32. The plates 48 and 49 receive between them the portion 50 of the shoe 51 which bears against the surface 34 in sliding relationship. The presence of the plates 48 and 49 prevents rotation of the shoe 51 about the axis of the cylindrical plunger portion 52 received in a corresponding bore 53 in the block 54. This latter block is a portion of the member which is pivotally mounted with respect to the base, and tilting movement will result in a generally vertical movement of the block 54 into and out of the space between the horizontal panels 37–38 and 39–40.

The bearing portion 50 of the shoe 51 is preferably of bronze, or some similar material, and has a circular recess receiving the end of the tubular plunger portion 52. The confinement of the bearing member 50 between the side plates 48 and 49, and the engagement with the end of the plunger 52, completely confines the bearing member in the assembly. A spring 55 is received within the bore of the socket portion 52, and biases the bearing member 50 against the surface 34. The block 54 is preferably provided with holes for receiving screws 56 engaging the mounting plate 57 secured to the underside of the seat 21 by the screws 58 and 59. The position of the holes receiving the screws 56 may be selected so that the bore 53 provides access to the heads of the screws for installation.
The movement of the device from the position shown in FIGURE 6 to that of FIGURE 7 involves a movement of the plunger portion 52 within the bore 53, as a result of the displacement of the center curvature of the surface 34 from the axis of the pivotal mounting of the seat 21 on the base 22. This pivot mounting is established by conventional hinges (not shown). The extended position of the plunger portion in FIGURE 7 will produce less load on the coiled compression spring 55, resulting in less pressure of the bearing member 50 against the surface 34. This results in a decreased breaking action, and a greater freedom of pivot movement of the seat with respect to the base. As the occupant of the seat shifts his weight slightly forward to move the seat into the erect position of FIGURE 2, the fulcrum assembly will progressively approach the condition shown in FIGURE 6, in which the increased compression of the spring 55 will produce an increased breaking action, and a tendency to cushion and remove the inertia of the forward tilting movement of the chair.

It is preferable to include a stop arrangement limiting the rearward tilting movement of the chair, and this can be easily accomplished through incorporating the members on opposite sides of the block 54, which may be secured by screws as shown at 61. The members 60 each have an out-turned L-shaped end 60a at the lower extremity which engages the underside of the panel 37 or 39 to provide a stop against further tilting movement. The particular degree of tilt which is permissible can be predetermined by the appropriate location of the screws 61.

The modified form of the invention shown in FIGURES 10, 11, 12, and 13 provides a unitary structure in which the hinge connection of the seat to the base is incorporated in the members 72 of the brake unit. This unit is illustrated in perspective in FIGURE 10, and is preferably of a generally rectangular configuration. The plate 63 is hinged to the base frame 62 at 64, and the seat of a chair is attached to the plate 63 by fastenings traversing the holes 65-67. Normally, the base structure of the chair will be secured to the frame 62 by appropriate fastenings engaging holes such as those shown at 68-71, clamped with the FIGURE 10 unit is the same in principle as that discussed in connection with FIGURES 7 and 8.

This mechanism is indicated in FIGURES 11, 12, and 13, and differs primarily in the inclusion of a pair of portions 72 positioned forming a somewhat larger bearing member 74, which eliminates the need for the guide plates 48 and 49 shown in FIGURE 6. The presence of the two plunger portions engaging the bearing member 74 serves to eliminate the possibility of rotation of the bearing member. The other function of this pair of plunger portions is similar to that of the individual plunger portion 52. The block 75 is provided with the bores 76 and 77, and the plunger portions 72 and 73 are biased by the springs 78 and 79. Screws 80 and 81 secure the block 75 to the plate 63, with the threaded grooves 82 and 83 being incorporated to increase the available threaded engagement for the screws 80 and 81. The block 84 is preferably notched over the front plate 85 in the same manner as previously described, and the bearing material 86 (together with the block 84) is curved to provide a preferably cylindrical surface having a center of curvature disposed approximately as shown in FIGURE 12, which is displaced from the axis of the hinge 64. Limit stops as shown at 86 in FIGURE 10 (functioning identically to the stops 60 of FIGURE 9) may be incorporated, and secured to the block 75 by screws 87 to determine the limit position of tilt as may be desired for the particular article of furniture.

The particular embodiments of the present invention which have been illustrated and discussed herein are for illustrative purposes only, and are not to be considered as a limitation upon the scope of the appended claims. In these claims, it is my intent to claim the entire invention disclosed herein, except as I am limited by the prior art.

I claim:

1. A fulcrum assembly, comprising:
a base member;
a tilt member having a hinged connection to said base member on a normally horizontal axis;
means fixed with respect to one of said members, and
forming a bearing surface;
a shoe mounted in the other of said members for movement transverse to said bearing surface and to said axis, said shoe and bearing surface being so disposed that said shoe moves across said bearing surface on pivoting of said tilt member about the hinged connection thereof; and
biasing means urging said shoe member toward said bearing surface.

2. An assembly as defined in claim 1, wherein said bearing surface is arcuate, having a center of curvature displaced from the axis of the hinge connection of said tilt member.

3. An assembly as defined in claim 1, wherein said means forming a bearing surface is fixed with respect to said base.

4. An assembly as defined in claim 1, wherein said tilt member includes means forming a guidingway extending transversely to said bearing surface, and said shoe has a portion slidably received in said guidingway.

5. An assembly as defined in claim 4, wherein said biasing means is a coiled compression spring disposed within said guidingway and received within a bore in said shoe portion.

6. An assembly as defined in claim 4, wherein said base includes a box-like structure receiving therein at least portions of said shoe and guidingway means.

7. An assembly as defined in claim 1, wherein said shoe moves outward with respect to the axis of the hinged connection of said tilt member as said tilt member pivots from a substantially horizontal position.

8. An assembly as defined in claim 1, wherein said tilt member is fixed with respect to a chair seat.

9. An assembly as defined in claim 8, wherein said base includes intersecting structural members, and said means forming a bearing surface is disposed in a sector between said structural members.

10. An assembly as defined in claim 6, wherein said tilt member includes a plate hinged to said box-like structure, and normally secured to the underside of the seat of a chair.

11. In combination with a chair having a base and a seat portion tiltably mounted on said base, a footstool device comprising:
a footstool base; a footstool top pivotally mounted on said footstool base at a point thereon remote from said chair for rotation on a normally horizontal axis; and
disengageable connection means on the front of said seat portion and on said footstool top, respectively, whereby vertical movement of the front of said seat is communicated to the adjacent portion of said footstool top to produce corresponding vertical movement of said adjacent portion.

12. A footstool device as defined in claim 11, wherein said connection means is a loop and a hook.

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