

[54] BACKREST HEIGHT ADJUSTMENT
DEVICE FOR OFFICE FURNITURE CHAIRS

[75] Inventors: Dean W. Abrahamson, Aurora;
James W. Lannert, Oswego, both of
Ill.
[73] Assignee: All-Steel Inc., Aurora, Ill.
[22] Filed: May 25, 1973
[21] Appl. No.: 364,101

[52] U.S. Cl. 297/353, 403/106
[51] Int. Cl. A47c 1/00
[58] Field of Search 297/296-298,
297/353, 374, 376, 383, 406, 407, 410, 437,
345; 248/157, 161, 295, 412; 403/106, 109,
110, 350

[56] References Cited

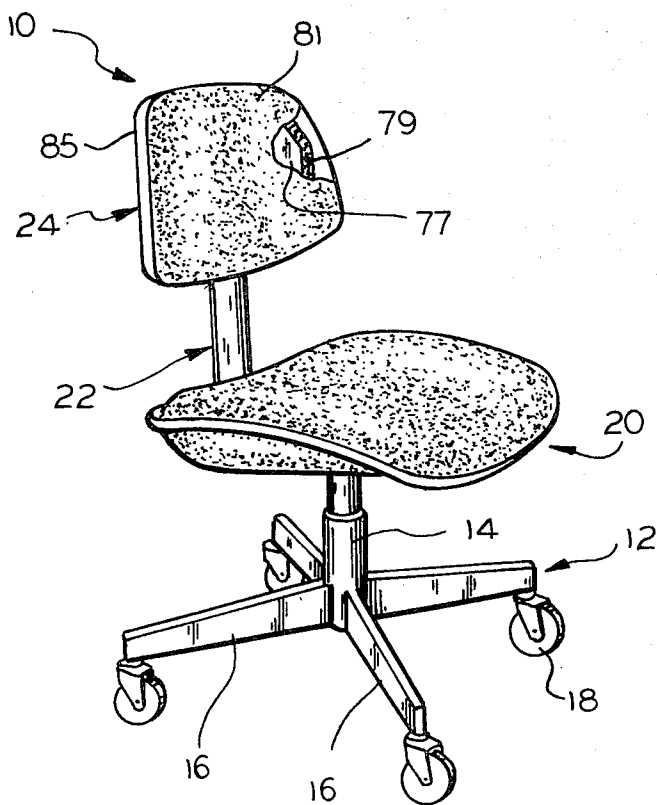
UNITED STATES PATENTS			
320,806	6/1885	Long	297/374
2,397,382	3/1946	Smith	403/350
3,145,053	8/1964	Thompson et al.	297/383

Primary Examiner—James C. Mitchell
Attorney, Agent, or Firm—Mann, Brown, McWilliams
& Bradway

[57] ABSTRACT

A backrest height adjustment device for office furniture chairs of the posture type in which the backrest is applied to a housing that forms a socket which freely receives the backrest support member that is conventionally secured to the chair seat, which housing journals a cam lock member that is received in the socket and operates with a vertical slot formed in the support member and about an axis extending transversely of the support member. The cam lock member includes a pair of oppositely disposed cam lock portions that are proportioned to make equal but opposite binding engagement with the respective sides of the slot to fix the backrest against vertical movement; such cam surface portions that have a slip fit relation with the slot sides when the cam lock surfaces are free of such slot sides, to permit height adjustment of the backrest. The housing also mounts a guide bushing received in the housing socket end cooperating with a second vertical slot in the support member to confine the movement of the backrest to up and down movement relative to its support.

8 Claims, 8 Drawing Figures



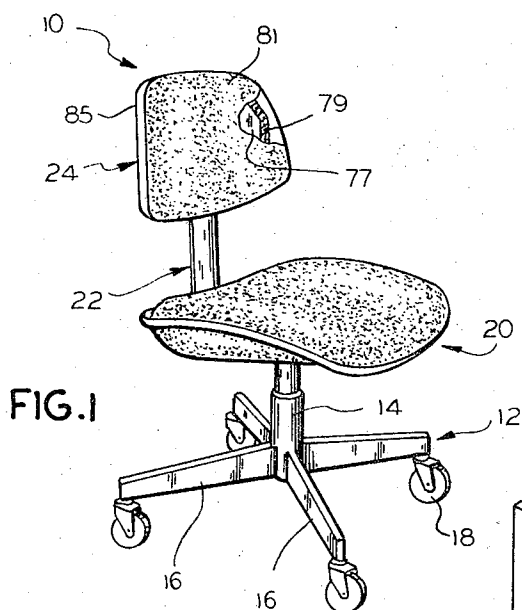
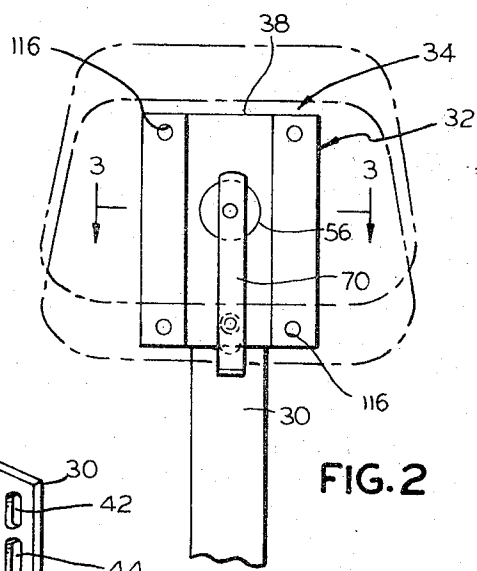
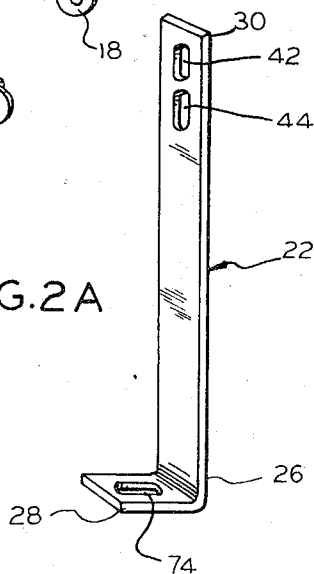
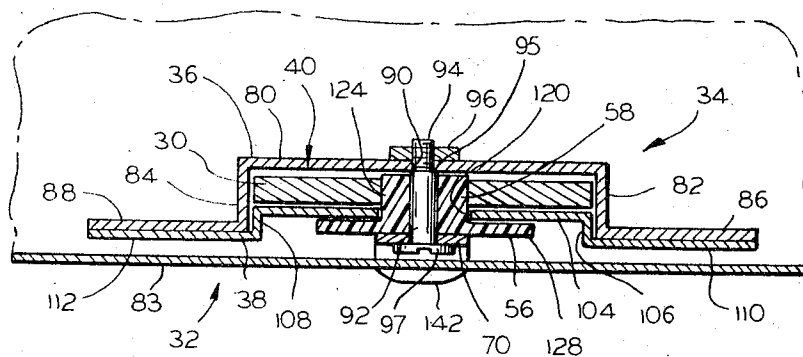


FIG. 2A



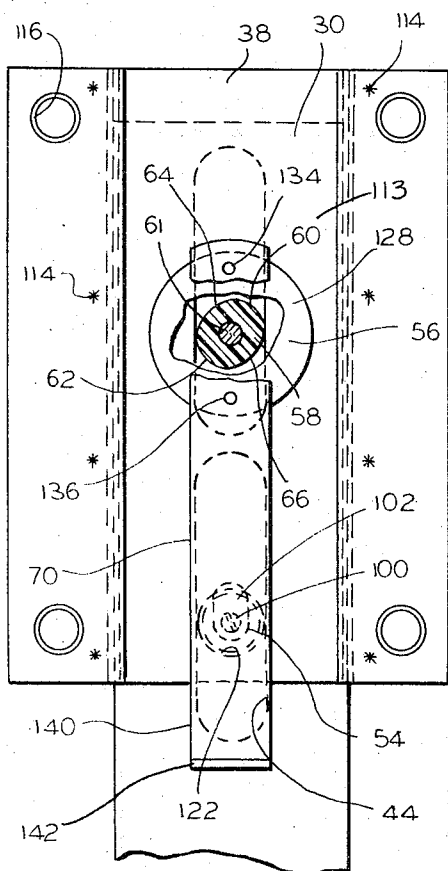


FIG. 4

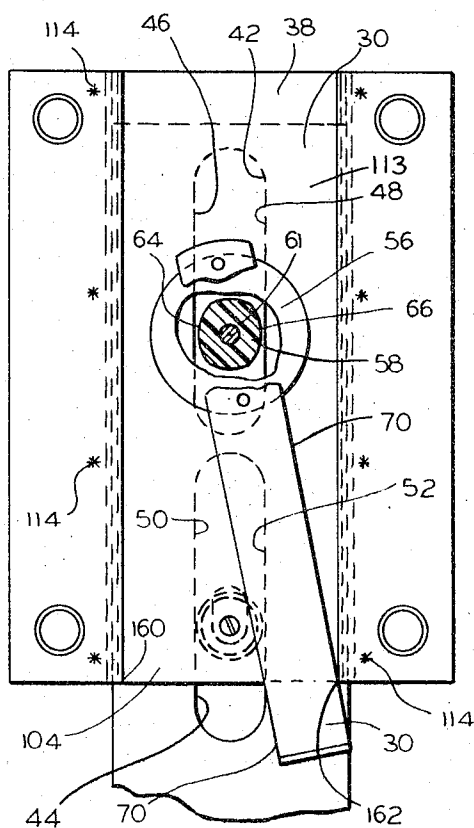


FIG. 5

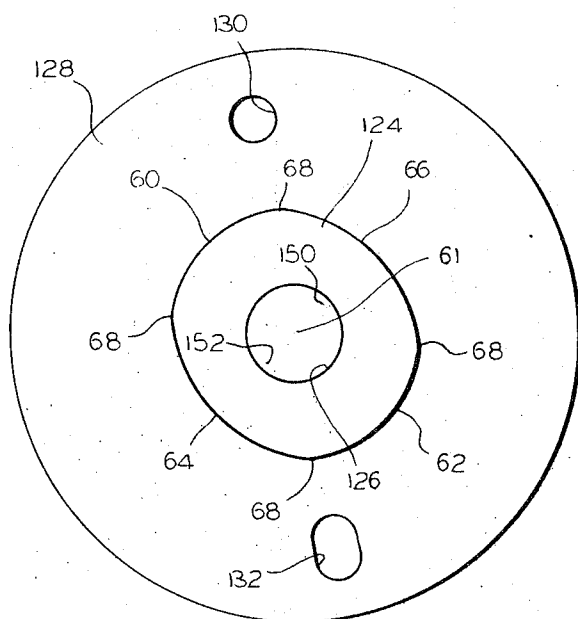


FIG. 6

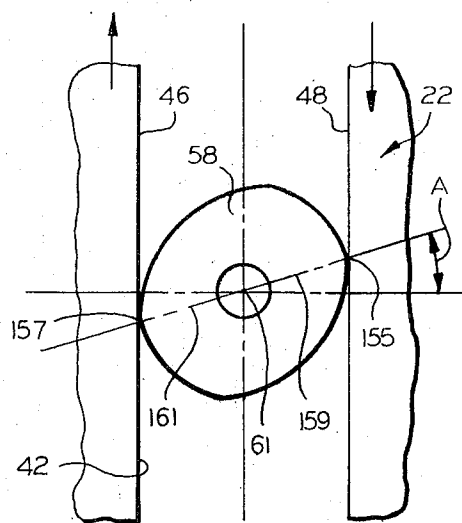


FIG. 7

BACKREST HEIGHT ADJUSTMENT DEVICE FOR OFFICE FURNITURE CHAIRS

This invention relates to a backrest height adjustment arrangement for posture chairs, and more particularly, to an arrangement for mounting the backrest on its support that permits ready height adjustment relative to the chair seat.

The prior art dealing with backrest height adjustments reveals a wide variety of devices of this type, many of which are concerned with some type of clamping arrangement either at the connection of the backrest to its support, or the connection of the support to the chair chassis, to permit height adjustment and sometimes lateral adjustment forwardly and rearwardly of the user. In devices of this type, the familiar screw clamp or over center cam lock lever type device usually provides the clamping action for binding several relatively movable parts together that, when released, permit the height adjustment desired.

A principal object of the present invention is to provide a backrest adjustment arrangement that avoids the clamping approach of the prior art, and uses instead a simple cam lock device that confines the locking stress to the backrest support.

Another principal object of the invention is to provide a backrest adjustment arrangement that not only provides a firm securement of the backrest support, but also is readily loosened for adjustment purposes without leaving the seat and provides for infinite or stepless adjustment within the range of adjustment allowed.

Other objects of the invention are to provide a backrest adjustment arrangement that is of few and simple parts, that is economical of manufacture, and that is reliable and long lived in use.

In accordance with this invention, the backrest height adjustment device comprises a housing to which the backrest is secured that defines a socket that freely receives the backrest support member, which is in the form of a bar suitably mounted in upright relation on the chair chassis. The support member is formed with a pair of rectilinear vertically spaced and vertically extending slots, with the portion of the support member defining such slots being received in the housing socket. The housing journals a cam lock member that is received in the socket and operates within the upper vertical slot and about an axis extending transversely of the support member. The cam lock member includes a pair of oppositely disposed cam lock portions that are concentric with said operating axis and are proportioned to make equal but opposite binding engagement with the respective sides of the upper slot to fix the backrest against movement, with such cam lock surface portions being separated by a pair of opposed surface portions that have a slip fit relation with the upper slot sides when the cam lock surfaces are free of such sides, to permit height adjustment of the backrest. The housing also mounts a guide bushing that is received in the housing socket and cooperates with the second slot to confine movement of the backrest relative to its support member to up and down movement when adjustment is desired.

The result is that the locking action desired is applied to the backrest support to the exclusion of the device housing and no clamping together of relatively movable parts is required.

Other objects, uses, and advantages will be obvious or become apparent from a consideration of the following detailed description and the application drawings.

In the drawings:

FIG. 1 is a perspective view of a posture chair of the secretarial type to which the invention is applied;

FIG. 2 is a rear view of the backrest support showing the height adjustment device in elevation and the backrest in phantom;

FIG. 2A is a perspective view of the backrest support;

FIG. 3 is a sectional view through the height adjustment mechanism taken substantially along line 3—3 of FIG. 2;

FIG. 4 is a view of the height adjustment mechanism similar to that of FIG. 2 but on an enlarged scale and with parts broken away showing the device in locked position;

FIG. 5 is similar to that of FIG. 4 but showing the device in its released position;

FIG. 6 is a plan view of the cam lock component employed in connection with the present invention, on an enlarged scale; and

FIG. 7 is a diagram of the cam lock device on an enlarged scale bringing out basic features of the invention.

However, it is to be understood that the drawing illustrations provided are supplied primarily to comply with the requirements of the Patent Laws, and that the invention may have other embodiments which will be obvious to those skilled in the art, and which are intended to be covered by the appended claims.

GENERAL DESCRIPTION

Reference numeral 10 of FIG. 1 generally indicates a posture chair of the type to which the invention is especially concerned, that shown being of the secretarial type (although the invention is equally applicable to executive and other types of posture chairs). Chair 10 generally comprises a suitable base 12 equipped with the usual pedestal 14 provided with legs 16 riding on suitable casters 18. Suitably mounted on the pedestal 14 is a chair seat 20 that may be of any conventional type, and that is equipped with backrest support 22 to which backrest 24 is applied in accordance with this invention.

The support 22 has its lower end 26 angled as at 28 for adjustable securement to the chair seat 20 in any suitable manner.

The backrest 24 is applied to the upper end 30 of the support 22 by employing height adjustment device 32 to which the backrest 24 is suitably secured.

The height adjustment device 32 generally comprises a housing 34 in the form of a pair of channel members 36 and 38 associated in nested relation to define a socket 40 (see FIG. 3) into which extends the upper end 30 of the backrest support member 22.

The backrest support member 22 at its upper end 30 is formed with a pair of rectilinear slots 42 and 44 that are in aligned vertically disposed and vertically spaced relation, with the slots 42 and 44 being identical in configuration and length. Slot 42 defines opposed planar side walls 46 and 48 while slot 44 defines opposed planar side walls 50 and 52.

The housing 34 journals a bushing 54 which is received in the socket 40 and is disposed in guiding relation in the slot 44 between its side walls 50 and 52.

The housing 34 also journals cam lock member 56 that includes a cam lock portion 58 received in the socket 40 and extending through slot 42 for operative cooperation with the side walls 46 and 48 of the slot 42.

The cam lock member 56 is journaled in the housing 34 for pivotal movement about axis 61 that extends transversely of the housing 34 and backrest support member 22. The cam lock portion 58 comprises a pair of opposed cam lock surfaces 60 and 62 that are concentric with the axis 61 and are each struck on an arc that proportions opposite portions of the cam lock portion 58 to make equal but opposite binding engagement with the respective slot sides 46 and 48 of the slot 42 to lock the backrest against vertical movement relative to the support 22. In the form shown, cam lock surfaces 60 and 62 are separated by surfaces 64 and 66 that are struck on arcs which proportion the corresponding areas of cam lock portion 58 between surfaces 60 and 62 to have slip fit relation with respect to the sides 46 and 48 of the slot 42 when the cam lock member 56 is positioned to dispose surfaces 60 and 62 out of engagement with slot side walls 46 and 48, respectively (see FIG. 5). The surfaces 60, 62, 64 and 66 are contoured to merge consecutively about cam lock portion 58 where indicated at cam surface portions 68 (see FIG. 6) in a smoothly contoured manner.

Cam lock member 56 has operating handle 70 keyed thereto for pivoting the cam lock member 56 between the positions of FIGS. 4 and 5, it being understood that the handle 70 when pivoted clockwise of FIG. 5 will lock the device 22 against adjustment.

The arrangement is such that when handle 70 is moved clockwise of FIG. 5 toward the position of FIG. 4, the cam lock portion 58 at approximately the locations of cam surface portions 68 makes equal but opposite binding engagement with the respective sides 46 and 48 of the slot 42 to lock the backrest against vertical movement.

It will thus be seen that when the handle 70 of device 32 is in the position of FIG. 5, the backrest 24 may be suitably adjusted vertically of the support member 22 to the position desired by the user of the chair, and by the user moving the arm 70 clockwise of FIG. 5 sufficiently to bring the cam lock portion 58 into binding engagement with the respective sides 46 and the slot 42, the device 32 is fixed against vertical movement relative to its support 22.

SPECIFIC DESCRIPTION

The support member 22 is suitably formed from bar stock to define the general shape included in the drawings, including angled lower end 26 that is slotted as at 74 for application to the chair seat chassis in any suitable manner that may provide for adjustment of support member 22 forwardly and rearwardly of the chair. Slots 42 and 44 are formed in any suitable manner, as by punching.

As the backrest 24 per se is conventional, it is only diagrammatically illustrated. In practice it comprises a polystyrene backing plate 77 (see FIG. 1) to which suitable cushion material 79 and a decorative cover 81 are suitably applied over the forward side of same, and an outer back shell 83 of plastic material on the backside

of the backing plate that masks the housing 34; the backing plate 77 and shell 83 are suitably secured together as by employing fasteners about their marginal edges that are masked by molding 85.

The housing member 36 comprises web 80 separating spaced side walls 82 and 84 (see FIG. 3), with the side walls 82 and 84 respectively being provided with the respective wing flanges 86 and 88. The web 80 of channel member 36 is formed with opening 90 that receives mounting screw 92 which journals cam lock member 56 in housing 34, as by having its threaded end 94 applied to suitable conventional weld nut 96 affixed to the web 80 exteriorly of the socket 40, such that its shoulder 95 is firmly against web 80, and its head 97 engages handle 70.

The web 80 is also formed with a second opening (not shown) spaced longitudinally of member 22 through which screw 100 extends for application to a second weld nut 102 (see FIGS. 4 and 5) affixed to the web 80 exteriorly of the socket 40 and below the weld nut 96.

The housing member 38 comprises web 104 separating spaced side walls 106 and 108 (see FIG. 3) that are respectively equipped with the respective wing flanges 110 and 112. As indicated in FIG. 3, the channel member 38 is nested within the channel member 36 to define the socket 40 as well as operating channel 113 within which handle 70 acts, and these two members 36 and 38 are suitably fixed together, as by spot welding at 114 (see FIGS. 4 and 5). The wing flanges of the channel members 36 and 38 are suitably formed with aligned openings 116 to receive suitable fasteners for securing the housing 34 to the aforementioned backing plate 77 of the backrest 24.

The web 104 of member 38 is formed with opening 120 through which extends the cam lock portion 58 of cam lock member 56. The web 104 is formed with a second opening 122 through which the bushing 54 is applied within the socket 40 and slot 44.

The cam lock member in the form illustrated is of hub configuration comprising sleeve portion 124 defining bore 126 through which the journalling screw 92 extends, and the respective surfaces 60, 62, 64 and 66. Integral with sleeve portion 124 is flange portion 128 defining a pair of spaced apart openings 130 and 132 which respectively receive pins 134 and 136 that are fixedly carried by handle 70. Handle 70 is secured to the flange 128 by the screw 92 to keep the pins 134 and 136 seated in their respective openings 130 and 132.

As indicated in FIG. 3, the flange 128 of the cam lock member 56 is proportioned from the standpoint of thickness to dispose the operating plane of the handle 70 within its operating channel 113, and thus substantially in the plane of the wing flanges 110 and 112 of channel member 38.

Handle 70 at its end 140 is formed with right angled projection 142 that projects rearwardly of the backrest 24 and beneath but closely adjacent the portion of the molding 85 that lies along the lower edge of the backrest, for easy gripping by the user when seated in the chair, and also to provide a handle for the chair user to hold up and move vertically the backrest when the cam lock member 56 is freed from binding engagement with support member 22.

The support 22 is preferably formed from a suitable steel such as SAE 1018, while cam lock member 56 is formed from a suitable composition of powdered

metal, such as steel, having a hardness of 25 to 35 Rockwell C. In one successful form of the invention, the slots 42 and 44 are .620 inch in width and have sufficient length to permit approximately 2 inches of vertical height adjustment. Cam lock surfaces 60 and 62 are struck on arcs concentric with the axis 61 and have a dimension of 0.320 inch. Surfaces 64 and 66 are struck on arcs about centers 150 and 152 that are offset from axis 61 and have a radius longer than the radius of surfaces 60 and 62. Thus, arc 64 is struck on an arc about center 150 and having a radius of 0.406 inch, while surface 66 is struck on an arc about center 152 having the same radius.

An important aspect of the invention is that cam lock portion 58 should be proportioned radially thereof relative to the width of slot 42 such that when the cam lock portion 58 is being moved to locking relation with the sides of slot 42, the cam lock portion 58 makes engagement with the respective slot surfaces 46 and 48 at positions where the cam contact points 155 and 157 (FIG. 7) involved lie along radii 159 and 161 from axis 61 that make angles with respect to the horizontal having a tangent which is less than the coefficient of static friction between the slot and cam surfaces involved.

In other words, the angle A should be such that its tangent is less than the coefficient of static friction between cam lock portion 58 and slot surfaces 46 and 48. Where cam lock portion 58 and support 22 are formed from steel, angle A should be a maximum of 8°. In this connection it is dry or unlubricated static friction that governs as any lubricant on the surfaces involved would be squeezed out under the application forces involved.

Thus, cam lock portion 58 makes contact with surfaces 46 and 48 at or adjacent cam surface portions 68, depending on the state of wear of cam lock portion 58, to effect the binding locking action contemplated by this invention.

It is understood, of course, that the usual manufacturing tolerances are permitted, and, of course, specific dimensions employed may be varied to suit special purposes, it only being important that the cam lock portion 58 and slot surfaces 46 and 48 have the relationships indicated, and the surfaces 64 and 66 permit ready slip fit relation between the cam lock member 56 and the sides 46 and 48 of slot 42 when the cam lock portion 58 is moved out of engagement therewith. The concentric relation of the cam surfaces 60 and 62 is a convenient way of forming these surfaces for the purpose intended.

Bushing 54 may be formed from a suitable antifriction material such as nylon and is proportioned to have slip fit relation with side walls 50 and 52 of slot 44. In the embodiment referred to above, the bushing 54 has an outer diameter of 0.618 inch.

To operate the device 32, the chair user, when seated in the chair 10, merely reaches around to the backside of the support 22 at the level of the lower edge of backrest 24 to grasp handle 70, and in particular its rearwardly projecting end portion 142, and swings handle 70 to its released position of FIG. 5 to free cam lock member 56 from binding engagement with the sides 46 and 48 of slot 42. The backrest may then be freely moved vertically as desired and relocked at the desired position by swinging handle 70 clockwise of FIG. 5 to approximately the position of FIG. 4 to bring cam lock portion 58 into equal but opposite binding engagement

relation with slot side walls 46 and 48 that effects the backrest locking action of this invention. Thus, handle 70 is approximately vertically disposed in the locked relation of device 32. Any wearing of surfaces 60 and 62 will result in additional movement to the left of FIG. 4 to achieve the locking action desired.

As it is desired that the handle 70 be an unobstructive as reasonably possible, handle 70 is confined in its movement to channel 113, and its range of swinging movement limited by such channel 113 so that projection 142 may be disposed closely adjacent the lower margin of molding 85. The corners 160 and 162 of housing 34 serves as stops that form the ultimate limits of the permissible range of movement of handle 70.

While the arrangement of handle 70 and cam lock member 56 that is shown is preferred (single locking direction operation), handle 70 can be keyed relative to cam lock member 56 so as to be vertically disposed in the released position of same, whereby handle 70 could be swung clockwise or counterclockwise to effect the locking action desired. Handle 70 may also be suitably spring biased to its locking position.

It will therefore be seen that in accordance with this invention, the backrest 24 is secured relative to its support 22 by a lock device which involves no clamping together of relatively movable parts, but rather the binding of a cam member with opposed sides of an operating slot in an equal but opposite manner whereby the parts subjected to stress are limited to the cam lock member and the support 22, to the exclusion of housing 34. The cam lock member 56 is readily moved into and out of its locking relation to permit ready height adjustment of the backrest. The positioning of handle 70 is such that the chair user can readily reach and operate same without rising from his seat.

It is also to be noted that within the range of height adjustment permitted, stepless or infinite positioning is available. There are no set locations or fixed series of height adjustment locations to contend with. The device 32 is generally flat in configuration with its thickness dimension minimized to be consistent with the slim trim overall appearance of the backrest and its support.

The foregoing description and the drawings are given merely to explain and illustrate the invention and the invention is not to be limited thereto, except insofar as the appended claims are so limited, since those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

We claim:

1. In a backrest for office chairs including a support member having its lower end adapted for securement to the chair and a backrest mounted on the upper end of the support member, a device for adjusting the backrest vertically of said support member, said device comprising:

a housing positioned on said support member adjacent the upper end thereof for movement vertically thereof and having the backrest secured thereto, said support member upper end having an elongated slot formed therein, said slot extending longitudinally of said support member and being rectilinear in longitudinal configuration, said slot defining spaced parallel sidewalls extending longitudinally of said support member,

and a cam lock member journaled in said housing, said cam lock member being journaled for pivotal movement about an axis extending transversely of said support member and said slot and defining a cam lock portion concentric with said axis and received in said slot,

said cam lock portion defining a pair of oppositely disposed cam locking surfaces proportioned transversely of said axis to have equal but opposite binding engagement with said slot side walls within said slot when in contact therewith at points lying on radii extending from said axis that make an angle with the horizontal having a tangent that is less than the coefficient of static friction between said cam lock portion and said slot side walls,

said cam locking surfaces being separated by opposed cam surfaces proportioned transversely of said axis to have slip fit relation with said slot side walls whereby the backrest has free sliding adjustment relative to the support member when said cam locking surfaces are out of contact with said support member slot side walls,

means for selectively pivoting said cam lock member about said axis relative to said housing, and means for guiding the movement of said housing longitudinally of said slot when said cam locking surfaces are free of binding engagement with said slot side walls.

2. In a backrest for office chairs including a support member having its lower end adapted for securement to the chair and a backrest mounted on the upper end of the support member, a device for adjusting the backrest vertically of said support member, said device comprising:

a housing positioned on said support adjacent the upper end thereof for movement vertically thereof and having the backrest secured thereto, said support member upper end having a pair of elongated slots formed therein in coplanar relation, said slots extending longitudinally of said support member in vertically spaced relation and being rectilinear in longitudinal configuration, a bushing mounted in said housing and received in one of said slots in backrest movement guiding relation therewith,

and a cam lock member journaled in said housing, said cam lock member being journaled for pivotal movement about an axis extending transversely of said support member and defining a cam lock portion concentric with said axis and received in the other of said slots,

said other slot defining spaced parallel side walls extending longitudinally of said support member, said cam lock portion defining a pair of oppositely disposed cam locking surfaces and proportioned to make equal but opposite binding engagement with said other slot side walls when in contact therewith at points lying on radii extending from said axis that make an angle with the horizontal having a tangent that is less than the coefficient of static friction between said cam lock portion locking surfaces and said other slot side walls,

said cam locking surfaces being separated by a pair of opposed cam portion surfaces having slip fit relation with said other slot side walls when said cam locking surfaces are free of contact with said other slot side walls,

and means for pivoting said cam lock member about said axis relative to said housing to selectively move said cam locking surfaces into and out of engagement with said other slot side walls,

whereby said cam lock portion cam locking surfaces when in binding engagement with said other slot side walls fix the backrest against movement longitudinally of said support member slots free of clamping stress applied to said housing.

3. In a backrest for office chairs including a support member having its lower end adapted for securement to the chair and a backrest mounted on the upper end of the support member, a device for adjusting the backrest vertically of said support member, said device comprising:

a housing positioned on said support member adjacent the upper end thereof and having the backrest secured thereto,

said housing comprising:

a pair of housing members secured together to define between same a socket in which said upper end of said support member is received,

said support member upper end having a pair of elongated rectilinear slots formed therein disposed in coplanar relation,

said slots extending longitudinally of said support member and each defining parallel planar side walls extending longitudinally of said support member,

a bushing carried by said housing and mounted within said socket and in one of said slots in backrest movement guiding relation with said one slot,

and a cam lock member mounted in said housing, said cam lock member being journaled between said housing members for pivotal movement about an axis extending through said other slot and transversely of said support member, and defining a cam lock portion concentric with said axis and disposed in said socket and said other slot,

said cam lock portion defining a pair of oppositely disposed cam locking surfaces proportioned radially of said axis to make equal but opposite binding engagement with said other slot side walls, respectively, when moved into contact therewith at points lying on radii extending from said axis that make an angle with the horizontal having a tangent that is less than the coefficient of static friction between said cam locking surfaces and said other slot side walls,

said cam locking surfaces being separated by a pair of oppositely disposed cam surface portions having slip fit relation with said other slot side walls when said cam locking surfaces are free of contact with said other slot side walls,

and a handle member keyed to said cam lock member for pivoting said cam lock member about said axis relative to said housing to move said cam locking surfaces into and out of said binding engagement with said other slot side walls,

whereby said cam lock portion cam locking surfaces when in binding engagement with said other slot side walls fix the backrest against movement longitudinally of said support member slots free of clamping stress applied to said housing.

4. The device set forth in claim 3 wherein:

9

said cam locking surfaces and said other slot side walls are formed from steel, and wherein said angle is no more than about 8°.

5. The device set forth in claim 4 wherein: said support is formed from steel, and said cam lock portion is formed from powdered metal and has a hardness in the range of 25 – 35 Rockwell C.

6. The device set forth in claim 3 wherein: said slots are aligned longitudinally of said support member.

7. The device set forth in claim 4 wherein said slip fit cam surface portions of said cam lock portion are struck on arcs eccentric with said axis and having a radius exceeding that of said cam locking surfaces, with said slip fit cam surface portions smoothly connecting said cam locking surfaces.

8. The device set forth in claim 3 wherein:

10

said housing members are each of channel configuration defining side flanges separated by a web, said housing members being in nesting relation with their webs separated to define said socket therebetween,

with one of said housing members being received within the other of said housing members to provide said nesting relation,

and with the other of said housing members having the backrest applied thereto,

said cam lock member including a flange exterior of said housing and concentric with said axis and positioned within said inner housing member,

said handle member being keyed to said flange for swinging movement in a plane exterior of said housing.

* * * * *

20

25

30

35

40

45

50

55

60

65

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,854,772 Dated December 17, 1974

Inventor(s) Dean W. Abrahamson and James W. Lannert

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 49, "46 and the slot" should read --46 and 48 of the slot--; Column 5, line 68, "opposite binding" should read --opposite and opposing binding--; Column 6, line 7, "an unobstructive" should read --an unobtrusive--.

Signed and sealed this 1st day of April 1975.

(SEAL)

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks