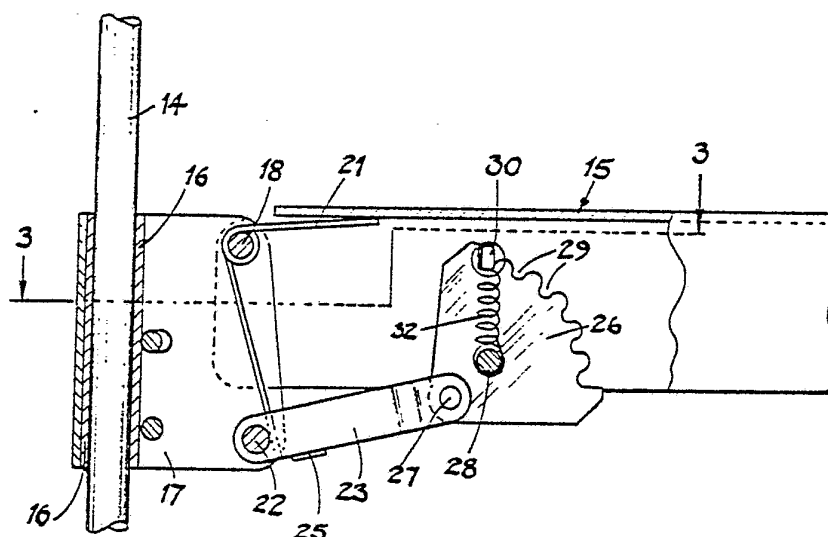




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(54) Title: TILTING MECHANISM FOR A CHAIR**(57) Abstract**

A tilting mechanism for a chair comprises two parts (15, 17), for connection to the chair seat (12) and chair back (13, 14) respectively, pivotally connected together for relative pivotal movement about a horizontal pivot (18), the parts being connected together by a pair of links (23, 24) pivotally connected to one of the parts (17) and also pivotally connected to a member (26) pivotally mounted on the other part (15) and formed with an arcuate row of teeth or recesses (29). A releasable stop bar (30) is provided for engagement in a selectable one of the recesses (29) in the pivotable member to lock it in a required position, so as to determine the relative angular position of the two parts of the mechanism and thus the degree of tilt of the chair back.

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"TILTING MECHANISM FOR A CHAIR"

This invention relates to tilting mechanisms for chairs, of a kind comprising two parts, for connection, in use, to the chair seat and chair back respectively, said two parts being pivotally connected together for relative pivotal movement about a horizontal axis, means being provided for securing the two parts of the mechanism in a required relative angular position, whereby, in use, the angle of the chair back with respect to the chair seat can be adjusted. Such a mechanism is frequently used in what are commonly referred to as "typists" chairs.

In one known form of mechanism of this type, the part for connection to the chair back is provided with a fixed extension which lies in a vertical plane, projects forwardly and is formed along its forward edge with an arcuate row of notches centred about the axis of pivoting of the chair back. Engageable with the notches is part of an operating arm mounted for horizontal swinging movement on the chair seat, a spring being provided to urge the arm rearwardly into engagement with the extension. Thus, the angle of the chair back in relation to the seat may be adjusted by swinging the arm forwardly out of engagement with the extension, against the action of the spring, tilting the chair back to the required angle and then releasing the arm so that it is urged by the spring into engagement with a new notch in the extension.

Such an arrangement has the advantage that it provides for positive location of the chair back with respect to the seat, and does not rely on frictional engagement as is the case in other known designs. However, the described arrangement suffers from two major disadvantages. Firstly, in order to provide a row of notches of sufficient length, the dimensions of the



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extension projects beyond the chair seat part at the upper and lower limits of its pivoting movement. The upward projection must be accommodated in the design of seat, whereas the downward projection of the extension below the seat makes for an unsightly appearance.

Secondly, the horizontal swinging movement of the operating arm, necessitated by the up-and-down swinging movement of the extension, means that there is, in practice, a risk of accidentally knocking the arm out of engagement with the notched extension so that the chair back is free to fall backwards under the weight of a person sitting in the chair. Also, any weakening or failure of the spring urging the operating arm into engagement with the extension may also permit the arm to slip out of engagement with the notches, again permitting movement of the chair back.

The object of the present invention is to provide a chair tilting mechanism which enables a chair back rest to be tilted easily and reliably, provides for positive location of the chair back, and is relatively inexpensive to produce, but which overcomes the above-mentioned disadvantages.

According to the invention a tilting mechanism for a chair comprises two parts, for connection, in use, to the chair seat and chair back respectively, said two parts being pivotally connected together for relative pivotal movement about a horizontal axis, characterized by said parts being connected by linkage means pivotally connected to one of the parts and also pivotally connected to a member movably mounted on the other of said parts, releasable stop means being provided for movement between a locking position, in which the movable member is engaged by the stop means



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to lock the movable member in a required position on said other part, thereby to determine a relative angular position of the two parts, and a release position, in which the stop means are dis-engaged from said movable member to allow relative angular movement between said two parts to define a different relative angular position thereof, such movement being transmitted through said linkage means to move said movable member relative to said other part, the arrangement being such that when said different relative angular position is reached, the stop means are moved to said locking position to lock said movable member relative to said other part.

Since the member which is locked in the required position is not an extension pivotable with said one part of the mechanism, as in the earlier known arrangement described above, but is instead a separate member connected thereto by a link, the movable member may be movably mounted on the other part of the mechanism in any convenient fashion so as to overcome the disadvantages referred to above.

Thus the movable member may be pivotally mounted on said other part, said link being pivotally connected to the movable member at a point spaced from the pivotal mounting of the member. Preferably the movable member is mounted on the part of the mechanism for connection to the chair seat.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a chair fitted with a tilting mechanism constructed in accordance with the present invention,



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Figure 2 is a side elevational cross-sectional view of the tilting mechanism,

Figure 3 is a cross-sectional view on the line 3-3 in Figure 2, with a torsion spring of the mechanism omitted for the sake of clarity;

Figure 4 is a view similar to Figure 2 but showing the backrest in an alternative, tilted position.

Figure 5 is a diagrammatic cross-section through an alternative form of tilting mechanism of the invention; and

Figure 6 is a top plan view of the mechanism of Figure 5.

A first embodiment of the invention will now be described with reference to Figures 1 to 4 of the accompanying drawings.

The type of chair to which the mechanism of the present invention is usually applied is that conventionally referred to a typists' chair. Such a chair is shown in Figure 1. The chair has a base comprising five castor-supporting legs 10 extending radially outwardly from the bottom of an upright, cylindrical support column 11. The legs are equi-angularly spaced around the column in the form of a star. The column 11 has conventional gas spring height adjustment means for raising or lowering a seat 12 of the chair in accordance with the users requirements. A backrest 13 of the chair is connected to the seat 12 by means of an oval section tube 14. By way of the tube 14 the backrest is spaced above and somewhat behind the seat 12. In addition to the facility for vertical adjustment, the column may have provision for rotary movement relative to the part of the base formed by the five legs 10.

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Considering now the tilting mechanism itself, Figures 1 to 4 show a frame 15 on which an upholstered seat pad would be fitted. This frame 15 constitutes a first part of the mechanism. The tube 14 is engaged in a socket in which it can be adjusted vertically to alter the position of the backrest 13 in a vertical direction relatively to the seat 12. This adjustment facility is provided by way of a resilient sleeve 16 surrounding the tube 14. The sleeve 16 is carried in a bracket 17 in which is engaged a locking bar. The bar has a head at one end and an operating lever portion at the other end. Within the bracket 17, which is of generally U-shaped configuration as shown best in Figure 3, the locking bar has an eccentric portion which can engage and press against the sleeve 16 and thus trap the tube 14. Locking and unlocking are carried out by an overcentre action and the bar engages in the bracket 17 through enlarged holes as seen in Figure 2 to allow freedom of movement of the bar in its released position..

The U-shaped bracket 17 is therefore normally secured relatively to the backrest but the latter can be adjusted in the vertical direction as described.

The frame 15 carrying the seat 12 is an elongated inverted channel and the bracket 17 is pivotally connected to the frame 15 by means of a horizontal pivot pin 18 extending through registering holes in the side flanges of the frame 15 and of the bracket 17. The bracket 17 constitutes a second part of the tilting mechanism.

Between the flanges of the frame 15 towards the opposite end thereof from the pivot pin 18, is welded a socket member 19 into which the upper end of a support post 20 fitted in the top of the column 11 is received in conventional manner.



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Surrounding the pivot pin 18 is a coiled torsion spring 21 having one limb engaging the base of the inverted channel of the frame 15 and the other limb engaging a second pivot pin 22 at the lower extremity of the bracket 17. Connected to the pivot pin 22 are two levers 23, 24 making up a linkage mechanism, the linkage mechanism being retained in a fixed axial position on the pivot pin 22 by means of a cylindrical sleeve 22a also carried on the pivot pin 22. Each lever is made up of a first straight part and a shorter second straight part integrally connected by a short step portion. The two first straight parts of the respective levers are parallel and interconnected by a short integral lug 25. The shorter second straight parts of the respective levers are also parallel and lie close to opposite sides of a sector or quadrant shaped angularly movable member 26. These shorter straight parts of the respective levers are pivotally connected together through a pivot pin 27 to said corner of the movable member 26. Since the bracket 17 is deeper than the frame 15, the pivot 22 is below the side flanges of the frame 15.

The movable member 26 lies in a vertical plane and is pivotally mounted on a pivot pin 28 which extends between the two side flanges of the frame 15. The upper edge of the movable member 26 opposite the pivot pin 27 is formed with a series of recesses or teeth 29 lying along an arc of which the centre coincides with the pivot pin 28 for the member 26. In this arrangement the pivot pin 27 is located remote from the recesses 29 behind the pivot pin 28.

A locking bar 30 can engage in any one of the recesses 29 in the member 26. This locking bar is pivotally engaged at 31 in one of the side flanges of the frame



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15 and is secured thereto by an appropriate locking device which may be a split pin or other fastening arrangement. The other end of the locking bar extends through a slot in the other side flange of the frame 15 so as to allow the bar to move up and down to a limited extent. As shown in Figure 1, the free end of the bar 30 is formed with a handle and is of such a length that the handle is accessible by a person sitting on the chair, as are also the operating portion of the locking bar for raising and lowering the backrest, and the operating means for raising or lowering the seat 12 relative to the base of the chair. The arrangement of the spring 21 is such that it biases the movable member 26 to the position shown in Figure 2, wherein the backrest is generally upright. A coiled tension spring 32 is connected between the bar 30 and the pivot pin 28 so as to urge the bar 30 downwardly into engagement with the member 26, and in particular into one of the recesses 29, so as to lock the member 26 relative to the frame 15 and thus to fix the frame 15 and bracket 17 in a particular relative angular orientation.

Provision, not shown, is made for securing the pivot pins 18, 22, 27 and 28 in the appropriate component to prevent endwise movement. Split pins, locking washers or other devices may be used for this purpose.

When it is required to adjust the angle of the chair back in relation to the seat, the bar 30 is raised to disengage it from its recess 29 in the member 26. This raising of the bar 30 takes place against the action of the spring 32. Pressure can then be applied to the backrest of the chair to move it forwardly or rearwardly to the desired position. The pivoting movement of the bracket 17 on which the backrest is mounted takes place about the pivot pin 18 against the action of the spring 21, and this pivoting movement is



transmitted through the links 23, 24 to the sector or quadrant shaped member 26 which swings about its pivot pin 28 to bring a new recess beneath the bar 30. When the back rest of the chair is in the desired new position, the bar 30 is released and is pulled downwardly by the action of the spring 32 so that it engages in the appropriate recess beneath it. As shown the sides of the recesses 29 are generally arcuate so that downward movement of the bar 30 can effect any slight necessary movement of the member 26 so that the bar can enter to the full depth of the appropriate recess.

Figure 2 shows the backrest in its most upright position with the bar 30 in its locking position in a recess 29 in the member 26. Figure 4 shows the bar 30 released from the member 26, with the backrest tilted slightly rearwardly so that a different one of the recesses is now under the bar. As can be seen from Figures 2 and 4 slightly raised portions of the member 26 are provided at opposite ends of the row of recesses, thereby to limit the permitted swinging movement of the member 26.

The tilting mechanism described provides a simple adjustment and is relatively inexpensive to produce. In addition it overcomes the disadvantages of the prior art referred to. In particular the member 26 lies wholly within the channel of the frame 16 during the whole of its possible movement. Moreover any weakening of the spring 26 will not render the mechanism inoperative or release the backrest since the bar 30 is urged downwardly by gravity into engagement with the recesses 29. Moreover accidental release of the bar 30 is unlikely as it would have to be moved upwardly against the action of the spring 32.

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Figures 5 and 6 show an alternative form of mechanism, although mostly this is of a form quite similar to that shown in Figures 1 to 4. In Figures 5 and 6 the same numerals have been used for parts which are the same as those described in Figures 1 to 4.

The main difference with this further embodiment of the invention, concerns the positioning of the pivot pin 27 on the movable member 26. As described in Figures 1 to 4, this pivot pin 27 is disposed remote from the recesses 29 behind the pivot pin 28. However as shown in Figure 5 it can be seen that in this alternative arrangement the pivot pin 27 is disposed approximately midway between the pivot pin 28 and the recesses 29. This has the effect of reversing the direction of movement of the member 26 relative to the movement of the backrest 13. In the example of Figures 1 to 4, rearward tilting of the backrest will cause the member 26 to pivot towards the bracket 17. However with the example of Figures 5 and 6 rearward tilting of the backrest will cause the member 26 to pivot towards the end of the frame 15 remote from the bracket 17.

Another difference in the embodiment of Figures 5 and 6 concerns the spring means which bias the backrest to a rest position. In Figures 1 to 4 the torsion spring 21 is provided. However with the alternative embodiment of Figures 5 and 6 a helical tension spring 33 is connected between the pivot pins 18 and 27. As can be seen from Figure 5 this tends to bias the backrest towards the seat 12. Alternatively the tension spring 33 may be connected between the pivot pin 22 and one flange of the channel shaped frame 15.

In both embodiments, instead of the member 26 being pivotally mounted, it could be movably mounted on the



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frame 15 by other means; for example it may comprise a member slidably movable along the channel-shaped frame 15. However the pivoted arrangement shown is preferred since it magnifies the movement of the recessed portion of the movable member 26. It will be appreciated that many alternative shapes of recesses in the movable member, and of the co-operating lock bar, may be provided instead of the arrangement shown. The member 26 could of course be provided on the bracket 17 instead of the frame 15.

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CLAIMS:

1. A tilting mechanism for a chair comprising two parts (15, 17), for connection, in use, to the chair seat (12) and chair back (13,14) respectively, said two parts being pivotally connected together for relative pivotal movement about a horizontal axis (18), characterized by said parts being connected by linkage means (23,24) pivotally connected to one of the parts and also pivotally connected to a member (26) movably mounted on the other of said parts, releasable stop means (30) being provided for movement between a locking position, in which the movable member is engaged by the stop means to lock the movable member in a required position on said other part, thereby to determine a relative angular position of the two parts, and a release position, in which the stop means are dis-engaged from said movable member to allow relative angular movement between said two parts to define a different relative angular position thereof, such movement being transmitted through said linkage means (23,24) to move said movable member relative to said other part, the arrangement being such that when said different relative angular position is reached, the stop means are moved to said locking position to lock said movable member relative to said other part.

2. A mechanism as claimed in claim 1, wherein said movable member (26) is pivotally mounted on said other part, said linkage means (23, 24) being pivotally connected to said member (26) at a position spaced from the mounting pivot (28) of said member.



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3. A mechanism as claimed in any one of the preceding claims, in which said releasable stop means (30) are manually operable between said locking and release positions, and said movable member (26) is formed with a plurality of recesses for selective engagement by said stop means to hold said member (26) in a desired position and thus said two parts (15, 17) in a desired relative angular position.

4. A mechanism as claimed in claim 3, wherein the movable member (26) is pivotally mounted and said recesses (29) lie along an arc centred on the axis of the mounting pivot (28) of the member (26).

5. A mechanism as claimed in claim 4, wherein said arc lies above the mounting pivot (28) so that the stop means (30) is vertically movable into or out of said recesses (29).

6. A mechanism as claimed in any one of claims 3 to 5, wherein the stop means (30) comprises an elongate member pivotally mounted on the part on which the member (26) is mounted, said elongate member having an operating handle at one end and having a portion engageable with the recesses (29) between said handle and its pivotal mounting.

7. A mechanism as claimed in any one of claims 3 to 6, wherein spring means are provided to urge the stop means (30) into engagement with the recesses (29).

8. A mechanism as claimed in any one of the preceding claims, wherein spring means (21, 33) are connected between the two parts (15, 17) resiliently to oppose relatively angular movement between the parts.



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9. A mechanism as claimed in claim 8, wherein said spring means is a torsion spring (21) between the two parts.

10. A mechanism as claimed in claim 8, wherein said spring means is a tension spring (33) between said one part (17) and said member (36) mounted on the other part (15).

11. A mechanism as claimed in claim 3 as appended to claim 2, wherein said recesses (29) lie on an arc centred on the axis of the mounting pivot (28) of the member (26) and the linkage means (23, 24) are pivotally connected to the member (26) between said arc and said pivot (28).

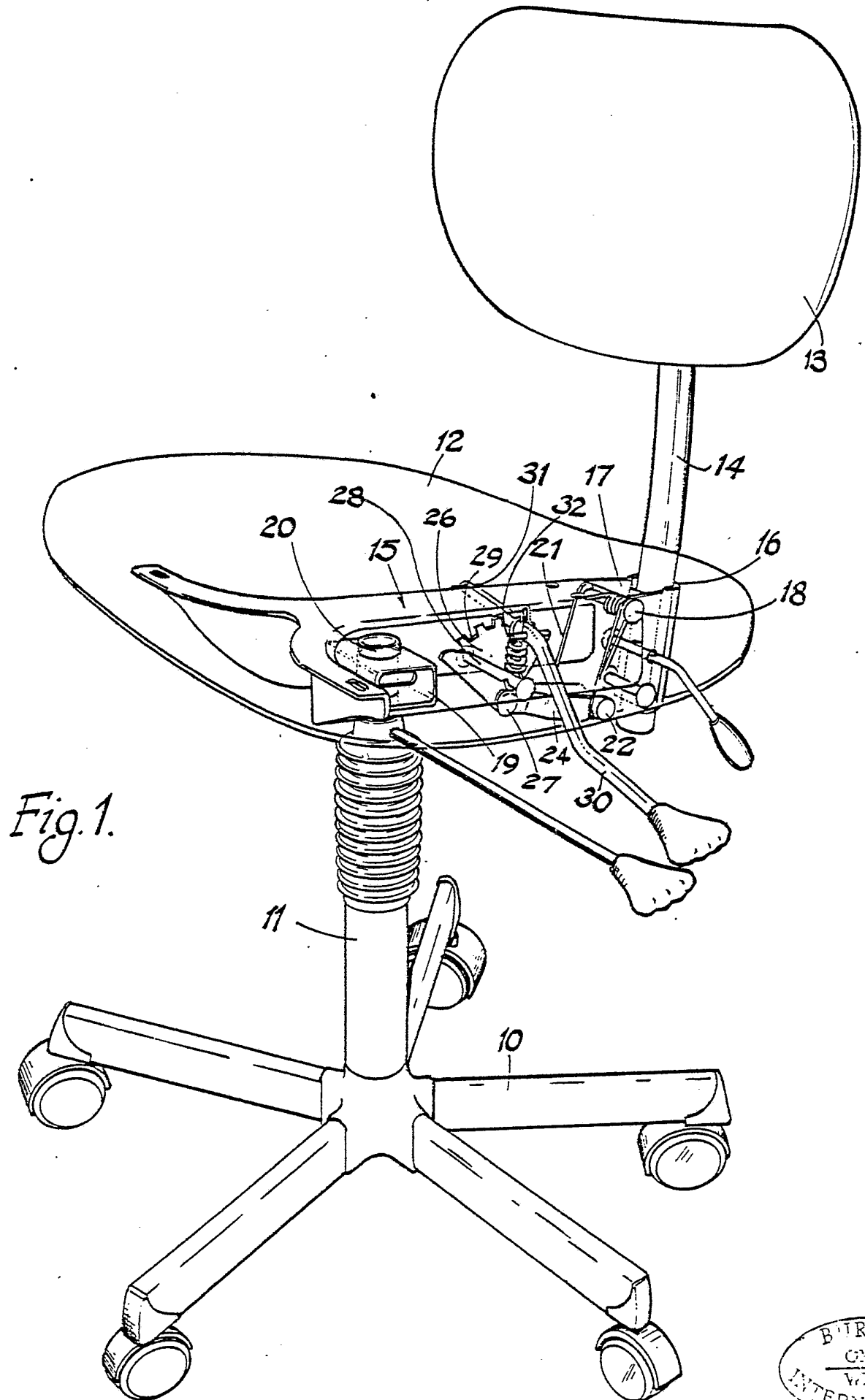
12. A mechanism as claimed in claim 3 as appended to claim 2, wherein said recesses (29) lie on an arc centred on the axis of the mounting pivot (28) of the member (26) and the linkage means (23, 24) are pivotally connected to the member (26) at the side of the pivot (28) remote from the arc.

13. A mechanism as claimed in any one of the preceding claims, wherein the member (26) is mounted on the one part of the mechanism for connection to the chair seat (12).

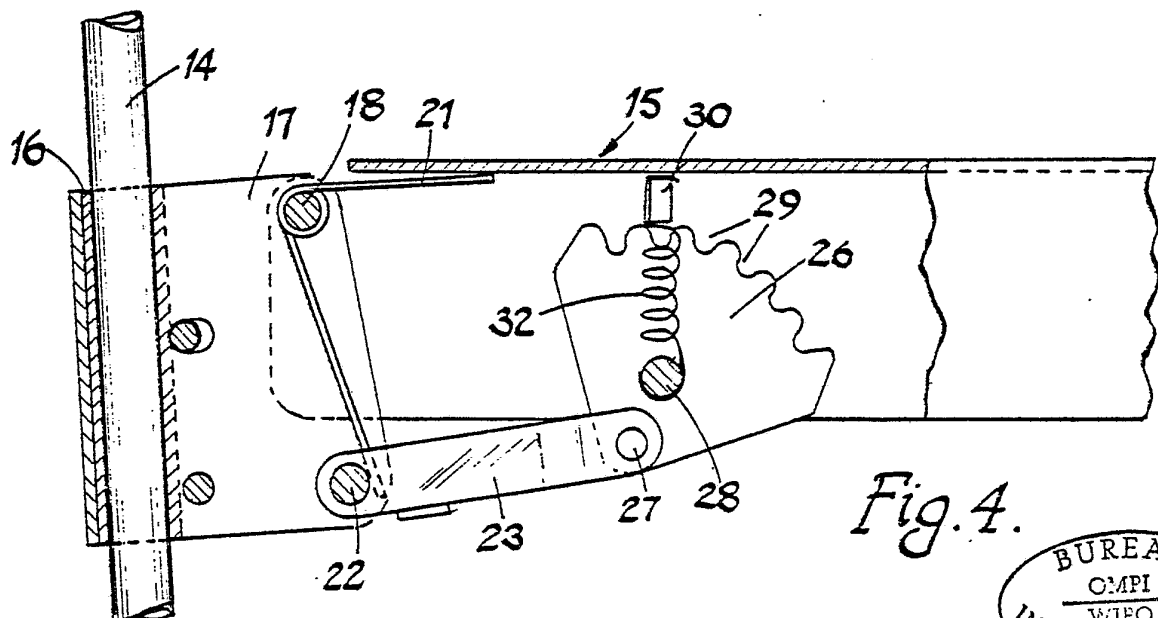
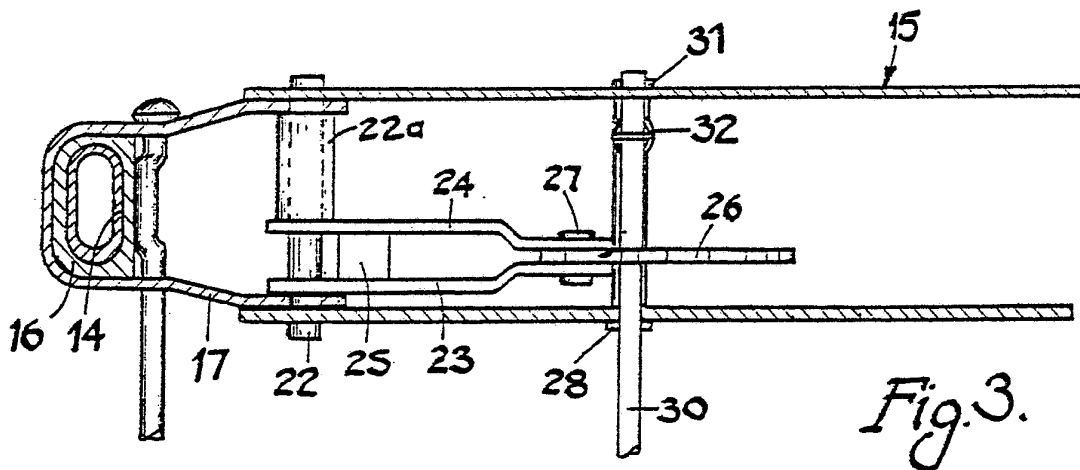
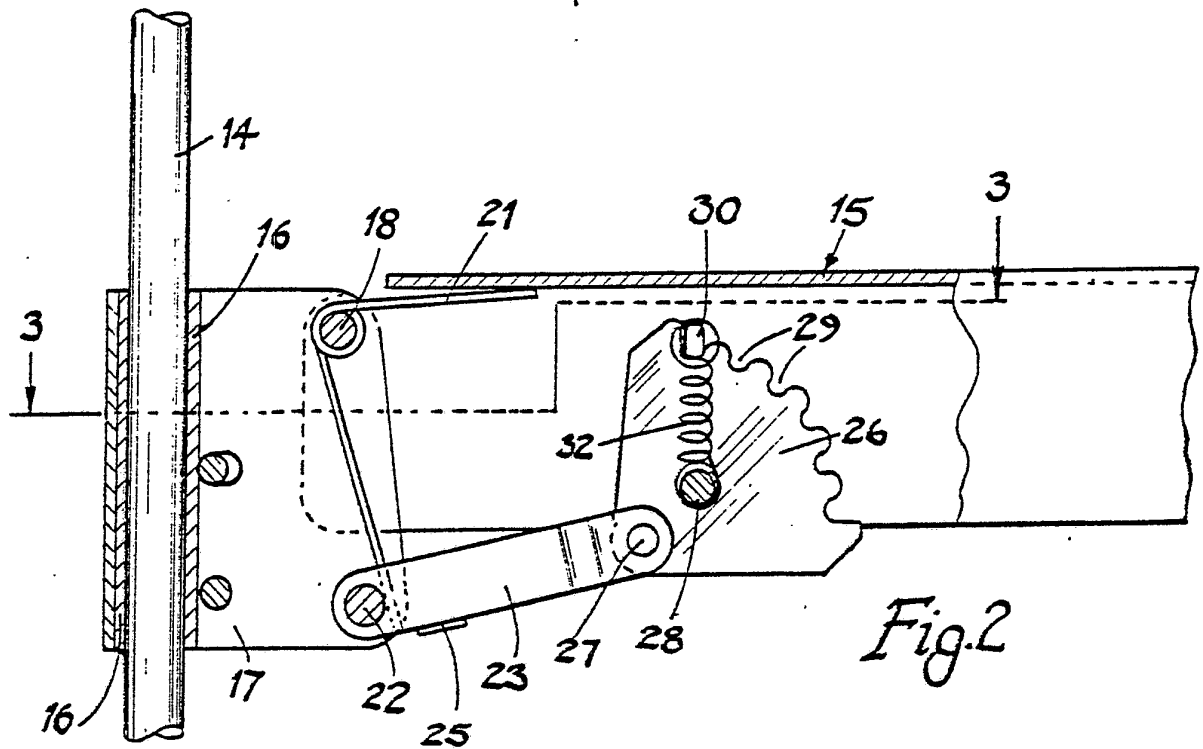
14. A chair incorporating a tilting mechanism as claimed in any one of the preceding claims.



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2/3



3/3.

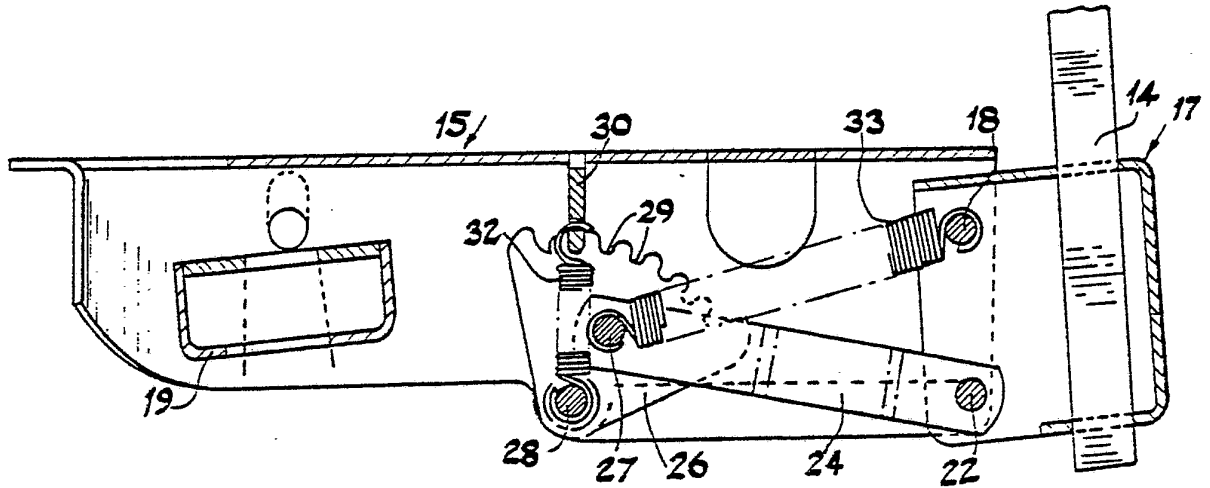


Fig. 5.

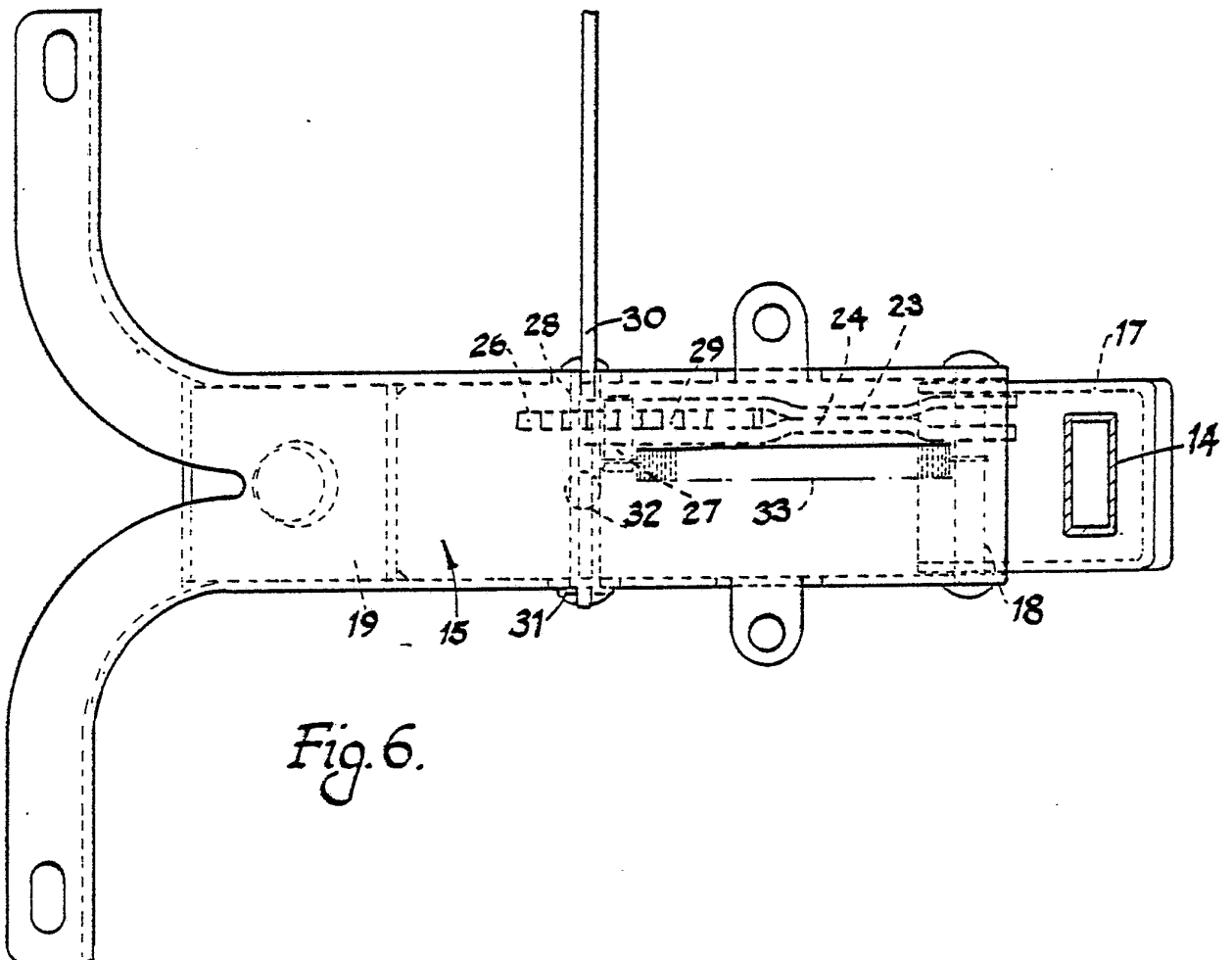


Fig. 6.

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 82/00307

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ³ : A 47 C 1/026		
II. FIELDS SEARCHED		
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	GB, A, 7950/A.D. 1913 (PAYNE) 30 October 1913 see page 3, lines 37-57 and the figures	1-6,8,9,13, 14
A	DE, C, 35467 (BREYER) 5 May 1886 see claims and figures	6,7
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IV. CERTIFICATION		
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