(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 371 729 A2**

# (12) EUROPEAN PATENT APPLICATION

(21) Application number: **89312290.3**

(51) Int. Cl.[5]: **A47C 9/00, A47C 3/20**

(22) Date of filing: **27.11.89**

(30) Priority: **29.11.88 GB 8827846**

(43) Date of publication of application:
**06.06.90 Bulletin 90/23**

(84) Designated Contracting States:
**BE DE ES FR GB IT SE**

(71) Applicant: **NATIONAL RESEARCH DEVELOPMENT CORPORATION**
**101 Newington Causeway**
**London SE1 6BU(GB)**

(72) Inventor: **Corlett, Esmond Nigel**
**193 Harrow Road Wollaton Park**
**Nottingham NG8 1FL(GB)**

(74) Representative: **Goodman, Christopher et al**
**Eric Potter & Clarkson St. Mary's Court St. Mary's Gate**
**Nottingham NG1 1LE(GB)**

## (54) Improvements in or relating to chairs.

(57) A chair (10) is provided with a seat (30) which can support a user in both a sitting and semi-standing position, the seat being so shaped to provide a substantially horizontal surface (323) for the user irrespective of the angle at which the seat is set.

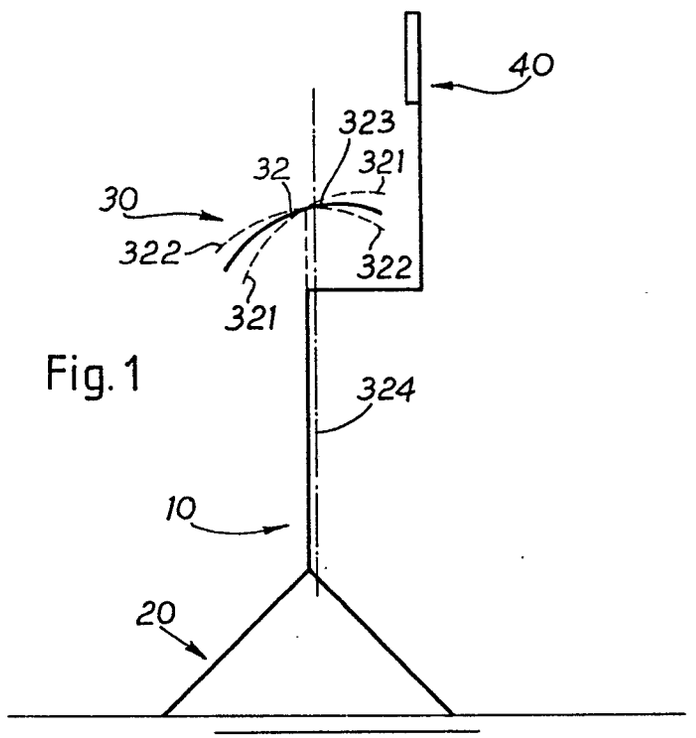


Fig. 1

EP 0 371 729 A2

# IMPROVEMENTS IN OR RELATING TO CHAIRS

The present invention relates to chairs and more particularly to chairs designed to be able to support the body of a human being (the user) at one or more heights.

Chairs are normally designed to support a user in a sitting position even through the height at which the user sits can be adjusted to suit users of different heights. Known adjustment systems comprise spring loaded central support columns or gas filled cylinder systems controlled by a lever adjacent the chair seat.

It is an object of the present invention to provide a chair with a seat which can support a user in a sitting or a semi-standing position.

According to the present invention there is provided a chair for supporting a user in a sitting or semi-standing position including a seat, the seat providing a substantially horizontal uppermost surface for the user irrespective of the angle at which the seat is set. If cushioned the actual upper surface may be curved when not in use.

Preferably the horizontal surface comprises at least a thin line running transversely on the seat surface forming the highest portion of the seat, this line lying in a vertical plane passing through a base structure of the chair. When the seat angle is adjusted this line, in a preferred embodiment, remains substantially in the same vertical plane relative to the base of the chair.

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

Figure 1 shows schematically a chair according to the present invention;

Figure 2 shows a perspective view of a first seat according to the present invention suitable for the chair of Figure 1;

Figure 3 shows a plan view of one half of the seat of Figure 2;

Figure 4 shows a cross-section of the seat of Figure 3 on line A-A;

Figure 5 shows a first cross-sectional front elevation of the seat of Figure 2;

Figure 6 shows diagrammatically the design of a second seat according to the present invention suitable for the chair of Figure 1;

Figure 7 shows diagrammatically the design of a third seat according to the present invention suitable for the chair of Figure 1;

Figure 8 shows a suitable adjustment mechanism for use with the chair of Figure 1 to provide an automatic tilting action for the seat;

Figure 9 shows in elevational partial cross section a practical embodiment of a chair incorporating a seat according to the present invention;

Figure 10 shows a cross sectional view along line A-A of Figure 9; and

Figure 11 shows a cross sectional view along line B-B of Figure 9.

With reference now to Figure 1, a chair 10 is shown diagrammatically. The chair comprises three basis component parts, a base 20, a seat 30 and a backrest 40 (if provided). The base 20 may be of the star or similar known type providing a stable base providing that the weight on the chair is within the area of the base. The backrest 40 (if fitted) may be attached to the seat in known manner.

The seat 30 has an upper curved surface 32 and may be adjusted or set at a number of angles as shown by dotted lines 321, 322. Dotted line 321 is suitable for a higher position of the chair corresponding to a stand position for the user and dotted line 322 is suitable for a lower for the chair corresponding to a sitting position for the user.

In the present invention the highest "point" on the surface of the seat shown diagrammatically at 323 is shown on the vertical dotted line 324. As the seat 30 is adjusted into the positions shown at 321 and 322 the highest "point" of the seat will in the seat design according to the present invention still remain substantially on the line 324.

In a practical seat design in three dimensions as opposed to the diagrammatic representation shown in Figure 1 the line 324 is in fact a plane and the point on the seat comprises a horizontal line across the seat as indicated by line X-X in Figure 2 to which reference is now made.

The seats shown in Figures 2 to 7 are specifically designed such that there is always an uppermost horizontal portion of the seat X-X to be sat on by the user for support at all heights within the designed height range. The shape of seat 30 is shown in Figures 2 to 5 and with reference to Figure 4 the seat is contoured to provide an upper surface 31 the shape of which is dictated by three arcs of radii R1, R2 and R3 as shown. The seat is shaped to be narrower at the front as indicated by the cross-sectional shapes $A'$-$A'$, $B'$-$B'$ and $C'$-$C'$ shown in Figure 5 and by the plan view of Figure 3. With reference to figure 5, the seat shape could, however, be of the more conventional substantially rectangular shape as indicated by the dotted lines.

With respect to the cross-sections the upper surface 31 of the seat need not necessarily be flat to form a completely horizontal surface but could be contoured by suitable upholstery to provide for example a domed shape which may be more comfortable or a seat contoured to accommodate the shape of the upper legs or thighs. The seat may be provided for example with a tensioned net or can-

vas sling stretched over a suitable frame.

In a particular embodiment the dimensions of the radii R1, R2 and R3 are as follows:-

R1 - 140 mm

R2 - 280 mm

R3 - 350 mm

These dimensions are given only by way of example and may be varied to suit specific requirements.

With reference now to Figure 6 a simpler contour for the seat is shown comprising two arcs of radii R4 and R5 as shown. Radius R4 is the shorter and is used as indicated by the solid line to form the back of the seat and R5 is the longer and is used to form the front of the seat as shown by the solid line. The dotted continuation lines of arc are only shown to illustrate the differences in the radii. The seat is pivoted about point P to achieve the desired property of maintaining an uppermost horizontal line X-X to sit on at all angles of pivot of the seat.

A modification of the seat contour of Figure 6 is shown in Figure 7, the radius R5 being replaced by a tangential shape as indicated by the straight line R, radius R5 being shown dotted for comparison.

In a practical embodiment R4 = 140 mm and R5 = 200 mm.

The seat shapes shown may be set at fixed angles for various types of seat and they will always provide an uppermost substantially horizontal line X-X for the user to sit on. In practise this line will, in an upholstered or padded seat provide a generally horizontal platform sloping at its extremities both to the back and the front of the seat. Thus the user will not be unbalanced on the seat since there there will be no tendency to slide to the front or back of the seat. This is particularly advantageous since any such tendency is always resisted by a user causing strain. The seat design according to the present invention is therefore comfortable to sit on at all heights at which is it set. Thus for example for laboratory stools the seat can be set for a high level use and for typing chairs it can be set at a low lever.

If it is required to provide an automatic adjustment of the angle of the seat the embodiment of Figure 8 may be used. In Figure 8 the upper part of a chair is shown and comprises the seat 30 pivoted on a pivot 35 attached to a main support member 25.

A first height adjustment is provided by for example a gas filled cylinder 200. This is used to adjust the seat for the height of the user for example at the lowest or sitting position by altering the height of ram 202. Once set for a particular user this cylinder 200 would not be further altered.

A further cylinder 204 is positioned within ram 202 to provide further vertical movement of seat 30. To further alter the height of seat 30 cylinder 204 is activated by means of for example of a lever in known manner to allow main support member 25 to move upwardly under the force of the cylinder or downwardly under the weight of the user on the seat 30. As member 25 moves into or out of cylinder 204 so seat 30 is moved by an arm 36 connected in a pivotal manner between ram 202 and the front of the seat at pivot points 37, 38. The seat 30 will therefore move as indicated by dotted outline 30'. Line X-X (as indicated by the arrow X) will as shown always be at the highest point on the seat and in this embodiment this line is vertically above the main support member 25 providing the most suitable condition for the seat.

As an alternative to the automatic adjustment provided by arm 36 a manual adjustment could be provided by a suitable screw clamp on pivot 35 allowing the seat to be rotated to suit the user. Line X-X will however always be the highest portion of the seat.

With reference now to Figures 9 to 11 a practical embodiment of a chair incorporating a seat according to the present invention is shown.

The chair 100 comprises a base 1200 which may be of the conventional three or five star configuration. In the drawing only two feet 1202, 1204 are shown for simplicity of drawing. A first main support member 1206 is fixed; for example by welding into the base 1200 and a second main support member 1208 is slidably mounted over the first member 1206 as shown. Preferably each support member 1206, 1208 comprises a steel tube of circular cross section.

Support member 1208 is movable vertically relative to support member 1206 by means of a spring 1210 (which in a practical chair would be provided with a cover 1212 shown as a dotted line).

The two members are normally locked together by a locking arrangement 1214, 1216 which operates in known manner to allow relative movement between the members on compression of a spring 1218. This is achieved by a downward movement of operating rod 1220 by downward operation of a lever 1222 which is situated under the front of seat 30 (Figure 1). This movement is well known in such chair designs and will not therefore be described in any greater detail. The lift provided for the chair seat by this arrangement is in the chair shown 120 mm (approx. 5 inches) which accomodates for the sitting position height range. It is noted here that the angle of the seat 30 does not change due to operation of lever 1222.

The seat 30 is pivotally supported on a pin 1224 and tilting of the seat is accomplished by the pivotal connection of the front of the seat to a lever

1226 on a pivot pin 1228. The seat is supported on a platform 1230 which is mounted on a bearing 1232 which enables the seat to be revolved.

The seat 30 may be raised by operation of a lever 1234 into the position shown partially at $30^1$ and $1226^1$. The lever 1234 operates when depressed to release the piston 1236 and allow the seat to rise (in known manner) under the pressure provided by either a pneumatic pressure or by a further spring (not shown). The seat may be lowered by operating the lever 1234 and pressing down on the top of the seat.

The operation of the seat may be clearly seen by the two positions 30, 1226 and $30^1$, $1226^1$. As the piston 1236 rises the upper portion 1240 of the platform 1230 rises relative to the base portion 1242 to which the opposite end of lever 1226 is pivotally connected at pivot point 1244. Thus as the seat rises the angle of the seat is tilted gradually, the seat always having a horizontal portion to support the user.

A backrest 1246, 1248 is also attached to the upper part 1240 of the platform 1230 so that the backrest rises with the seat.

## Claims

1. A chair for supporting a user in a sitting or semi-standing position including a seat, the seat providing a substantially horizontal uppermost surface for the user irrespective of the angle at which the seat is set.

2. A chair as claimed in Claim 1 in which the seat is provided with pivot means, the pivot means being operative to allow the angle of the seat to be adjusted.

3. A chair as claimed in Claim 1 or Claim 2 in which the seat has an upper surface, the upper surface being cushioned, the cushioning providing a curved surface when not in use.

4. A chair as claimed in any one of Claims 1, 2 or 3 in which the horizontal surface comprises at least a thin line running transversely on the seat surface and forming the highest portion of the seat, and in which this line lies in a vertical plane passing through a base structure of the chair.

5. A chair as claimed in Claim 4 in which the line remains substantially in the same vertical plane relative to the base structure of the chair at each angular position of the seat.

6. A chair comprising:
a seat;
means for raising and lowering said seat to any height in a range from a fully seated, low, position to a semi-standing, high, position;

a horizontal section which, in any position of said range, supports weight of a user; and
co-operative means for adjusting an angle of tilt of said seat so as to accommodate needs of said user in any position in said range, said co-operative mans providing forward and backward rotation of said seat as said seat is raised or lowered in order to alter said angle of said seat such that legs of said user in said semi-standing position are clear of a front portion of said seat, the horizontal section forming in any adjusted angle of the seat the uppermost part of the seat.

au dépôt / Newly filed
Nouvellement déposé

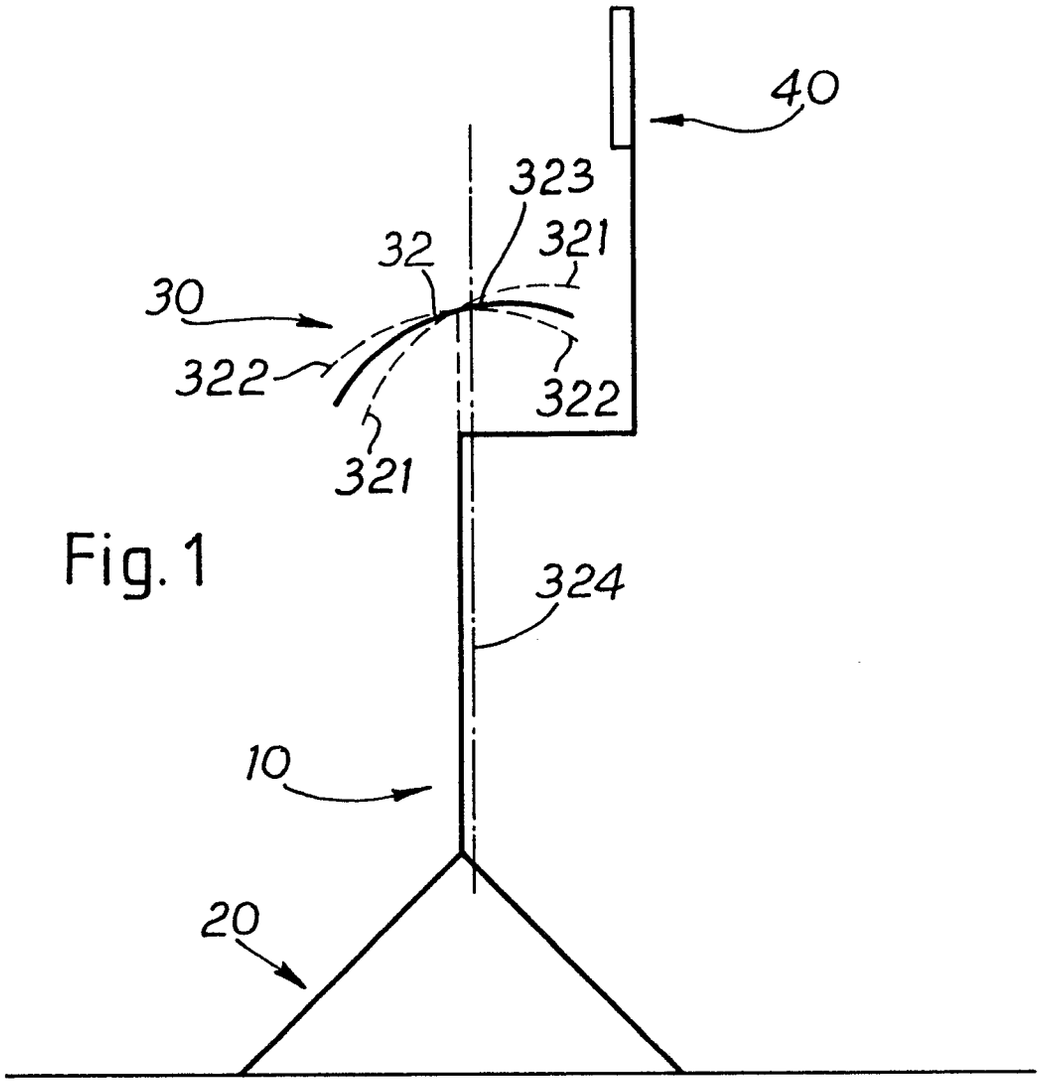


Fig. 1

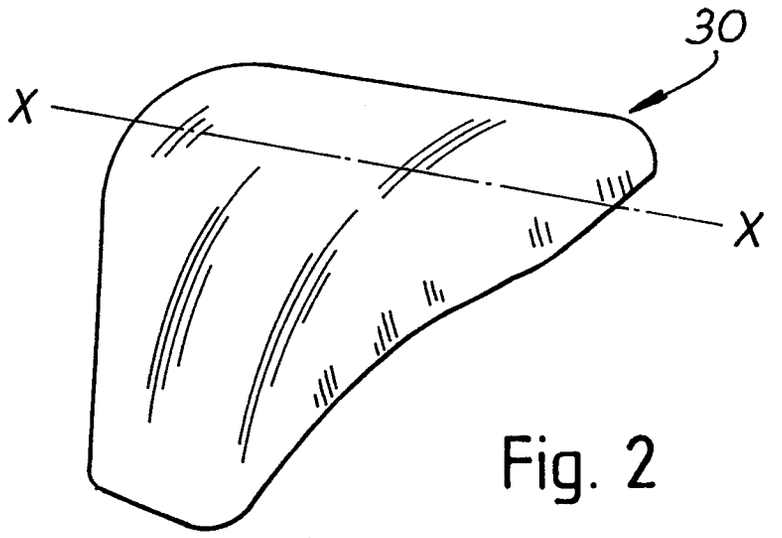


Fig. 2

Neu eingereicht / Newly filed
Nouvellement déposé

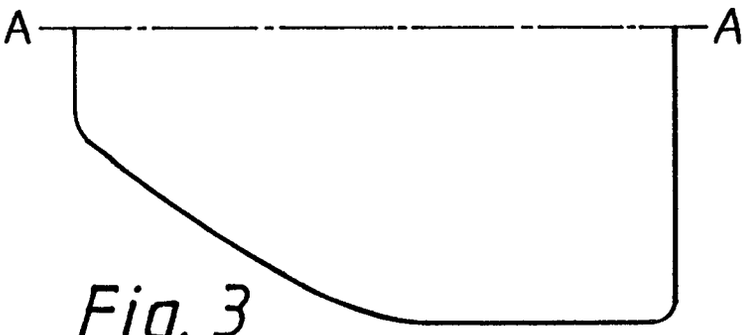


Fig. 3

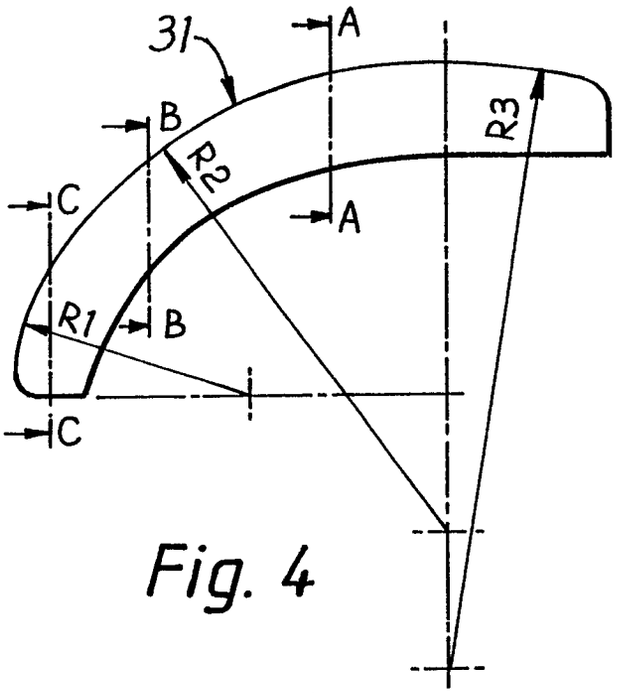


Fig. 4

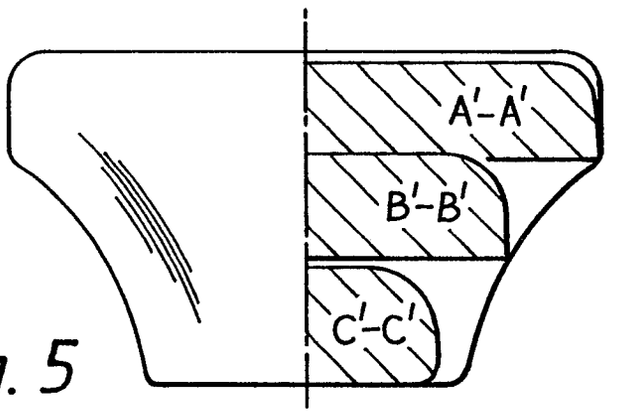


Fig. 5

Nouvellement déposé

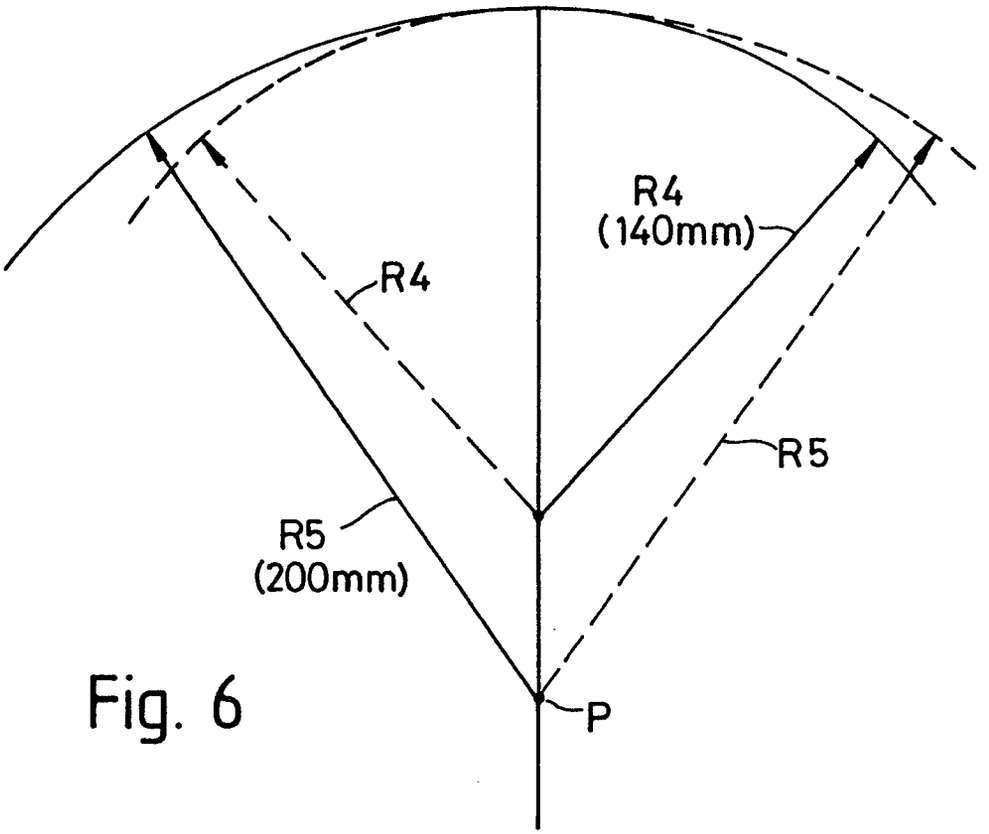


Fig. 6

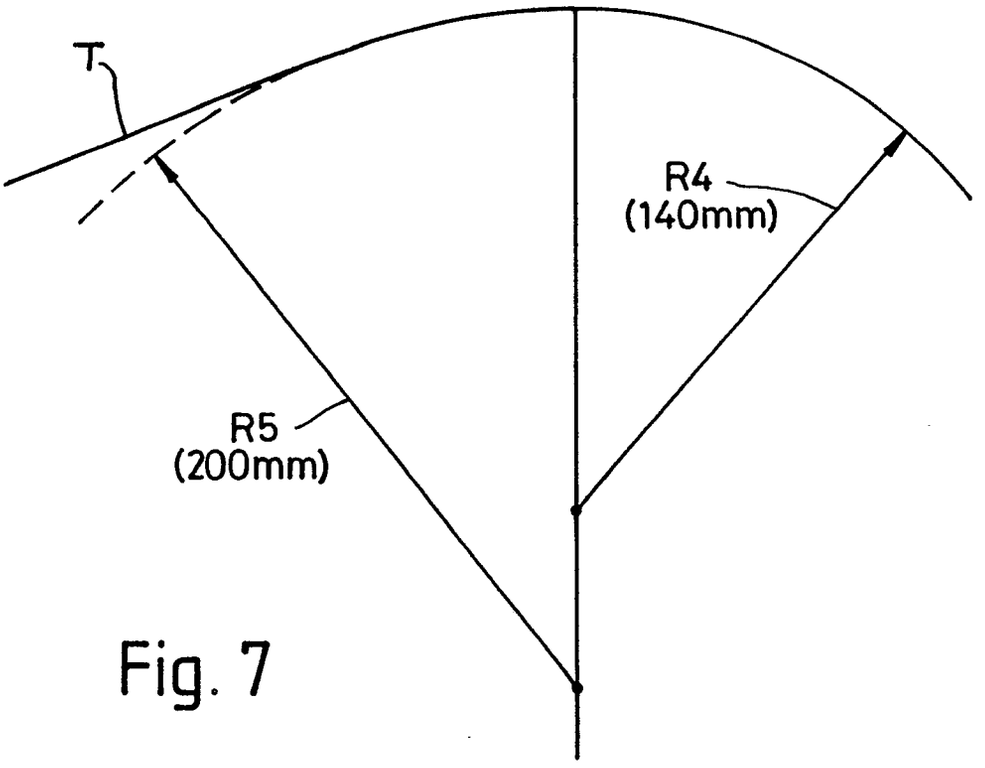


Fig. 7

eu eingereicht / Newly filed
Nouvellement déposé

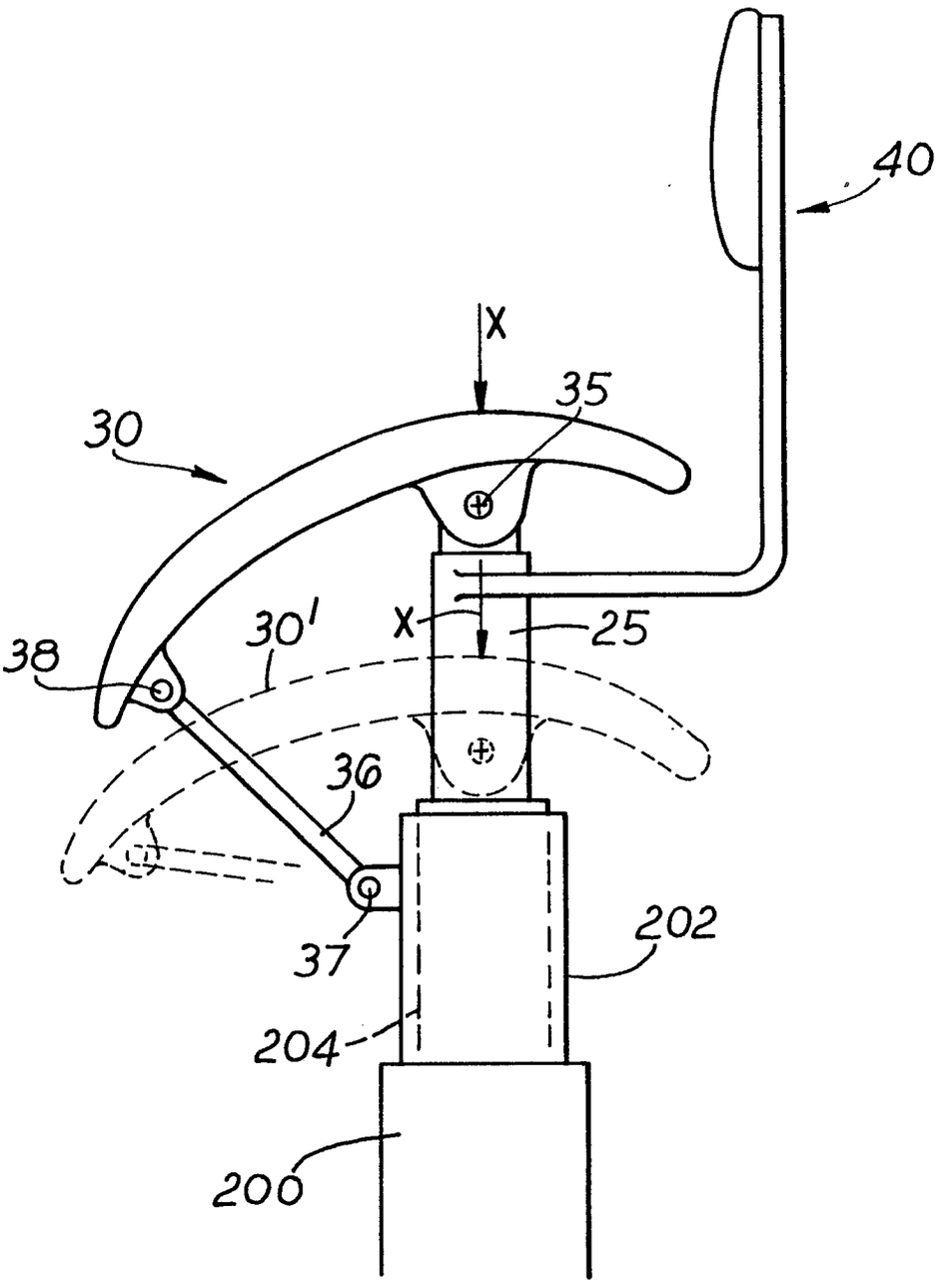


Fig. 8

Neu eingereicht / Newly filed
Nouvellement déposé

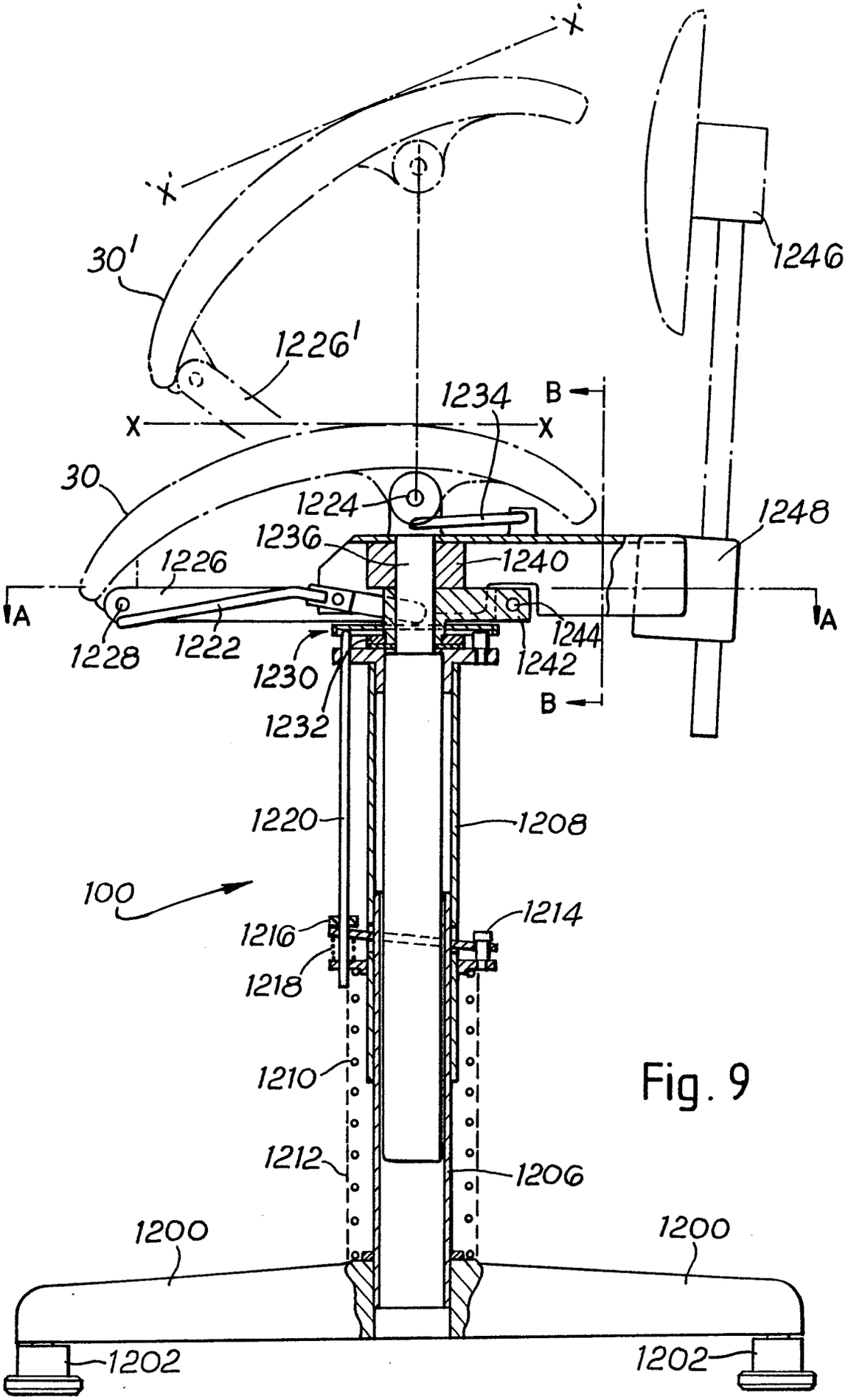


Fig. 9

Neu eingereicht / Newly filed
Nouvellement déposé

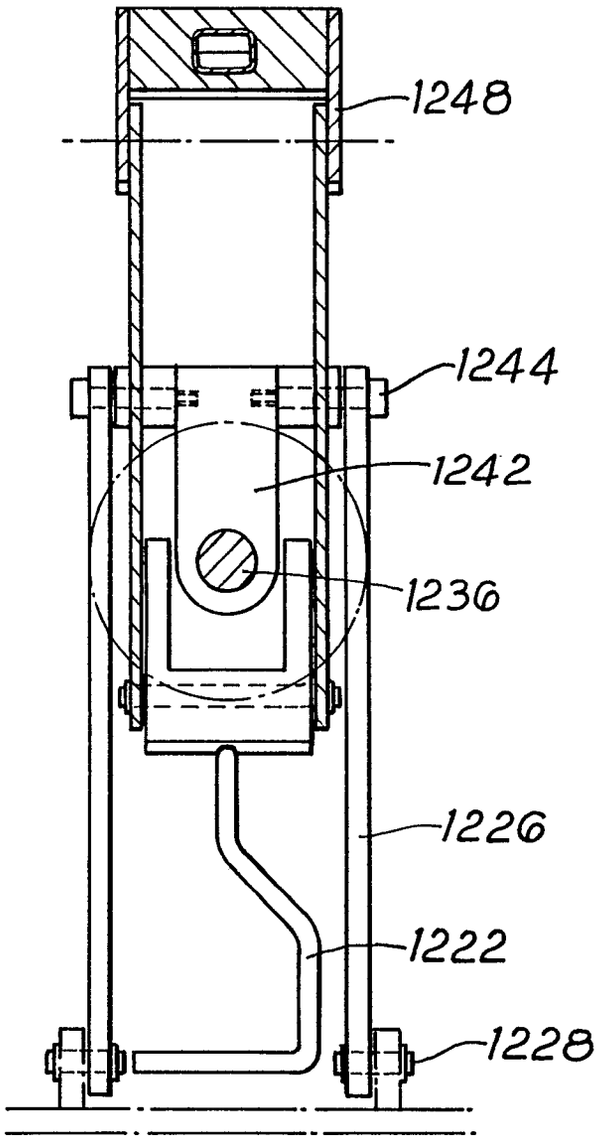


Fig. 10

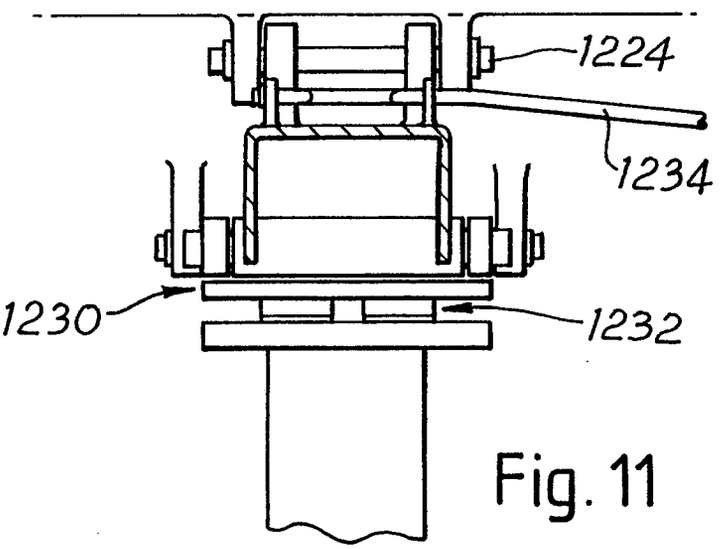


Fig. 11