



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
16.09.2009 Bulletin 2009/38

(51) Int Cl.:
A47C 1/032 ^(2006.01) **A47C 7/46** ^(2006.01)

(21) Application number: **09154755.4**

(22) Date of filing: **10.03.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA RS

(30) Priority: **10.03.2008 NO 20081244**

(71) Applicant: **Savo AS**
0611 Oslo (NO)

(72) Inventor: **Schmidt, Ralph-Christian**
1344, Haslum (NO)

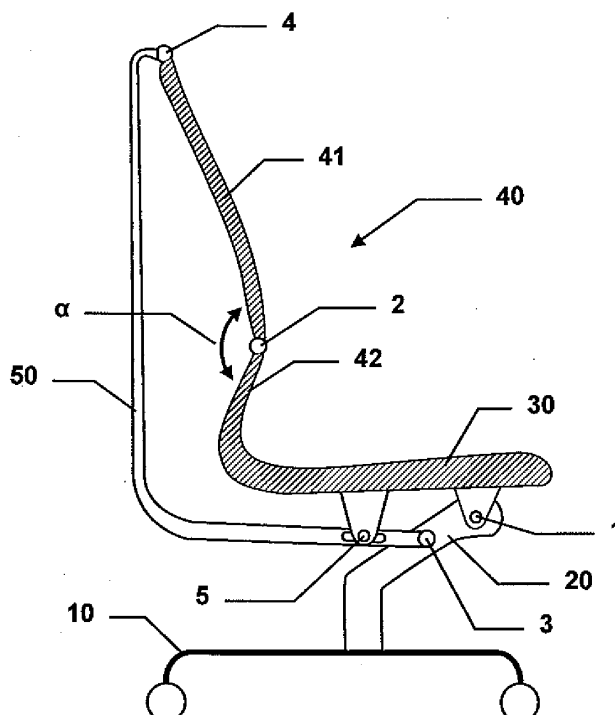
(74) Representative: **Bokinge, Ole**
Awapatent AB
Junkersgatan 1
582 35 Linköping (SE)

(54) **Back rest device**

(57) The present invention relates to a device for a chair comprising an undercarriage (10) with a support unit (20) for a chair seat (30) and a backrest (40), the chair seat being pivotally connected to the support unit about a first pivot axis (1), and the backrest being pivotally connected to the chair seat, wherein the backrest (40) is split horizontally into at least an upper back part (41) and a lower back part (42) pivotally connected to each other about a second pivot axis (2); a pulling element (50) is

pivotally connected to the support unit (20) about a third pivot axis (3) positioned behind the first pivot axis (1), and pivotally connected to the chair's upper back part (41) about a fourth pivot axis (4); the chair seat is pivotally connected to the pulling element about a fifth pivot axis (5) positioned behind the first pivot axis (1) and the third pivot axis (3); and at least one of the first, third or fifth pivot axes (1, 3, 5) is displaceable relative to at least one of the parts pivoting about said pivot axes.

Fig. 1



Description

Field of the invention

[0001] The present invention relates to a device for a chair, such as a desk chair, comprising an undercarriage, a column and/or a support unit, a chair seat and a backrest.

Background of the invention

[0002] Normally, the desk- or office chairs of today are equipped with various tilting mechanisms to be able to change the sitting position to a comfortable and functional working position and, possibly, with an option of being able to assume a more relaxed sitting position, whereby the user may recline to a reclined position. In such chairs, a seat plate is generally attached to a support unit by it self, or also to a column, a lower portion of which in turn is attached to an undercarriage. Oftentimes the undercarriage comprises a number of feet with wheels to be able to move the chair while a user is sitting in the chair.

[0003] The backrest may be attached to a rear portion of the seat plate, or to a rear portion of the support unit under the seat plate. Possibly, a lower portion of the backrest is attached, via a joint, to said seat plate or support unit in order to make possible to change the angle of the backrest relative to the seat plate.

[0004] Upon reclining a chair seat, the curvature of the user's back is changed relative to an upright sitting position. There may be several reasons for this change, such as the user utilising the rear shoulder portion to force the backrest backwards, and oftentimes against a spring-load, or the user bends the neck and head further backwards so as to curve the back more than that of an upright sitting position, particularly in the lumbar region of the back. Moreover, the upper part of the user's back take up a part of the body weight relative to that of an upright sitting position, in which mainly the seat and the underside of the thighs take up the load. In ordinary office chairs, the backrest withdraws from the user's back upon reclining, and the user loses contact with the backrest.

[0005] Thus, it is desirable to have a backrest that adapts to the shape of the user's back when reclining in an office chair.

[0006] Therefore, a need exists for a better support of the user's back, particularly in the middle back portion, such as the lumbar region of the back, when reclining in office chairs. Especially, such support should be adaptive and change synchronous with respect to the angle of the backrest.

Short description of the invention

[0007] According to the present invention, an adaptive support of the user's back upon reclining the backrest is obtained by virtue of the backrest being split horizontally and hinged at a vertical distance from the seat plate.

Thereby, a breakpoint in the backrest is formed, where the angle of the upper part of the backrest may be changed. By means of a pulling element pivotally attached to both the upper part of the backrest, the chair seat, and the support unit, the angle of the upper part of the backrest may be changed as a function of the reclined angle of the chair seat.

[0008] The present invention thus relates to a device for a chair comprising an undercarriage with a support unit for a chair seat and a backrest, the chair seat being pivotally connected to the support unit about a first pivot axis, and the backrest being pivotally connected to the chair seat, characterized in that:

- the backrest is split horizontally into at least an upper back part and a lower back part pivotally connected to each other about a second pivot axis,
- a pulling element is pivotally connected to the support unit about a third pivot axis positioned behind the first pivot axis, and pivotally connected to the chair's upper back part about a fourth pivot axis;
- the chair seat is pivotally connected to the pulling element about a fifth pivot axis positioned behind the first pivot axis and the third pivot axis; and
- at least one of the first, third or fifth pivot axes is displaceable relative to at least one of the parts pivoting about said pivot axes.

[0009] The present invention also relates to a chair comprising a device as described above. Hereinafter, the invention will be described in more detail by means of drawings and examples of embodiments, which are not intended to limit the scope of the invention.

Short description of the drawings

[0010]

Figure 1 shows an embodiment of a device for a chair according to the present invention when in an upright position.

Figure 2 shows the device for a chair of figure 1 when in a reclined position.

Figure 3 shows an alternative embodiment of a chair of the invention when in an upright position.

Figure 4 shows the device for a chair of figure 3 when in a reclined position.

Figure 5 shows an alternative embodiment of a chair of the invention when in a reclined position.

Figure 6 shows an alternative embodiment of the invention in a chair in a leaning position.

Figure 7A shows an alternative embodiment of a

chair of the invention when in an upright position.

Figure 7B shows, in perspective, inner details of the chair of figure 5A.

Figure 8 shows the device for a chair of figure 7A when in a reclined position.

Detailed description of examples of embodiments

[0011] In the following description, the terms "front", "in front of" and "forward" are used with respect to the horizontal direction onto which the face and the chest of the person sitting in the chair is facing during normal use.

[0012] Further, the terms back", "at the back of", behind" or "backwards" are used with respect to the opposite horizontal direction, i.e. the direction onto which the back of a person sitting in the chair is mostly facing during normal use.

[0013] All pivoting elements, such as pivotal joints, attachments, connections or pivoting axes, etc. discussed in the application, shall be considered to be pivotal about axes that are horizontal and perpendicular to the plane of symmetry through the chair, unless specifically stated otherwise.

[0014] "Middle" and "middle portion" implies areas of the chair positioned in the immediate vicinity of the plane of symmetry through the chair, as opposed to "right", "left" and "outer transverse areas", which are the areas furthest away from the plane of symmetry.

[0015] Figure 1 shows an embodiment of the present device for a chair comprising an undercarriage 10 with an upwards-extending support unit 20 supporting a chair seat 30 with a backrest 40.

[0016] The front lower edge of the chair seat 30 is pivotally connected to a front part of the support unit 20 about a first axis 1, which herein is termed a seat joint, which renders possible to tilt the seat by lowering or raising the rear part of the chair seat.

[0017] Further, the rear part of the chair seat 30 comprises a substantially vertical lower backrest part 42 of the backrest 40, which may be rigid or semi-rigid in order to provide the desired combination of comfort and support for the user's back. The height of the lower backrest part 42 may be selected freely but, preferably, it extends up to the lumbar region of the user of the chair, and the upper edge thereof is pivotally connected to the upper backrest part 41 about a second pivot axis 2, positioned at a backrest joint, which allows the angle of the upper backrest part 41 to be changed relative to the chair seat 30 and/or the lower backrest part 42.

[0018] In order to control the angle of the upper backrest part 41 relative to the chair seat 30, a pulling element 50, here appearing in the form of an angled bow at a first end of a substantially horizontal part, is pivotally connected to the support unit 20 about a third pivot axis 3, herein termed a pulling element joint positioned behind the first pivot axis 1, and also that the pulling element 50, at a

second end of an upright part, is pivotally connected to an upper part of the upper backrest part 41 about a fourth pivot axis 4, herein termed a neck joint.

[0019] In addition, the chair seat 30, at the underside thereof, is pivotally connected to the pulling element 50, here on the substantially horizontal part of the angled bow, about a fifth pivot axis 5, herein termed a syncro-joint, in an area behind both the first pivot axis 1 in the seat joint and the third pivot axis 3 in the pulling element joint.

[0020] As is apparent from figure 2, reclining of the chair will cause the rear part of the chair seat 30 to be pivoted downwards about the first pivot axis in the seat joint which, via the fifth pivot axis 5 in the syncro-joint, moves the pulling element 50 downwards relative to the support unit 20 as the pulling element is pivoted about the third pivot axis 3 in the pulling element joint.

[0021] In order to allow pivoting about the aforementioned pivot axes, the syncro-joint is shown as a displaceable joint in figure 1 and 2, in which the chair seat 30 and the pulling element 50 may be displaced relative to each other during pivoting about the fifth pivot axis 5. Such a displacement is necessary to allow pivoting about the pivot axes, in which the first 1, third 3, and fifth 5 pivot axes form pivotal corners of a triangular structure, and in the same manner as that of the second 2, fourth 4, and fifth 5 pivot axes. Alternatively, one or more of the axes in each of these two triangular structures may be displaceable or have a predetermined slack to allow pivoting and avoid locking of the structures. For example, and in order to obtain such a displacement, a slide track or a longitudinal recess that receives a pivot bolt, a double joint, a rail or similar, and combinations thereof, may be used to allow for a displacement between the elements connected about said pivot axes.

[0022] Due to the arm formed by the horizontal distance between the first axis 1 and the third axis 3, and the connection between the chair seat 30 and the pulling element 50 about the fifth pivot axis 5, the deflection angle of the pulling element 50 will be larger than the deflection angle of the chair seat 30 relative to the support unit 20 when reclining the chair seat/backrest. This angular difference between the chair seat 30 and the pulling element 50 causes the upper backrest part 41 to be pivoted backwards relative to the lower backrest part 42 and the seat 30 about a second pivot axis 2 in the backrest joint. The angle at the rear of the backrest 40, between the lower 41 and upper 42 backrest parts, will thus be changed from an angle α when in the upright position (figure 1) to an angle β when in the reclined position (figure 2), where $\alpha > \beta$. In this manner the total curvature of the backrest 40 is increased, and the effect for the user will be increased support in the vertical position area of the backrest joint, such as in the lumbar region of the user when reclining the chair.

[0023] Figure 3 shows an alternative embodiment of the chair of figure 1, wherein the upper end of the pulling element 50 comprises a headrest 60, and wherein the

headrest joint is positioned at the lower edge of the headrest 60. The seat joint, which pivots about a first pivot axis 1 in this embodiment, is further shown as being displaceable, whereby the chair seat 30 and the support unit 20 may be displaced to some degree relative to each other, mainly horizontally back and forth. In addition, at least one of the second 2, fourth 4 or fifth 5 axes are displaceable, or at least one of these elements, which are connected about these pivot axes, are flexible so as to avoid locking of the aforementioned triangular structure, but this is not shown.

[0024] In this embodiment, and in order to obtain a resistance against reclining, a coiled spring 7 is positioned between the underside of the pulling element 50 and the support unit 20. Such a spring provides a certain resistance against reclining and resets the chair seat and the backrest to an upright starting position after use. Alternatively, this function may be provided by alternative positioning of any type of spring, such as between one or more of: the support unit 20 and the chair seat 30, the support unit 20 and the pulling element 50, the pulling element 50 and the chair seat 30, the pulling element 50 and the upper back part 41, the upper back part 41 and the lower back part 42, etc. The spring may comprise one or more springs selected from: a coil spring, a leaf spring, a torsion spring or a flexible material. Preferably, an option exists for adjusting a preloading of the spring in order to adapt the resistance to the weight of the user.

[0025] As may be seen from figure 4, a reclining the chair of figure 3 will lead to the same movement and curving of the backrest as that corresponding to what is shown in figure 2. However, the headrest 60 will assume a more upright position than that of the upper backrest part 41 owing to the fact that the upper backrest part will pivot about the fourth pivot axis relative to the headrest 60, whereby the head is held more upright than the upper part of the user's back, yet somewhat more reclined than the lower backrest part 42 of the chair seat 30.

[0026] In the above embodiments, the chair seat with backrest, and particularly the cores thereof, are made of rigid or semi-rigid materials, such as plastics, wood, metal, composites or similar, preferably with an outer padding toward the side of the user. However, the backrest may alternatively be made of softer materials, such as flexible plastics, particularly in sections replacing, for example, the physical joints described above.

[0027] Figure 5 shows an embodiment having the backrest 40 split horizontally in three places, wherein the parts are connected to each other about three respective pivot axes 201, 202, and 203 in the form of three joints. The angle between the lower 41 and the upper 42 backrest parts still has the same angle β as in figure 5, but with this embodiment a less sharp transition is obtained in the backrest upon reclining than that of the split in the back using one joint only, as shown in the figures above. Preferably, joints having a limited pivot angle are used for such pivoting, whereby the pivoting takes place within a predetermined area for each of the joints. This may be

of particular importance should even more joints be used in the back of the chair, which is a foreseen alternative.

[0028] Figure 5 also shows an alternative embodiment wherein the joints, which provide the pivot option in the backrest, may be displaced vertically in order to change the height of the pivot point or pivot area, e.g. for adaptation thereof to the user's height. The displacement may, for example, be provided by virtue of rails in the upper and the lower back parts of the chair, which preferably may be locked to keep the breakpoint area in the back in a desired position. In this embodiment, the chair also comprises a height-adjustable headrest 80 in order to adapt the chair further to the user's height. Alternatively, the headrest 80 may be mounted onto the upper backrest part and may, as an alternative, be pivotal for adaptation to the user's sitting position.

[0029] Upon possibly using even more joints in the back of the chair (such as e.g. 4 or more), the back of the chair will imitate the user's spine to a greater extent and be further adaptable thereto. For example, also the upper part of the upper backrest part 41 may be provided with one or more joints. In an even further expanded version, the entire back of the chair may be envisaged to consist of joints only, possibly having small intermediate pieces, which preferably have individual deflection angles, and more preferably having individually adjustable deflections from the chair seat and upwards to the uppermost joint toward the pulling element or the headrest.

[0030] Instead of using joints in order to pivot the shape of the backrest, a flexible material, as shown in figure 6, may be used as an alternative. Here the horizontal split by virtue of joints interconnecting the lower 42 and the upper backrest part 41 is replaced by a flexible element 210, such as a plate of plastics, wood, metal, fibreglass or other suitable material, providing the desired flexibility. Alternatively, the entire backrest 40, i.e. both the lower and upper parts, may be made from a flexible material assuming a curvature adapted to the user upon reducing the distance between the upper end of the backrest and the rear edge of the chair seat. In such an embodiment, however, the flexible material should have a resistance against allowing it to be bent from its convex shape toward the user's back, to a concave shape, which would be unfavourable. The material may possibly have an increasing flexibility in an upwards direction, e.g. from the rear edge of the chair seat and towards the upper edge of the backrest 40, for example by virtue of a decreasing material thickness or a variable thickness in order to obtain flexibility in certain areas.

[0031] In the aforementioned examples, the device according to the present invention has been shown by virtue of pivot axes positioned in the core of the seat back, theoretically depicted as a plane in the transverse direction having no or minimal horizontal transverse curvature, as opposed to that normally depicted for a backrest.

[0032] In figure 7A, however, the backrest is illustrated having a curved shape with an extension in the forward direction of side supports relative to the thickness of the

core. In the figure, the middle part of the backrest (near the plane of symmetry through the chair) is the area behind the dashed vertical line in the back, whereas the side supports on the right and left sides of the chair are areas in front of the dashed line.

[0033] In figure 7B, an example of horizontal frame parts is shown in perspective, the frame parts of which may provide such a curvature in the transverse direction of the backrest 40. Advantageously, and by virtue of the backrest having a transverse curvature, the joints providing the pivot area of the backrest may be positioned at the outer transverse sides of the backrest 40, in pairs and in parallel upwards at each side of the backrest, as shown in the figure by virtue of the four pairs of joints having pivot axes 211-214.

[0034] In this embodiment, the central and middle part of the backrest 40 will be squeezed together upon reclining, as shown in figure 8. The pivot axes 211-214 of the four pairs of joints used keep their distances relative to each other, but the effective length of the middle "spine" of the chair is shortened from a length "k" in the upright position, as shown in figures 7A and 7B, to a shorter length "l" in the reclined position, as shown in figure 8. Such a reduction in length of the middle portion of the backrest will smooth out the curvature of the backrest relative to the curvature of the user's own back, whereby the user will not experience a "shirt lift" in the back, i.e. the backrest will not pull up the user's clothes in the back or provide unpleasant frictional movement when the backrest is reclined, which conventional chairs inconveniently do. The shortening from value k to value l may assume any value in accordance with what is desired to achieve, but may be e.g. a shortening in the range of 60% to 10%, possibly in the range of 40% to 25%.

[0035] In this manner, the present invention provides a device, and a chair provided with such a device, providing good support for the user's back, possibly also for the user's head, by ensuring full contact between the back of the chair and the user's back, possibly also correct positioning of the headrest relative to the user's head.

[0036] The device is simple and can be made with few parts and is uncomplicated to assemble, which provides high flexibility and user friendliness and also reduces the risk of malfunctioning, such as unintentional locking of mechanisms. Moreover, the device provides for advanced adjustment of the backrest in a simple manner otherwise requiring many and complicated parts in addition to required support- or frame structures.

Claims

1. A device for a chair comprising an undercarriage (10) with a support unit (20) for a chair seat (30) and a backrest (40), the chair seat being pivotally connected to the support unit about a first pivot axis (1), and the backrest being pivotally connected to the chair seat,

characterized in that:

- the backrest (40) is split horizontally into at least an upper back part (41) and a lower back part (42) pivotally connected to each other about a second pivot axis (2),
- a pulling element (50) is pivotally connected to the support unit (20) about a third pivot axis (3) positioned behind the first pivot axis (1), and pivotally connected to the chair's upper back part (41) about a fourth pivot axis (4);
- the chair seat is pivotally connected to the pulling element about a fifth pivot axis (5) positioned behind the first pivot axis (1) and the third pivot axis (3); and
- at least one of the first, third or fifth pivot axes (1, 3, 5) is displaceable relative to at least one of the parts pivoting about said pivot axes.

5

10

15

20

25

30

35

40

45

50

55

2. The device according to claim 1, wherein at least, in addition, one of the second, fourth or fifth pivot axes (2, 4, 5) is displaceable relative to at least one of the parts pivoting about said pivot axes.
3. The device according to claim 1 or 2, wherein the displacement of the pivot axes is provided by one or more of: a recess receiving a pivot bolt, a double joint or a rail, or combinations thereof.
4. The device according to any one of claims 1 to 3, wherein the upper backrest part (41) is pivotally connected to the lower backrest part (42) via one or more pivot elements or flexible elements (210), or combinations thereof, for example by joints or bendable elements.
5. The device according to claim 4, wherein one or more of the pivot elements have limited angular deflection (s), preferably adjustable angular deflection(s).
6. The device according to claim 4 or 5, wherein the pivot elements or the flexible elements are positioned in the middle transverse portion of the backrest.
7. The device according to claim 4 or 5, wherein the pivot elements or the flexible elements are positioned in pairs and in parallel upwards at the outer transverse areas of the backrest.
8. The device according to claim 7, wherein a backwards pivoting of the pivot elements or the flexible elements causes a reduction in length of the middle portion of the backrest, preferably a mainly vertical reduction in length.
9. The device according to claims 4-8, wherein the pivotal elements or flexible elements are adjustable in

height and displace the horizontal split of the back (40) in the vertical direction.

10. The device according to any one of the preceding claims, wherein at least the main part of the chair back (40) consists of a flexible element, preferably with varying flexibility in the longitudinal direction. 5
11. The device according to any one of the preceding claims, wherein the pulling element comprises a bow, preferably a bow with an angle, wherein a front end is pivotally connected to the support unit about a third axis (3), and wherein an upper end is pivotally connected to the upper backrest part about a fourth axis (4). 10 15
12. The device according to any one of the preceding claims, wherein the reclining of the chair seat (30) is springloaded. 20
13. The device according to claim 12, wherein the spring-loading is provided by virtue of a springing action between one or more of the support unit (20) and the chair seat (30), the support unit (20) and the pulling element (50), the pulling element (50) and the chair seat (30), the pulling element (50) and the upper back part (41), the upper back part (41) and the lower back part (42). 25
14. The device according to claim 12 or 13, wherein the spring-loading is provided by one or more springs selected from a coiled spring, a leaf spring, a torsion spring or a flexible material. 30
15. The device according to any one of the preceding claims, wherein the upper end of the pulling element (50) or the upper backrest part (41) comprises a headrest (80), preferably a height adjustable and/or pivotal headrest. 35 40
16. A chair comprising a device according to claims 1-15, particularly a desk chair. 45 50 55

Fig. 1

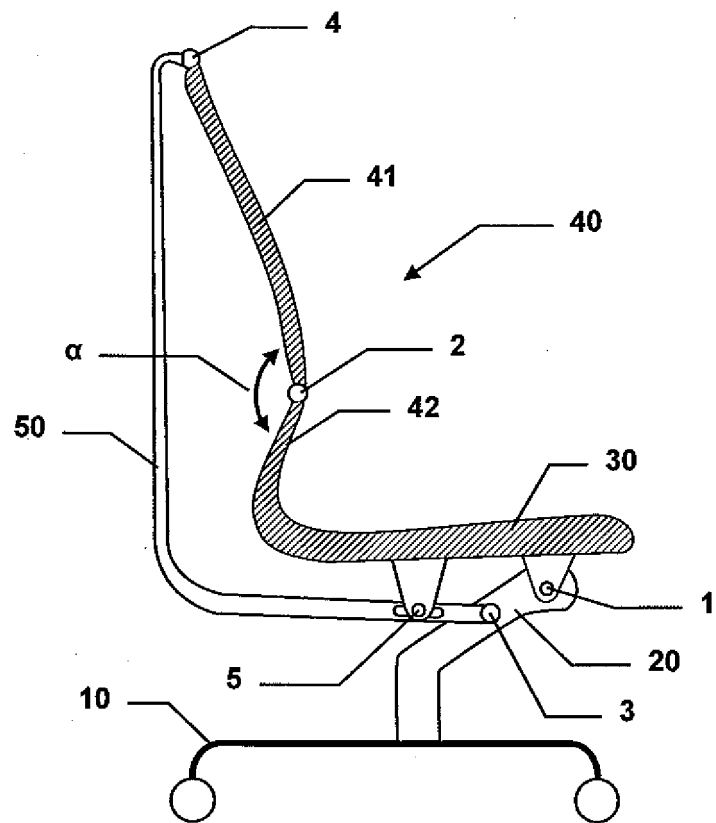


Fig. 2

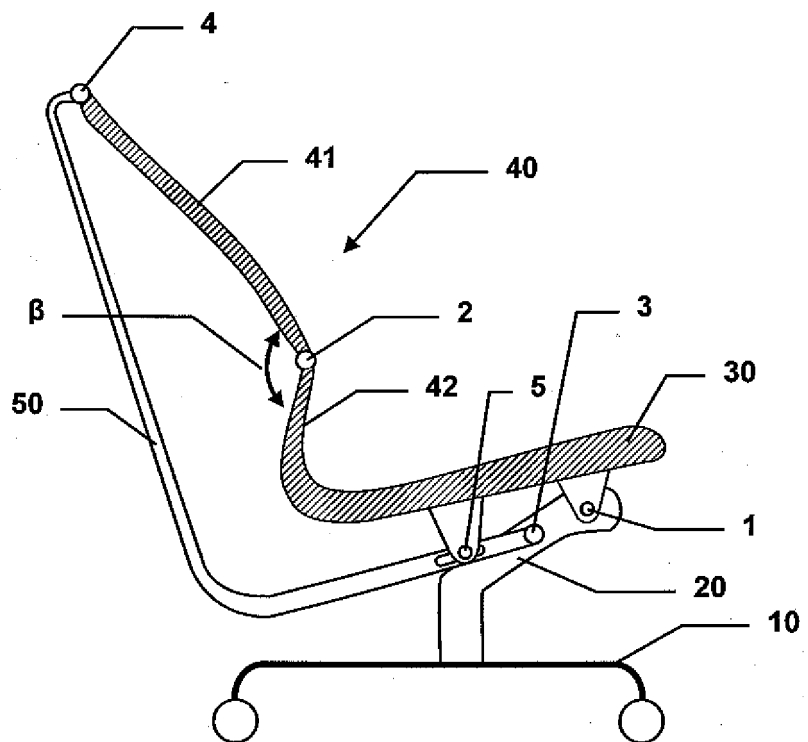


Fig. 3

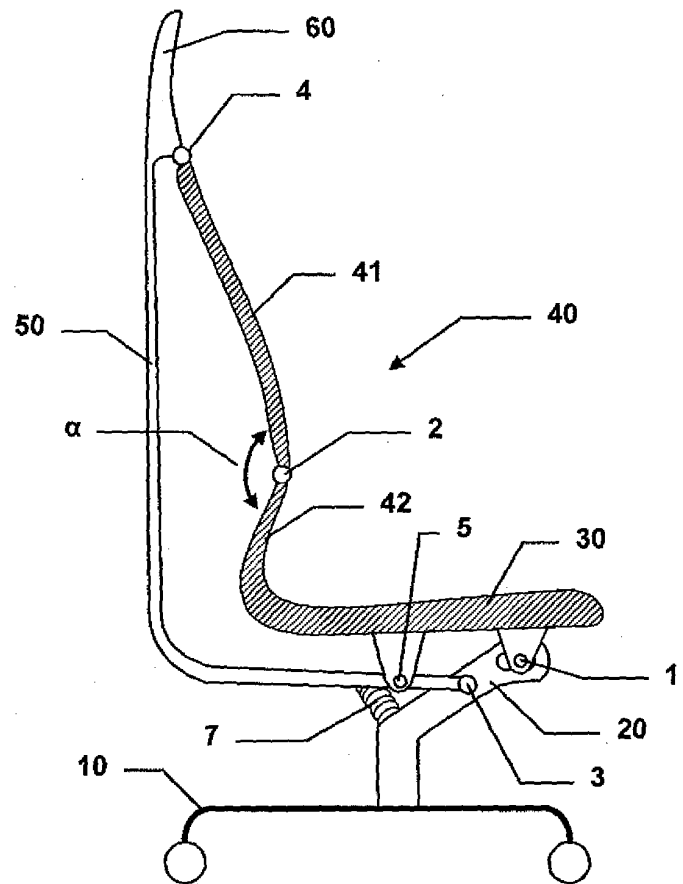


Fig. 4

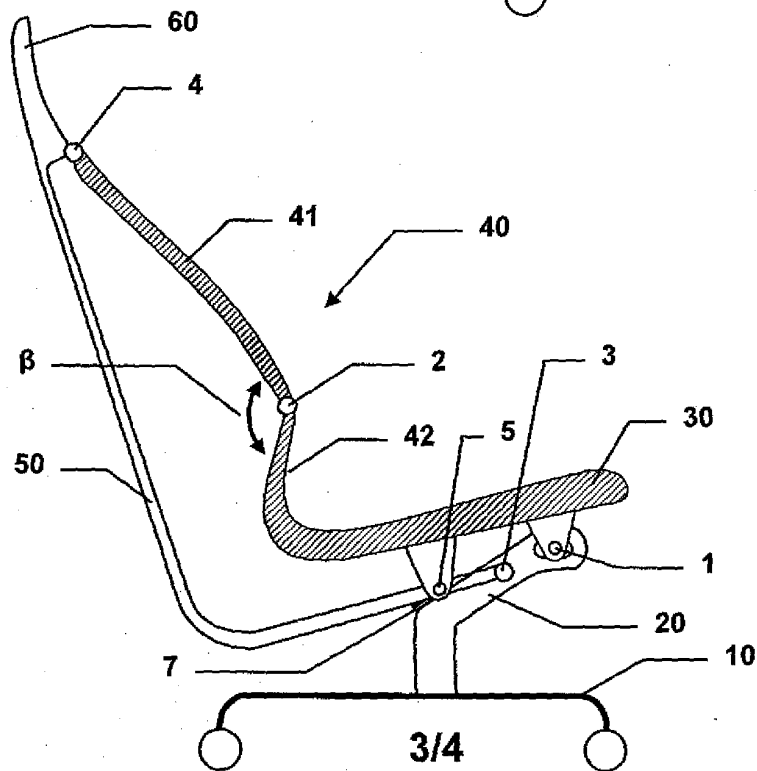


Fig. 5

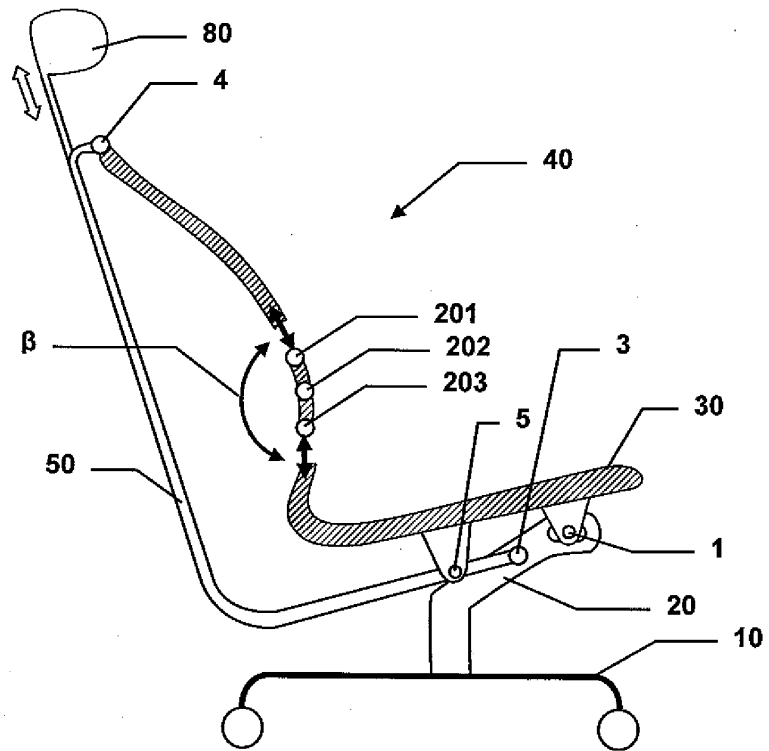


Fig. 6

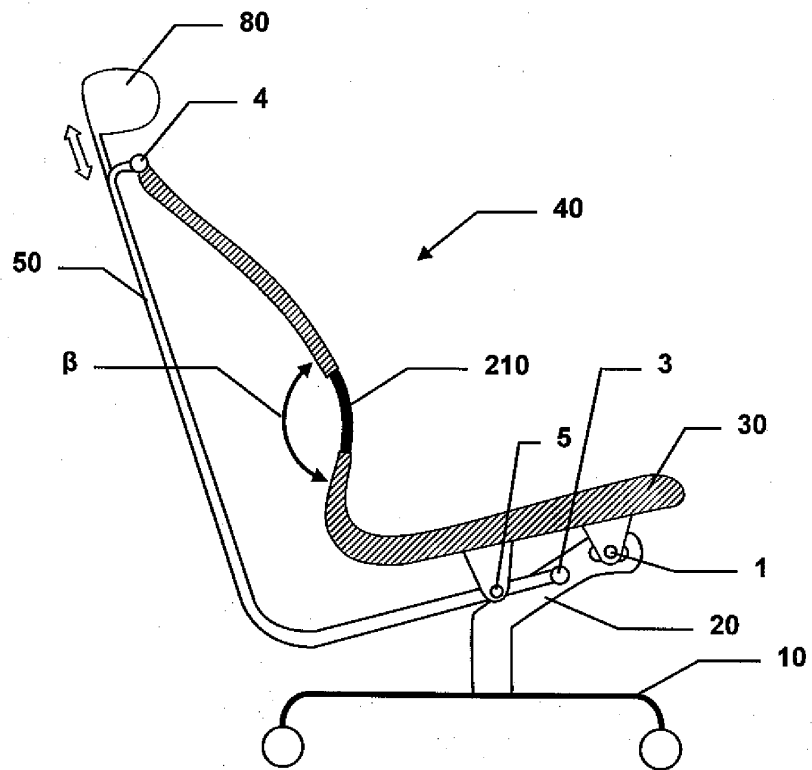


Fig. 7A

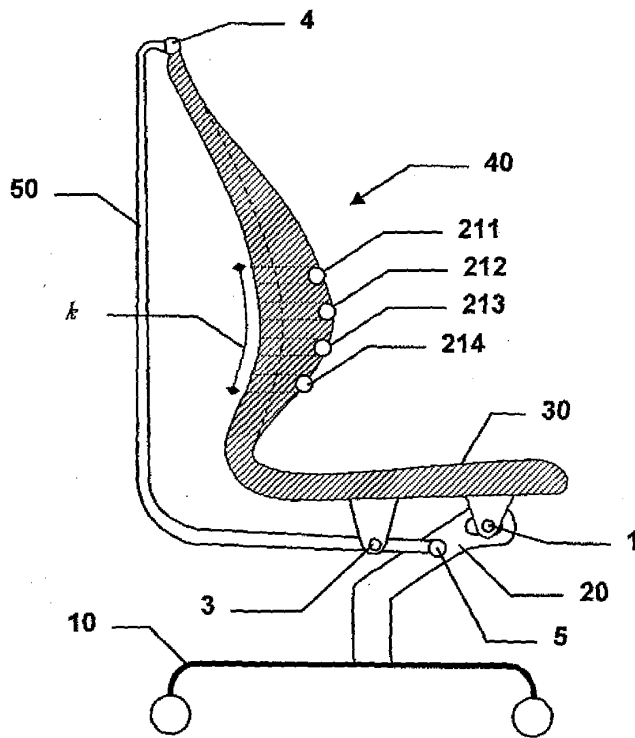


Fig. 7B

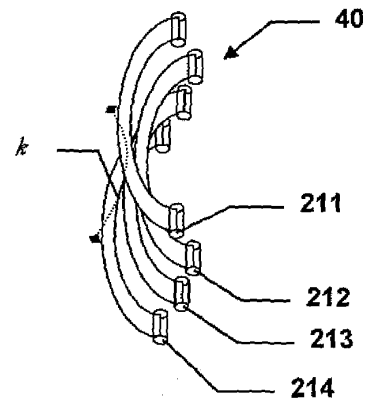
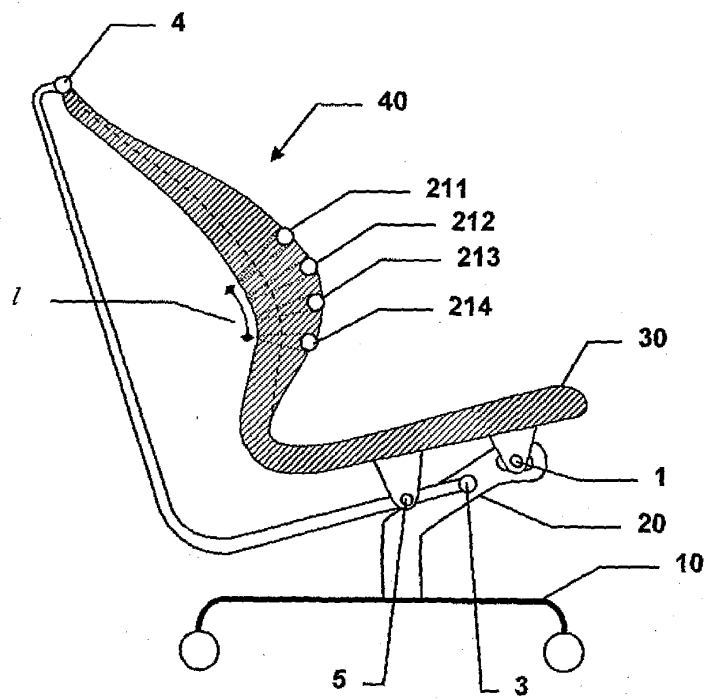


Fig. 8





EUROPEAN SEARCH REPORT

Application Number
EP 09 15 4755

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 42 16 159 A1 (KLOEBER GMBH) 18 November 1993 (1993-11-18) * figures *	1-16	INV. A47C1/032 A47C7/46
A	DE 199 30 922 A1 (OKAMURA MFG CO LTD) 4 May 2000 (2000-05-04) * figures *	8,10	
A	US 2002/149247 A1 (DIFFRIENT NIELS) 17 October 2002 (2002-10-17) * figures 3,4,22,34 *	15	
A	EP 0 559 185 A (SDM HANSEN AG) 8 September 1993 (1993-09-08) * figures *	1	
A	EP 0 343 450 A (ROEDER GMBH) 29 November 1989 (1989-11-29) * figures *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 June 2009	Examiner Kis, Pál
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 2
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 15 4755

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-06-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 4216159	A1	18-11-1993	NONE	
DE 19930922	A1	04-05-2000	US 6257665 B1	10-07-2001
US 2002149247	A1	17-10-2002	NONE	
EP 0559185	A	08-09-1993	DE 4306546 A1	09-09-1993
EP 0343450	A	29-11-1989	CA 1320676 C	27-07-1993
			ES 2032626 T3	16-02-1993
			JP 2191410 A	27-07-1990
			US 5071189 A	10-12-1991