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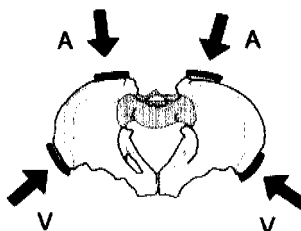
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(54) **Work chair with forward tiltable seating part and support for upper body**

(57) This invention offers a support for the body in a bended seating posture by decreasing the overloads of the body in the region of the pelvis, legs, back and servical muscles in such a way that the freedom of movement of the upper body is not being hindered. The invention pro-

vides of a working chair with a combination of a tilting construction for the forward tilting of the seating part together with a support construction, to support the front side of the ilium in a limited forward bended seating position.

Drawing 2



Description

[0001] Some professions bring along the situation that working in a more or less forward bended seating position is necessary because the sitting treator has to be able to move above the to be treated subject or object to have a clear view and the necessary freedom of movement in treating. This causes exceeding loads to the leg muscles, the pelvis, the spinal column, dorsal muscles and the cervical muscles.

[0002] Several findings exist that aim to decrease a load of the body in those working postures. For instance, the patent US2002158492A1 proposes a torso support at the front and the patent WO2007115418 proposes a torso support in combination with a back support. Except from the fact that in the known solutions the adaptation of those supports is fixed to one position and that for any different position an adaptation is needed, also the support at the height of the breast is hindering the freedom of movement of the user. This is especially a problem where complex and precision work is needed in the treatment such as for example is the case at dental surgery or dentists. Some chairs exist that offer a possibility to tilt, that makes it more easy to bend forward, but in those cases extreme forces of the legs are needed aside from the load of the upper body because the body is not supported at the front.

[0003] It is the aim of this invention to offer an effective support for the body in a bended seating posture and to lower the overloads of the body in the region of the pelvis, legs, back and servical muscles in such a way that the freedom of movement of the upper body is not being hindered.

[0004] This aim is being reached by providing the work chair in combination with a tilting construction for the forward tilting of the seating part together with a support construction, to support the front side of the ilium in a limited forward bended seating position. By the use of such a support the weight of the body is partly carried by the front of the ilium and the legs are deloaded significantly. Also the ilium is forced into a fixed position, which decreases uncontrolled torsal movements of the two parts of the ilium and more support is offered for the movement from out of the spinal column. Such a support device can for instance exist of a support surface that is placed in a fixed position in relation to the seating surface, that supports the ilium at the front side whilest bending forward. A further version of the invention provides in a support device for support of the ilium in which the ilium of the one seated is clamped by a configuration of a for this purpose fixed and in relation to each other adjustable seating part, a front support and a back support. To enhance an effective support in all positions in between sitting upright and being bended forward upto the limited forward bending seating posture, the invention makes use of a spring device with an adjustable force in relation to the weight of the user, that is working against the tilting movement of the seating part and by doing so is working

against the whole configuration. The user can hereby bend forward against the spring force and supported by the configuration, through which the legs are disloaded proportionally.

[0005] To make the tilting of the configuration more comfortable the invention makes use of a position of the tilting point around an axis behind the centre of gravity, so that a decreased pressure on the legs can easily start the tilting movement around this axis without any further effort. This enables a dynamic seating posture, in which every seating position between being bended forward and sitting upright can be reached by relocating the feet or by lowering or increasing the tension of the leg muscles thus changing the counter pressure, which enables the configuration to tilt upto an aimed position and than again slightly changing the counter pressure to remain the balance or to slightly increase the counter pressure by using the leg muscles until the next aimed position is reached and then changing the counter pressure again to remain in balance. The benefit of this is that the body load of the bending forward is decreased by the fact that the system is supporting both pelvis and legs in every position and that without any extra mechanical adaptation but strictly through dynamic body movement every position between sitting upright and bending forward can be reached and also the unthoughtful or uncontrolled movement such as torsion of the ilium and lower back is being counter worked and full concentration can be given to a correct movement from out of the spinal column.

[0006] In a possible version of the invention the support device of the ilium is existing of a configuration of seating part (22) that is supporting the seating bones and a back part (21) that is supporting the back part (A) of the ilium and two both anatomically to the body shaped cushion supports (19 and 19') to support the two front parts (V) of the ilium, for the aim of which those cushions (19 and 19') are mounted to an arm (20) respectively (20') that is mounted to or near a side of the chair under or beneath the seating part and that can be turned away sideways by a hinge that is mounted more or less parallel to the seating direction in such a way that every arm (20 and 20') can also be adapted in an axial direction and thus can be fastened in both directions without any steps. This enables the configuration to be adjusted to diversing dimensions of the diverse users. Possibly the cushion supports (19 and 19') can be mounted turnable in an axial way in or around the arms (20 and 20'), so that the corner adjustment of the cushions is self-seeking.

[0007] A possible version of the invention containing a tiltable configuration of seating and ilium supports with all mentioned turning and adjustabilities mounted on an in height adjustable basis with wheels will be described hereafter by using a drawing:

[0008] On a star foot (1) with wheels a column is mounted (2) in which a second in height adjustable column (3) is mounted conform the known technical solutions used by office chairs. At the upper end of the second column (3) a horizontal profiled plate (4) is mounted, with at the

back side of the column (3), parallel to the front and back side of the chair behind the centre of gravity of the seating position a combination of a horizontal rotation and torsion axis (5) is mounted and around which a assembly of profiled mounting panels (4) and (6) for the tilting movement of the configuration of the seating part and other ilium supports limitedly rotatable is hung up with the counter pressure of the torsion axis (5) connected to a lever (9) provided with a adjustment bolt (18) for varying the pressure. The assembly of mounting panels (4) and (6) and the components mounted to those, existing of support arms (20), back support (21) and seating part (22), enables adjustment of diverse positions of diverse components because the profiled mounting plate (4) that is mounted turnable to the column is provided on both sides with a crossed to the torsion- and rotation axis (5) standing axis (11) that is mounted between vertical flanges (12) and along which the second mounting panel (6) can move axial by use of bearing cylinders that are positioned between folded flanges (6') and to which support arm (20)(20') for the ilium support (19) (19') by use of a bearing cylinder (23) is mounted axial movable along the axis (11), whereby the support arm (20) can also rotate freely around this axis (11).

[0009] The stepless synchronic movement of the arms and fixation in every wished position is reached by connecting the bearing arms (20 and 20') each from out of a mounted lever excentric and crossed over by using beams to a turning point on a central turnable mounted circular part (15) on the axial moving mounting panel (6) and an excentric point on that part (15) or one of those arms (20 or 20') or one of the beams (15)(16') with a self blocking gas spring (18) that is connected with the other end tot the moveable mounting panel (6). Through this only one arm part has to be moved in direction of the body and pressed with the support cushion (19) against the ilium and block both arms in this position by blocking of the gas spring as soon as the movement is stopped. Be deblocking the gas spring in a technical known way both arms (20 and 20') are being pushed away sideways, one to the left and one to the right thus enabling the one seated to stand up unhindered. The axial movement can be blocked by a lever (24) that is hooking into the holes in the mounting panel (4) or for example in a technical known clamping device that grips around the bearing axis (11) and is mounted to the mounting plate (6) with which the arm is connected.

[0010] The back support (21) and the seating part (22) can be produced or furnished with soft or hard material. The preference is given to material with a spring characteristic. The seating surface strictly only needs a support for the seating bones (0) of the ilium. To enlarge the feeling of stability and comfort here it was chosen for a longer seat. With an adaption the support of this part at a forward bended posture would move away from the upper legs. Therefore the invention foresees in a seat that also supports a part of the upper legs with the characteristic that after the part to which the ilium is leaning, the seat can

bend back, against a light spring pressure and that in the posture of sitting upright the seat is being pushed down by the legs in such a way that in the posture of being bended forward the legs are noticeably slightly supported.

Claims

1. Conclusion 1: Work chair with a foreward tiltable seating part and a support for the upper body with the characteristic that is providing a movable support device that is positionable in an adjustable fixed position in relation to the seating part that is located with an, preferably anatomically to the body shaped part to the upper part of the front side (V) of the ilium and on this position in exchanged with the support of the mounted support to the ground, or on a to the chair mounted support, actively leaning legs, is supporting the upper body when tilting as soon as pressure is emerging or the limitation of the tilting devise is reached.

2. Conclusion 2: Work chair following conclusion 1 with the characteristic that is providing a relatively to the seating part and front support fixed mounted support for the back side of the ilium of the one seated,

3. Conclusion 3: Work chair following conclusion 1 and or 2 with the characteristic that the seating part together with the moving support parts for the ilium is tilting around a turning point, that is located behind the centre of gravity of the one seated.

4. Conclusion 4: Work chair following conclusion 1 and or 2 and or 3 with the characteristic that it provides an in force adjustable spring device with wich the tilting of the seat part and the support parts for the ilium that are mounted to the seat part in a fixed position, more or less can be compensated.

5. Conclusion 5: Spring device following conclusion 4 with the characteristic that it exists of an in the axis (5) around which the seating part is tilting, included, in the not tilting part of the chair part anchored torsion-axis (5), with help of which a to this part connected lever (9) and a queer to that lever mounted adjustable bolt (18) that is leaning on the lower part of the seat part (4) in such a way that tilting of the seat part more or less can be compensated.

6. Conclusion 6: Support of the ilium at the front side following conclusion 1, 2 and 3, 4 and 5 with the characteristic that it is formed by two seperately of each other mounted, on the position of the upper part of the ilium adjusted form and angle, in axial and radial direction movable and in every position fixable support surfaces that each is supporting an upper front side (V) of the ilium.

7. Conclusion 7: Support device of the ilium following conclusion 6 with the characteristic that every support is mounted to a separate bearing arm (20) (20'), that is mounted movable around an axis in such a way that it can be moved at the front of and to the one seated and can be turned sideways to the left respectively right of the one seated.

8. Conclusion 8: Support device of the ilium following conclusion 6, 7 with the characteristic that the support areas (19 and 19') lie in a V-shaped angle to the ilium (V) and compress the ilium at the front when forward pressure at the front is occurring.

9. Conclusion 9: Support device of the ilium following conclusion 6 and 7 and 8 with the characteristic, that the part that is leaning to the ilium has the characteristic of a cushion.

10. Conclusion 10: support device following conclusion 6, 7 and 8 and 9 with the characteristic that the two supports (19) and (19') and the to those connected support arms (20) and (20') are connected in such a way that movement of each one support arm is synchronically leading to a mirrored movement of the other support arm.

11. Conclusion 11: Support device following conclusion 10 with the characteristic that the connection between the support arms (20) and (20') consists of crossed over excentric connections to a centric turnable mounted plate (15) by use of two beams (16) and (16') by which every time one beam is connected turnable to one lever at one support arm (20) or (20').

12. Conclusion 12: Support device following conclusions 6, 7, 8, 9, 10 and 11 with the characteristic that both support arms (20) and (20') are being fastened by a common fixation system.

13. Conclusion 13: Fixation system following conclusion 12 with the characteristic that fixation for the axial movement is realised by a self blocking gas spring (18) that on the one side is connected to one of the support arms (20) or (20') or to the plate (15) or to the beams (16) or (16') with which both arms are connected and at the other side to a fixed point at the mounting panel (6).

14. Conclusion 14: Support device following conclusion 7 with the characteristic that the axial adjustment of the arms with the support for the ilium is existing of two at both sides between two plates of a mounting plate of the seating part queer to the for forward tilting of that seating part mounted torsion and rotation axis, where around a between plates and to a second mounting panel included bearing with between them a bearing cilinder with a to this

cilinder connected support arm and support for the front side (V) of the ilium is axial movable mounted.

15. Conclusion 15: Work chair following conclusion 1 and further with the characteristic that the contact surface of seating and support parts of front and back side (A) of the ilium are made from a soft flexible material.

16. Conclusion 16: Work chair following conclusion 1 with a seating part that is reaching further under the upper legs than strictly necessary for the support of the ilium with the characteristic that the part of the point where the support of the seating bones is stopping, is hinging down and is being held in surface with the other part by using spring pressure.

17. Conclusion 17: Work chair following conclusion 1-16 and also standing for itself by shown preferent version following pictures 2 and 3 with the characteristic, that it exists of a star foot (1) with wheels with on it a mounted column (2) with in it a second in height adjustable column (3) using known technic of office chairs, with on top of the second column (3) a horizontal mounted profiled mounting panel (4), with a to the back of the column (3), parallel to the projected front- and back side of the chair behind the centre of gravity of the seating posture mounted combined horizontal rotation- and torsion-axis (5) around which an assembly of profiled mounting panels (4) and (6) for the tilting movement of the configuration of the seating part and pelvis supports is limitedly rotatable hung up by counter pressure of a to the torsion - axis (5) connected lever (9) provided with a adjustable bolt (18) for the variable pressure adjustment. The assembly of the mounting panels (4) and (6) and the to those mounted components existing from support armes (20) with anatomically to the body shaped support cushions (19) and (19'), back support (21) and seating part (22) is characterizing itself further through the fact the the adjustment of divers positions of diverse components is made possible by a to the column turnable connected profiled mounting panel (4) that on every side is provided with a queer to the torsion- and rotation axis (5) standing axis (11) that is mounted between two vertical flanges (12) and along which the second mounting panel (6) can move in axial direction by bearing cilinders that are placed between bended plates (6') and to which support arm (20) for the pelvis support (19) is mounted movable axial along the axis (11), whereby the support arm (20) is also able to rotate around this axis freely.

The stepless synchronic movement of the arms and the fixation in every wished position is reached by the support arms (20 and 20') excentriely and crossed over by use of beams and a lever to a turning point to connect on a central turnable mounted

plate (15) on the axial movable mounting panel (6) and that centric plate (15) or one of those arms (20) or (20') or one of the beams (16) or 16) to connect with a self blocking gas spring (18) that is connected to the other side of the movable mounting panel (6).
Through this solution only one arm part has to be moved in direction of the body and pressed with the support cushion (19) to the body and block both arms in this position by blocking of the gas spring. By unlocking the gas spring both arms (20 and 20') are being turned away by the gas spring (18) sideways to the left and right and the one seated is free to stand up.
The axial movement can be blocked through a lever (25) that is hooking into holes in the mounting panel (4) or for example a clamping devices that includes the bearing axis (11) or (11') and is mounted to the mounting plate (6) to which the arm is connected.

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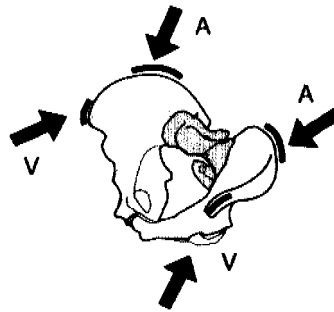
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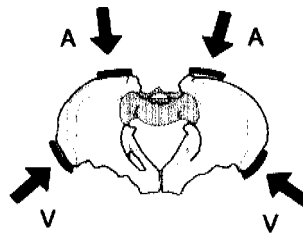
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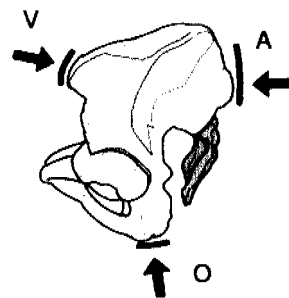
Drawing 1

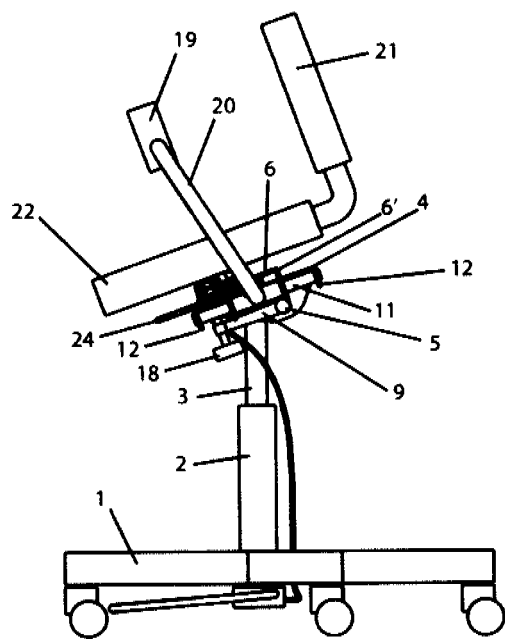


Drawing 2

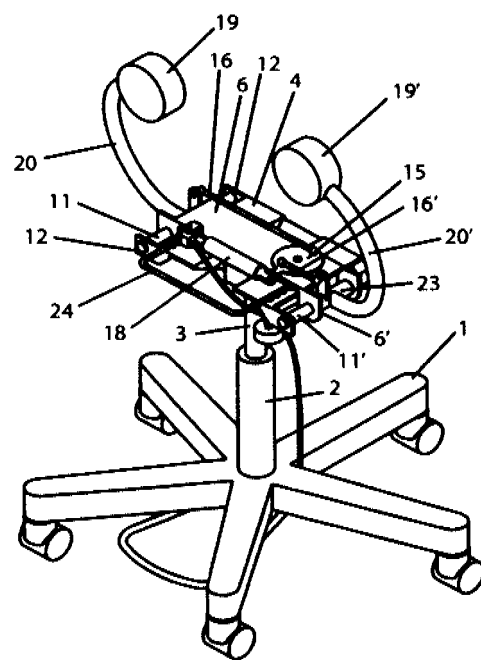


Drawing 3





Drawing 4



Drawing 5

**PARTIAL EUROPEAN SEARCH REPORT**

Application Number

which under Rule 63 of the European Patent Convention EP 09 01 2509 shall be considered, for the purposes of subsequent proceedings, as the European search report

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	CN 101 088 434 A (LI) 19 December 2007 (2007-12-19) * figures *	1-5, 15-16	INV. A47C9/00 A47C7/14
X	DE 203 00 157 U1 (HSU CHANCHUN) 24 April 2003 (2003-04-24) * figures *	1-9,14	
A	US 1 836 630 A (THUM) 15 December 1931 (1931-12-15) * figures *	16	
A	NL 1 028 301 C2 (DEKKER) 17 August 2006 (2006-08-17) * figures *	1	
A	CH 486 232 A (HERLEEN) 28 February 1970 (1970-02-28) * figures *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
INCOMPLETE SEARCH			
The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims. Claims searched completely : Claims searched incompletely : Claims not searched : Reason for the limitation of the search: see sheet C			
Place of search		Date of completion of the search	Examiner
The Hague		16 March 2010	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			



**INCOMPLETE SEARCH
SHEET C**

Application Number

EP 09 01 2509

Claim(s) completely searchable:
1-16

Claim(s) not searched:
17

Reason for the limitation of the search:

Rule 43(6) EPC

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

EP 09 01 2509

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
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16-03-2010

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REFERENCES CITED IN THE DESCRIPTION

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- WO 2007115418 A [0002]