Description

DEVICE FOR SEAT TILT ADJUSTMENT OF A CHAIR

The invention relates to a device for seat tilt adjustment (seat angle adjustment) of a chair, in particular an office chair.

High-quality office chairs are often equipped with a so-called synchronous mechanism, by means of which the seat and the backrest of the chair pivot together in a backwards and downwards movement in response to a reclining of the user in a correlated movement. Furthermore, different adjustment possibilities are known for improving the ergonomics of office chairs, such as, for example, the height adjustment of the seat, backrest and armrest, the adjustability of the armrest in longitudinal and lateral position as well as the longitudinal adjustment of the chair.

Furthermore, to further improve the ergonomics of office chairs, an adjustability of the base angle of the chair is called for to an increased extent. It should thereby at least be possible to adjust the seat between a horizontal position and a position, which is inclined slightly forwards. In response to the activation of the synchronous mechanism, the backwards downwards pivot movement of the chair, caused with it, is thus carried out from this position.

It is an object of the invention to provide a seat tilt adjustment of a chair, which enables a particularly safe and reliable adjustment of the seat tilt.

This object is solved by a device as claimed in claim 1.

As claimed in the invention, the device comprises a base support, a seat support connected to the base support by means of a joint as well as an adjustment mechanism, which allows a selectively forward pivot movement of the seat support beyond a substantially horizontal base position.

It is a basic idea of the invention to pivot the seat support itself beyond its base position so as to adjust the seat tilt of the chair. As claimed in the invention, the adjustment of the seat tilt may selectively either be turned on or off. This enables a particularly flexible handling, depending on the use and user request. Furthermore, the device as claimed in the invention can optionally be installed into an otherwise conventional synchronous mechanism. In other words, a refitting may be selected.

The subclaims specify advantageous embodiments of the invention. They are explained in more detail in the following description of an exemplary embodiment by means of the enclosed drawings.

Fig. 1 shows a perspective view of a synchronous mechanism in a horizontal base position,

Fig. 2 shows a side view of the synchronous mechanism from Fig. 1,

Fig. 3 shows a side view of the synchronous mechanism from Fig. 1 in an angle position,

Fig. 4 shows an exploded view of the adjustment mechanism,

Fig. 5 shows a top view onto the adjustment mechanism, set up for the angle position,

Fig. 6 shows a top view onto the adjustment mechanism, set up for the base position,

Fig. 7 shows a sectional view along the line AA in Fig. 6.

Fig. 1 shows an exemplary synchronous mechanism 1, that is, a component in the underframe of an office chair, which ensures a mutually coupled kinematics, which entails a certain relative movement of the seat and backrest to one another. For this purpose, a base support 2 is placed on a (non-illustrated) chair supporting post, on which base support 2 are mounted, on the one hand, a seat support 3, which is pivotable about a lateral axis and which is connected to the base support 2 in an articulated manner and, on the other hand, a backrest support 4, which is also pivotable about a lateral axis and which is connected to the base support 2 in an articulated manner.

The seat of the office chair, which is, as a general rule, provided with a padded seat, is mounted on the seat support 3 (not illustrated herein for reasons of clarity). For this purpose, provision is made on the lateral frame elements 5 of the substantially frame-shaped seat support 3 for a number of latches 7, which are arranged behind one another in the longitudinal direction 6 of the chair, said latches 7 serving the purpose of positioning and fastening the seat on the seat support 3 in an inherent manner, which is not explained in detail.

The backrest support 4, which extends backwards in an established manner from the actual synchronous mechanism 1, supports the backrest of the office chair at an arm (not illustrated), which runs upwards. The flanges 8, 9 of the backrest support 4, which is substantially bifurcate in top view, are arranged at both sides of the base support 2.

The seat support 3 and the backrest support 4 are coupled in an articulated manner such that a backwards pivoting movement of the backrest - as it can be caused by a leaning of the user against the backrest, for example - induces a lowering movement of the trailing edge of the seat. This correlated seat-backrest-movement entails a considerable comfort advantage and is desirable for orthopedic reasons. Provision is made on both sides of the base support 2 for operating levers 10, 11, which serve the purpose of triggering the height adjustment of the chair supporting post and for operating the pivoting mechanism, respectively.

The further set-up of the synchronous mechanism 1, in particular the connection of the seat support 3 and of the base support 2 via a guide configuration or the like for providing the correlated seat/backrest movement will not be further considered in the following.

For better understanding, however, it is pointed out that the seat support 3, at its front end region 12, is connected to the base support 2 via two swivel-slide joints 13. See Fig. 7, in which one of the swivel-slide joints 13 is illustrated in a section. On the one hand, each swivel-slide joint 13 is made up of a sliding element 14 connected to the seat support 3, which, on the other hand, is encompassed in a sliding guide, which is formed by means of two mutually spaced apart sliding flanges 15, 16, which are fixedly connected to the base support 2. In the illustrated horizontal base position, the upper sliding flange 15 stops at a stop element 17 at the seat support 3, which will be explained below in more detail. Through this, it is avoided that the seat support 3 completes a forwards pivoting movement, which extends beyond the substantially horizontal base position. Both sliding flanges 15, 16 encompass convex guide surfaces, which permit the sliding element 14 and thus also the seat support 3 connected to the sliding

element 14 to follow the pivoting movement backwards downwards. In other words, the sliding element 14 of the seat support 3, which is designed according to the type of a rail, moves with its upper side and its lower side along the guide surfaces of the upper and lower sliding flange 15, 16, wherein the sliding element 14, in any pivoting state between upper and lower sliding flange 15, 16, is guided in a particularly safe manner. Other types of joints can also be used.

An adjustment mechanism 18 as claimed in the invention is assigned to the seat support 3. As will be explained in more detail below, the adjustment mechanism 18 enables a safe and reliable adjustment of the seat tilt. An operating lever 19, which is arranged laterally at the synchronous mechanism 1 in the same way as the remaining operating levers 10, 11 and which can be operated by being removed and inserted in operating direction 20, respectively, is arranged for operating the adjustment mechanism 18.

In the exemplary embodiment, a forward incline of the seat support 3 about an angle α of approx. 3 degrees is possible by means of an adjustment of the seat tilt. Due to the seat/backrest correlation, this corresponds here to a deviation of the backrest about an angle β of approx. 8 degrees; see Fig. 3. These angle designations are only exemplary and serve the purpose of clarifying the functionality. In particular, they depend on the length of the stop elements 17 in the adjustment mechanism 18 and on the available displacement path, respectively, as well as on the concrete design of the synchronous mechanism 1.

Based on the "retracted" position of the adjustment mechanism 18 illustrated in Fig. 5, which corresponds to an angle position of the seat support 3 (as illustrated in Fig. 3), the function thereof is explained below. In the position of the adjustment mechanism 18 illustrated here,

the seat support 3 can be inclined forwards beyond its horizontal base position.

The adjustment mechanism 18 is substantially made up of a base plate 21, on which the actual elements of the mechanics are mounted, as well as of a cover plate 22. In the final mounted state, the base plate 21 of the adjustment mechanism 18 is covered by means of the cover plate 22, which is fastened to the base plate 21 by means of screws 23.

The adjustment mechanism 18 comprises two prism-shaped stop elements 17, 17', which are encompassed in the guide channels 24 of the adjustment mechanism 18, which extend in longitudinal direction 6. At the lower sides 59 of the stop elements 17, 17', provision is made for detent openings (not illustrated), which, when in "retracted" state, cooperate with detent knobs 60, which are arranged in the guide channels 24. The position of the stop elements 17, 17' in this state is additionally secured through this.

Double T-shaped cushioning elements 25, which are made up of a softer plastic material, for example rubber, are inserted in the stop elements 17, 17', which are made up of a plastic material. The front sides 26 of the stop elements 17 are completely covered by the cushioning elements 25. On their back sides 27, the stop elements 17 encompass slanted contact surfaces 28, which are oriented towards one another and in the direction to the center of the adjustment mechanism 18. In the "retracted" position shown herein, two angled wedge elements 29, 30 comprising wedge surfaces 31 being mounted thereon at the outer ends, which face away from one another, rest against the contact surfaces 28 of the stop elements 17. The wedge elements 29, 30, in turn, are located in guide channels 33 of the adjustment mechanism 18, said guide channels 33 extending substantially in lateral direction 32 extending

perpendicular to the longitudinal direction 6 and being connected with one another by means of a coupling mechanism 34, which will be described below in more detail.

One of the wedge elements 29 encompasses a recess 35, which is provided with slanting side walls and which serves as the support for the one end 42 of a substantially L-shaped steel spring 36. The bent end 42 of the steel spring 36 is thereby inserted into an opening of the wedge element 29 and is fixed therein so as to be rotatable.

The steel spring 36 is connected with the operating lever 19. The operating lever 19 is designed so as to be made up of two parts and consists substantially of an operating arm 37, which is curved so as to be slightly S-shaped and at the end of which an operating knob 38 is mounted and an operating slide 39 fixed on the operating arm by means of screws 23 in which the other end 40 of the steel spring 36 is fastened. For this purpose, the operating slide, similarly to the wedge element 29, encompasses an opening 41, into which the bent other end 40 of the steel spring 36 is inserted. The steel spring 36 is encompassed in a bifurcate guide element 43 at the operating slide 39, which, at the same time, serves as an anti-twist device. The operating slide 39 is guided in a lateral direction 58 in the base plate 21 of the adjustment mechanism 18.

The operating slide 39 encompasses a central opening 44, in which a catch element 45 is arranged. The catch element 45 serves the purpose of locking the adjustment of the seat angle in the horizontal base position and in the angle position, respectively, and is designed in such a manner that it interacts so as to catch with two correspondingly provided catch recesses 46, 47, which are arranged in the base plate 21 of the adjustment mechanism 18, see Fig. 4. When locked in place, the catch element 45 can be

disengaged, in each case, by means of a simple operation of the operating element 19.

In response to an operation of the operating element 19 in operating direction 20 towards the seat support 3, a movement of the steel spring 36 occurs in operating direction 20, wherein the one wedge element 29 is carried along. This wedge element 29, which, at its end facing the one stop element 17, encompasses a wedge surface 31, serves as an impellent wedge of a wedge gear and displaces the stop element 17, which now assumes the function of a driven component, perpendicular to the operating direction 20 in longitudinal direction 6. In other words, the stop element 17 is displaced in its guide channel 24 by the wedge element 29, which is arranged perpendicular thereto. Preferably, the wedge angle is 45 degrees. The displacement of the stop element 17 shortens the displacement path of the seat support 3, which is still available, by an amount, which corresponds to the width 48 of the outer ends of the wedge elements 29, 30. The corresponding position of the adjustment mechanism 18 is shown in Fig. 6. In other words, once the horizontal base position is reached, the stop element 17 rests against the upper flange 15 of the swivel-slide joint 13. A further displacement beyond this base position and thus a lowering the seat support 3 is then no longer possible. The seat support 3 is in its horizontal base position, as illustrated in Fig. 2.

For a particularly safe function of the adjustment mechanism 18, provision is made for the use of two stop elements 17, 17′ so that a stop against the corresponding sliding guides 15 occurs for both swivel-slide joints 13 of the seat support 3. For this purpose, the wedge element 17, which is directly impinged upon by the steel spring 36, is coupled with a second wedge element 30, which impinges upon the opposite stop element 17′ in the same manner. For this purpose, a movement of the opposite wedge element 30 in

opposition to the original operating direction 20 is required. In order to achieve this, a deflection of the movement occurs by means of a guide element 49, which is located on the base plate 21 of the adjustment mechanism 18 so as to be rotatable and which serves as a type of bridge. For this purpose, the guide element 49 encompasses, in its center, a bearing opening 61 for accommodating a pivot pin 62, which is mounted on the base plate 21 of the adjustment mechanism 18. At their ends located opposite the wedge surfaces 31, the two wedge elements 29, 30 encompass journals 50, which extend perpendicular to the operating direction 20 and which project into the long holes 51 of the guide element 49 and thus enable a mechanical coupling. In other words, the coupling of the two wedge elements 29, 30 is carried out by means of an indirect crank mechanism. To achieve a particularly safe guide of the wedge elements 29, 30, they encompass, at their lower side, a spring 52, which is encompassed in a corresponding groove 53 in the base plate 21 of the adjustment mechanism 18, see Fig. 7.

If the stop elements 17, 17′ are in the "extended" position, which corresponds to a horizontal base position of the seat support 3, the rear sides 27 of the stop elements 17, 17′ then rest against the front sides 54 of the wedge elements 29, 30, see Fig. 6. If pressure is put on the seat support 3, for example in that a user sits on the chair and puts pressure on the seat in the direction of the front end region 12, without supporting himself on the backrest, forces act on the stop elements 17, 17′ in longitudinal direction 6, which cause a jamming of the wedge elements 29, 30 between the rear sides 27 of the stop elements 17, 17′ on the one hand and the opposite shoulders 55 of the guide channel 33, on the other hand. If, in this situation, the operating element 19 is operated, that is, the steel spring 36 is retrieved into its starting position, which is shown in Fig. 5, the L-journal 56 of the steel spring 36 fastened to the operating slide 39 is

already in the position shown in Fig. 5, while the other L-journal 57 still remains with its journal end 42 in the position illustrated in Fig. 6. In this situation, the two L-journals 56, 57 form an obtuse angle between one another. The steel spring 36 is prestressed.

As soon as the seat support 3 is relieved of pressure, for example when the user stands up or leans against the backrest, the second L-journal 57 abruptly follows the first L-journal 56 and causes the movement of the wedge elements 29, 30 into the position shown in Fig. 5, whereby the stop elements 17, 17' can retract. This safety feature ensures that a sudden change of the adjustment of the angle is not possible. The transition from the one position into the other position always requires a "pressure relief" of the seat support 3.

This also holds true in the reverse case. If the seat support 3 is in the angle position (Fig. 5) and if pressure is put on the chair, the operating lever 19 can still be operated. In this case, the occurring forces cause a clamping of the rear sides 27 of the stop elements 17, 17' directly on the opposite sides 55 of the guide channels 33. The first L-journal 56 of the steel spring 36 is then already in the position illustrated in Fig. 6, while the second L-journal 57 is still in the position illustrated in Fig. 5. In other words, the L-journals 56, 57 form an acute angle. The steel spring 36 is prestressed.

In response to a pressure relief of the seat, an abrupt displacement of the wedge elements 29, 30 then occurs by means of the steel spring 36, which leads to an extension of the stop elements 17, 17'. As a result of these safety features, the operating element 19 is always slightly movable. At the same time, an adjustment takes place only if the seat is relieved of pressure, that is, never offhand.

List of Reference Numerals

1	synchronous mechanism
2	base support
3	seat support
4	backrest support
5	frame element
6	longitudinal direction
7	latch
8	flange
9	flange
10	operating lever
11	operating lever
12	front seat end
13	swivel-slide joint
14	sliding element
15	sliding flange
16	sliding flange
17	stop element
18	adjustment mechanism
19	operating lever
20	operating direction
21	base plate
22	cover plate
23	screw
24	longitudinal guide channel
25	cushioning element
26	front side
27	rear side
28	contact surface
29	wedge element
30	wedge element
31	wedge surface
32	lateral direction
33	lateral guide channel
34	coupling mechanism

35 recess
36 steel spring
37 operating arm
38 operating knob
39 operating slide
40 spring end
41 opening
42 spring end
43 guide element
44 opening
45 catch element
46 catch recess
47 catch recess
48 change of the displacement path
49 guide element
50 journal
51 long hole
52 spring
53 groove
54 front side
55 side
56 L-journal
57 L-journal
58 lateral guide
59 lower side
60 detent knobs
61 bearing opening
62 pivot pin

CLAIMS

1. A device for seat tilt adjustment of a chair, in particular an office chair,
   - comprising a base support (2),
   - comprising a seat support (3) connected to the base support (2) by means of a joint (13) and
   - comprising an adjustment mechanism (18), which allows a selectively forward pivot movement of the seat support (3) beyond a substantially horizontal base position.

2. The device according to claim 1, wherein the joint (13) is a swivel-slide joint.

3. The device according to claim 2, wherein the joint (13) comprises a sliding element (14) connected to the seat support (3) and a sliding guide (15, 16) connected to the base support (2), in which sliding guide (15, 16) the sliding element (14) is placed.

4. The device according to one of claims 1 to 3, wherein the adjustment mechanism (18) is designed in such a manner that the operation thereof effects a change of the displacement path (48) of the seat support (3) in the joint (13).

5. The device according to one of claims 1 to 4, wherein the adjustment mechanism (18) is part of the seat support (3).

6. The device according to one of claims 1 to 5, wherein the adjustment mechanism (18) comprises at least one adjustable stop element (17, 17').

7. The device according to claim 6, wherein the at least one stop element (17, 17') is designed for stopping

against the base support (2), in particular against the sliding guide (15, 16) of the base support (2).

8. The device according to claim 6 or 7, wherein the adjustment mechanism (18) comprises a wedge gear for operating the at least one stop element (17, 17').

9. The device according to claim 8, wherein the adjustment mechanism (18) encompasses a spring element (36), which can be operated by an operating element (19) for moving a driving wedge (29, 30) of the wedge gear.

10. The device according to claim 9, wherein the spring element (36) may be operated without causing an adjustment of the at least one stop element (17, 17') as long as a pressure is put on the seat support (3).