

Description

Synchronizing mechanism

- 5 The invention relates to a synchronizing mechanism for a correlated seat/backrest movement of an office chair, having a base carrier, which can be placed on a chair column, a seat carrier and a backrest carrier.
- 10 The term "synchronizing mechanism" is intended to be understood as being assemblies in the seat substructure of an office chair which ensure the coupled kinematics which result in a certain movement of the seatrest and backrest relative to one another. The office-chair
- 15 seat, which is usually provided with an upholstered seat surface, is mounted on the seat carrier. The backrest carrier, which commonly extends rearwards from the actual synchronizing mechanism, bears the backrest of the office chair on an upwardly running extension
- 20 arm. The seat carrier and backrest carrier are usually coupled in an articulated manner such that a pivoting movement of the backrest in the rearward direction - as may be brought about, for example, by the chair user leaning against the backrest - induces a lowering
- 25 movement of the rear edge of the seat in the downward direction.

- In order to change the "pivoting resistance" of the backrest, such synchronizing mechanisms usually have a
- 30 spring arrangement for prestressing the synchronizing mechanism. The level of prestressing here depends, inter alia, on the weight of the chair user.

- German Offenlegungsschrift 2026 929 discloses a chair
- 35 with an automatically adapting backrest in the case of which the rear part of the seat panel rises up when the user leans against the backrest and thus pivots the latter in the rearward direction. This is achieved by a

handle-design lever end of the backrest carrier butting constantly against the underside of the seat panel. In the case of the seat panel being lowered, the backrest moves forwards. If the user leans against the backrest,
5 the rear part of the seat is raised.

It is an object of the present invention to provide a synchronizing mechanism in which there is no need to adjust a spring force in order to change the "pivoting
10 resistance" of the backrest.

This object is achieved by a synchronizing mechanism according to Claim 1. Accordingly, it is provided that the backrest carrier, which can be pivoted about a
15 transverse spindle, is connected on the one hand to the base carrier, via a first link, and on the other hand to the seat carrier, via a second link, such that a pivoting movement of the backrest in the rearward direction induces a raising movement of the rear region
20 of the seat carrier. At the same time, the seat carrier is connected to the base carrier such that a raising movement of the front region of the seat carrier takes place.

25 A basic idea of the invention is that the user of the office chair "raises" himself upwards by subjecting the backrest itself to loading. In other words, by pushing back the backrest, upon actuation of the synchronizing mechanism, the user works against his own weight
30 resting on the seat. The desired "pivoting resistance" is thus established in a quasi-automatic manner on account of the weight of the user. There is no need for any prior-art spring-force adjusting means with high-outlay adjusting mechanisms (worm gear mechanisms, gearwheels, threaded rods, etc.). This considerably
35 reduces the production costs of the synchronizing mechanism. At the same time, the fail-safe properties of the mechanism increase.

Since the seat carrier is raised not just in its rear region, but, at the same time, also in its front region, the seat is carried along synchronously rearwards and upwards to a defined extent in relation to the backrest.

Advantageous embodiments of the invention are specified in the subclaims.

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It is particularly advantageous if the base carrier is connected to the front end region of the seat carrier via a linear guide. In this case, the seat moves synchronously with the backrest in linear fashion. In addition to guides with rectilinear guideways, other guideways are, of course, also possible. The synchronous movement of the seat carrier can be adapted individually by way of the configuration of the guide and of the position of the guide (for example the angle of inclination of the guide in relation to the horizontal), etc. It is thus, for example, possible for the seat carrier to be moved synchronously with the backrest in absolutely linear fashion without any "tilting" at all. However, "tilting" is also possible by way of a corresponding configuration of the guide. Further variants can be achieved by the connecting point between the base carrier and seat carrier being more or less remote from the front seat edge.

30 The lever geometry which is necessary for the "self-adjusting" mechanism of the present invention is achieved by the arrangement and configuration of the two links, it being the case that preferably the first link is provided with a pivot bearing, for producing a pivoting connection to the base carrier, and that the one link end is connected in an articulated manner to the seat carrier and the opposite link end is connected in an articulated manner to the backrest carrier. The

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movement of the seat carrier and backrest carrier relative to one another is thus defined by the position of the, in total, four hinge pins which run through the ends of the two links. At the same time, the
5 displacement of the seat carrier in relation to the base carrier is defined, on the one hand, by the linear guide in the front region of the seat carrier and, on the other hand, by the position and functioning of the pivot bearing on the first link.

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It is quite particularly advantageous if the first link and/or the second link are/is covered in the outward direction by a part of the backrest carrier and/or a part of the seat carrier. Such a concealed arrangement
15 "in the interior" of the synchronizing mechanism makes it possible to prevent soiling and damage to the pivoting mechanism.

In comparison with the solutions which are known from
20 the prior art, the invention presents a pivoting mechanism which is of comparatively straightforward design and considerably reduces the "shirt-pulling effect". In other words, a particularly high level of comfort is achieved without use having to be made of
25 relatively high-outlay and expensive solutions.

An exemplary embodiment of the invention is explained in more detail hereinbelow with reference to the drawings, in which:

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Figure 1 shows a perspective view of a synchronizing mechanism as seen obliquely from the rear,

Figure 2 shows a side view of the synchronizing mechanism in the basic position, and

35 Figure 3 shows a side view of the synchronizing mechanism in a rearwardly pivoted position.

All the figures show the synchronizing mechanism merely schematically with the constituent parts which are essential to the invention.

5 The synchronizing mechanism has a base carrier 1 which is positioned, by means of a conical mount 2, on the top end of a chair column (not depicted), see Figure 1. The synchronizing mechanism also comprises an essentially frame-like seat carrier 3 and a backrest
10 carrier 4, which is fork-like in plan view and of which the side pieces 5, 6 are arranged on either side of the base carrier 1. The seat carrier 3 is provided in order for a preferably upholstered seat surface (not depicted) to be accommodated or mounted thereon. The
15 mounting takes place in a conventional manner with the aid of fastening elements (not illustrated specifically). A backrest (not illustrated specifically), which in the case of modern office chairs is height-adjustable, is seated on the backrest
20 carrier 4. The backrest may also be connected integrally to the backrest carrier 4.

As can be seen from the figures, the entire synchronizing mechanism is constructed in a mirror-
25 symmetrical manner in relation to the centre longitudinal plane M, as far as the actual kinematics are concerned. To this extent, it is always assumed, in the following description, that the structural elements of the actual pivoting mechanism are provided in pairs,
30 on both sides.

Figures 1 and 2 show the basic position, in which the backrest carrier 4 assumes an essentially perpendicular position. Figure 3 shows the synchronizing mechanism in
35 a rearwardly pivoted position.

The backrest carrier 4, which can be pivoted in the pivoting direction S about a transverse spindle, is

connected to the base carrier 1 via a first link 7. The first link 7 here is provided with a pivot bearing 8, for producing a pivoting connection to the base carrier 1. The link 7 is articulated, with the aid of a bearing pin 9, on a side leg 11 of the base carrier 1, this side leg extending in the direction of the rear seat edge 10. The one free end 12 of the first link 7 is connected in an articulated manner, via an articulation 13, to a side arm 14 of the seat carrier 3, this side arm extending in the direction of the rear seat edge 10. The opposite free end 15 of the link 7 is connected in an articulated manner, via an articulation 16, to a side piece 5, 6 of the backrest carrier 4, this side piece extending in the direction of the front seat edge 17. The side arm 14 of the seat carrier 3 here runs parallel to the side leg 11 of the base part 1 and to the side piece 5, 6 of the backrest carrier 4. Whereas, however, the side arm 14 and side piece 5, 6 are arranged essentially in alignment, the side leg 11 is offset in the direction of the centre M of the chair in relation to the side arm 14. The first link 7 thus runs between the side leg 11 of the base carrier 1, on the one hand, and the side arm 14 of the seat carrier 3 or the side piece 5, 6 of the backrest carrier 4, on the other hand.

The first hinge pin 18, which is defined by the bottom end 15 of the link 7 being articulated on the backrest carrier 4, is arranged, as seen in the longitudinal direction 19 of the chair, behind the second hinge pin 20, which is defined by the top end 12 of the link 7 being articulated on the seat carrier 3. The angle α of the first link 7 in relation to the horizontal in the basic position is approximately 5° . It is also the case that, in a position in which the synchronizing mechanism is pivoted rearwards to the maximum extent, there is no change in this order in which the hinge pins 18, 20 are arranged. In the rearwardly pivoted

position, as is illustrated in Figure 3, the first link 7 likewise slopes forwards, although in this case it encloses an angle β of approximately 12° with the vertical. In addition, the first hinge pin 18 always runs beneath the second hinge pin 20, as seen in the vertical direction.

The pivot bearing 8 is arranged outside the centre of the link, that is to say it is offset slightly in the direction of the second hinge pin 20. The pivot spindle 21, which runs through the pivot bearing 8, runs parallel to the two hinge pins 18, 20. In accordance with the course taken by the hinge pin 18, the two bottom ends 15 of the two first links 7 of the synchronizing mechanism are connected by a retaining spindle 22, of which the ends, designed as bearing pins, serve for forming the articulations 16. At the same time, this ensures defined pivoting of the first link 7 and avoids tilting of the link 7.

It should be mentioned here once again that two of each of the components of the pivoting mechanism are provided. However, for example Figure 1 illustrates only the first link 7 which is arranged on the right-hand side 23 of the seat, while the first link which is present on the left-hand side 24 of the seat is concealed by the side piece 6 of the backrest carrier 4.

Furthermore, the backrest carrier 4 is connected to the seat carrier 3 via a second link 25. The first link 7 is slightly longer than the second link 25. The length ratio between the (rear) first link 7 and the (front) second link 25 is approximately 1.07:1. The one free end 26 of the second link 25 here is connected in an articulated manner, in turn via an articulation 27, to the side arm 14 of the seat carrier 3 and the opposite free end 28 of the link 25 is connected in an

articulated manner, via an articulation 29, to the side piece 5, 6 of the backrest carrier 4. The third hinge pin 30, which is defined by the bottom end 28 of the second link 25 being articulated on the backrest carrier 4, is arranged, as seen in the longitudinal direction 19 of the chair, behind the fourth hinge pin 31, which is defined by the top end 26 of the link 25 being articulated on the seat carrier 3. This means that it is also the case that the second link 25, in the basic position of the synchronizing mechanism, slopes up from the rear at the bottom to the front at the top, cf. Figure 2. In this case, the angle γ of the second link 25 to the horizontal is approximately 52° . In the rearwardly pivoted position, as is illustrated in Figure 3, the second link 25, however, slopes rearwards, namely at an angle δ of approximately 24° to the vertical, whereas the first link 7 still slopes forwards. In other words, in this position, the fourth hinge pin 31 has been displaced behind the position of the third hinge pin 30, that is to say it has been displaced further in the direction of the rear chair edge 10.

The vertical arrangement of the hinge pins 30, 31 of the second link 25 corresponds, in principle, to the vertical arrangement of the hinge pins 18, 20 in the case of the first link 7. Accordingly, the third hinge pin 30 always runs beneath the fourth hinge pin 31, as seen in the vertical direction.

The vertical arrangement of the four hinge pins 18, 20, 30, 31 of the first and second links 7, 25 is as follows: the second and fourth hinge pins 20, 31 are essentially level both in the basic position and in the pivoted position. The pivot spindle 21 of the first link 7 always runs between the height of the second and fourth hinge pins 20, 31 and the height of the first and third hinge pins 18, 30. The first hinge pin 18 is

located, in the basic position, between the pivot spindle 21 and the third hinge pin 30 and, in the pivoted position, beneath the fourth hinge pin 31.

5 The pivoting mechanism described ensures that it is possible to pivot the backrest carrier 4 with the backrest in the pivoting direction S about a pivot spindle. At the same time, the pivoting movement S of the backrest in the rearward direction induces a
10 raising movement H1 of the rear region 32 of the seat carrier 3, cf. Figure 3. In the case of the backrest being pivoted downwards in the rearward direction, in other words, the seat carrier 3 is displaced rearwards and upwards, while the base carrier 1 remains fixed in
15 position by way of the pivot bearing 8.

In the region of the first and second links 7, 25, the side piece 5, 6 of the backrest carrier 4 and the side arm 14 of the seat carrier 3 meeting in this region,
20 the bottom edge of the side arm 14, this edge running from the rear at the top to the front at the bottom, rests on the similarly running top edge 34 of the side piece 5, 6 in a defined contact region and thus secures the basic position of the synchronizing mechanism. The
25 slope is followed in the rearward direction by a region in which the essentially vertically running free end 35 of the side arm 14 and the correspondingly formed end surface 36 of the side piece 5, 6 are located opposite one another. This arrangement forms a closed covering
30 by means of which the lever structure located behind the same is protected against soiling. A straightforward additional covering, for example in the form of the side pieces 5, 6 of the backrest carrier 4 being extended upwards, may additionally make it
35 possible for access through to the pivoting mechanism to be reliably ruled out even in the pivoted state. This allows a high level of safety for handling the office chair.

At the same time, the seat carrier 3 is connected to the base carrier 1 such that pivoting of the backrest carrier 4 results in a raising movement H2 of the front region 37 of the seat carrier 3. In the exemplary embodiment, the synchronizing mechanism is configured such that the rear region 32 of the seat carrier 3 is raised somewhat more than the front region 37 of the seat carrier 3 ($H1 > H2$), in which case the essentially planar position of the seat carrier 3 in the basic position changes into a slightly forwardly inclined position of the seat carrier 3 in the pivoted position. This avoids the situation where the seat carrier undesirably cuts into, or presses on, the underside of the thighs during pivoting. In the pivoted position, the backrest carrier 4 has been pivoted through a pivoting angle ε of approximately 24° in relation to the base carrier 1, while the seat carrier 3 is raised more or less parallel. In the exemplary embodiment ($H1 > H2$), the rear region 32 of the seat carrier 3 is raised by an angle ϕ of approximately 2° in relation to the front region 37 of the seat carrier 3.

The base carrier 1 is connected to the seat carrier 3 via a linear guide in the manner of a slot-like guideway 38 arranged in the front region 37 of the seat carrier 3. The base carrier 1 has two laterally arranged rockers (not illustrated) running in the direction of the front seat edge 17. These rockers are connected to one another via a bearing spindle. The bearing spindle is arranged parallel to the hinge pins 18, 20, 30, 31, the pivot spindle 21 and the retaining spindle 22. The two ends of the bearing spindle, which are in the form of bearing pins 39, are each positioned in the guideway 38, which serves as a linear sliding guide, from the inside. The guideway 38 is formed in a side element 40 of the seat carrier 3, this side element extending in the direction of the front seat

edge 17. The guideway 38 here slopes from the front at the bottom to the rear at the top and, in the pivoted position, encloses an angle η of approximately 42° with the horizontal (basic position approximately 40°). In
5 the basic position of the synchronizing mechanism, the ends 39 of the bearing spindle butt against the top stop of the guideway 38. The bearing spindle is then located approximately level with the second and fourth hinge pins 20, 31. During pivoting, the raising of the
10 seat carrier 3 results in the bearing spindle being displaced in the direction of the opposite, bottom end of the guideway 38. The bearing spindle is then located approximately level with the pivot spindle 21.

15 This design means that it is not just the rear region 32 of the seat carrier 3 which executes a raising movement H1 when the backrest is subjected to loading and the backrest carrier 4 executes a pivoting movement downwards and rearwards in the pivoting direction S.
20 The front region 37 of the seat carrier 3 is also raised linearly in a synchronous manner (raising movement H2). In other words, the front and the rear ends of the seat surface are lifted simultaneously. The entire seat is raised.

25 The synchronizing mechanism further comprises a spring element which is arranged essentially horizontally in the seat carrier 3 in the basic position and is in the form of a tension spring 41 which is connected, on the
30 one hand, to the bearing spindle of the base carrier 1 and, on the other hand, to a further transversely located retaining spindle 42 on the seat carrier 3. The tension spring 41 has its front end fitted on the bearing spindle and its rear end fitted on the
35 retaining spindle 42. The tension spring is prestressed in the direction of the basic position of the synchronizing mechanism. In the basic position, the retaining spindle 42, which is arranged between the

side legs 11 of the base carrier 1, is located approximately level with the bearing spindle and the second and fourth hinge pins 20, 31. In the pivoted position, the retaining spindle 42 is carried along rearwards and upwards with the seat carrier 3 and is then likewise located approximately level with the second and fourth hinge pins 20, 31. The spacing between the bearing spindle and retaining spindle 42 increases here and the tension spring 41, which then slopes up in the rearward direction, is subjected to further stressing. This spring stressing assists the backrest in being returned from the pivoted position into the basic position. Instead of a single tension spring 41 it is also possible, depending on the envisaged loading of the chair, to use a plurality of tension springs in parallel or other spring elements. A mechanism which is not explained specifically, but can be operated with the aid of an actuating lever (not depicted), is provided in order to secure the backrest inclination.

List of designations

25	1	Base carrier
	2	Conical mount
	3	Seat carrier
	4	Backrest carrier
	5	Side piece
30	6	Side piece
	7	First link
	8	Pivot bearing
	9	Bearing pin
	10	Rear seat edge
35	11	Side leg
	12	Free end
	13	Articulation
	14	Side arm

	15	Free end
	16	Articulation
	17	Front seat edge
	18	First hinge pin
5	19	Longitudinal direction of the chair
	20	Second hinge pin
	21	Pivot spindle
	22	Retaining spindle
	23	Right-hand side
10	24	Left-hand side
	25	Second link
	26	Free end
	27	Articulation
	28	Free end
15	29	Articulation
	30	Third hinge pin
	31	Fourth hinge pin
	32	Rear region
	33	Bottom edge
20	34	Top edge
	35	Free end
	36	End surface
	37	Front region
	38	Guideway
25	39	Pin
	40	Side element
	41	Tension spring
	42	Retaining spindle

Claims

1. Synchronizing mechanism for a correlated seat/backrest movement of an office chair, having a
5 base carrier (1), which can be placed on a chair column, a seat carrier (3) and a backrest carrier (4), it being the case that the backrest carrier (4), which can be pivoted about a transverse spindle, is connected on the one hand to the base carrier (1), via a first
10 link (7), and on the other hand to the seat carrier (3), via a second link (25), such that a pivoting movement of the backrest in the rearward direction induces a raising movement (H1) of the rear region (32) of the seat carrier (3), and that the seat carrier (3)
15 is connected to the base carrier (1) such that a raising movement (H1) of the front region (37) of the seat carrier (3) takes place at the same time.

2. Synchronizing mechanism according to Claim 1, it
20 being the case that the base carrier (1) is connected to the seat carrier (3) via a guide (38), in particular a linear guide, which is preferably arranged in the front region (37) of the seat carrier (3).

25 3. Synchronizing mechanism according to Claim 1 or 2, it being the case that the first link (7) is provided with a pivot bearing (8), for producing a pivoting connection to the base carrier (1), and that the one link end (12) is connected in an articulated manner to
30 the seat carrier (3) and the opposite link end (15) is connected in an articulated manner to the backrest carrier (4).

4. Synchronizing mechanism according to one of
35 Claims 1 to 3, it being the case that the first link (7) and/or the second link (25) are/is covered in the outward direction by a part of the backrest carrier (4) and/or a part of the seat carrier (3).