

The invention relates to a chair according to the preamble of claim 1.

5 Such a chair is known from US-A-2 321 385 with the seat carrier and the backrest support part being connected with one another each in the vicinity of its lower end about a pivot axis. In the vicinity of its backward end the seat is connected via a joint strap with two pivot axes parallel to
10 one another with the backrest support part. The energy storage device is provided as a to-be-pre-tensioned compression spring arranged outside and below the seat carrier. It is passed through by a clamping bolt articulated to the backrest
15 support part. A locking screw is arranged at the other end of this clamping bolt, with one end of the helical compression spring bearing against the locking screw while its other end bears against the seat carrier from outside. This energy storage
20 device is arranged above the pivot axis. Due to the lower arrangement of the pivot axis the fastening point of the seat to the backrest support part is subjected considerable horizontal movement relative to the front articulation of the seat
25 to the seat carrier when the backrest support part is shifted, so that a joint strap must be

provided to compensate this longitudinal movement. But simultaneously this joint strap causes that, when the backrest support part is shifted more strongly, the seat carries out an increased superposed double movement relative to the backrest, during which movement the distance to the backrest is first decreased and then again increases. When the backrest is pivoted from its most upright position backwards, then the seat is first lifted relative to the backrest support and subsequently it is drawn downwards relative to the backrest support. The so-called shirt pull-out effect is particularly characteristic in this case, moreover, when the constructive height and depth is particularly pronounced.

A chair is known from DE-A-31 39 448 with a seat carrier rigidly connected with a support column. A backrest support part is provided at the seat carrier pivotable about a pivot axis. A gas spring is provided as an energy storage device between the seat carrier and the backrest support part. Adjacent to the front edge of the seat carrier and in the vicinity of the rear end of the backrest support part a seat is secured on the backrest support part by way of rubber blocks. This unit is not compact. In this case, too, the so-called shirt pull-out effect cannot be easily avoided.

The afore-described chairs are provided with a mechanism which assures that when the user shifts his weight, for instance when leaning back in the chair, an anatomically adapted shift in the relative inclination of the seat surface and the backrest is effected in a coordinated manner. Such mechanisms are therefore known as synchronizing mechanisms.

Further chairs, provided with this kind of synchronizing mechanism and for example known from DE-A-27 57 349, DE-C-27 33 322 and DE-C-28 36 216 have the disadvantage that because of the relative movement in shifting the inclination of the seat and the backrest, a pull is exerted on the clothes of the user, which is perceived as unpleasant. This is due, among other factors, to the fact that in the previously known construction, an adjusting device is supported on the supporting column of the chair base such that it is pivotable about a horizontal axis, with the pivoting movement of the seat and backrest being coordinated via a triangular swinging arm. The posterior end of the seat is connected via a toggle joint to the lower end of the backrest support column, and this articulation point of the toggle joint is connected to the lower articulation point of the triangular swinging arm via a gas spring. This means that the backrest support column, in the final analysis, is pivotably joined to a section of the seat via a parallelogram linkage embodied by a triangular swinging arm, the toggle joint, the gas spring and this section of the seat. A further parallelogram linkage is embodied between the triangular swinging arm and a toggle joint which with one end engages the vicinity of the front edge of the seat and the other end of which is joined to a further gas spring. The known embodiment has not only the inherent disadvantage of a pushing or pulling effect on the user's clothes but also has the disadvantage that in order to attain a damping effect on the inclination shifting movement on the one hand and to attain a sufficiently great restoring moment on the other, two springs that are independent of one another must be pro-

vided, which makes construction relatively complicated and increases the cost of manufacture.

5 It is the object of the invention to embody a chair of the generic type in such a way that a synchronized movement which is properly adapted anatomically and is perceived as pleasant by the user is attained between the backrest and the seat when the user shifts his weight, and such
10 that the chair, in terms of its construction, functions reliably and can be manufactured at a favorable cost.

15 This object is attained in accordance with the invention by the features of the characterizing part of patent claim 1.

As a result of the association of the individual structural parts with one another as provided
20 by the invention, the user's clothing is not subjected to undesirable pushing and pulling, since the downward movement of the backrest does not lag behind the downward movement of the end of the seat; quite the contrary, the distance between
25 the upper edge of the seat and the lower edge of the backrest in fact decreases. It is also possible in accordance with the invention to provide only a single gas spring, which both damps the inclination movement and also exerts the necessary
30 restoring moments for restoring the backrest whenever the user again shifts his weight forward. The elastic buffers, of rubber or the like, provided by the invention act on the one hand as resilient spacers between the rear section of the seat and
35 the supporting part of the backrest, and on the other hand enable a complicated relative movement

between the seat and the backrest portion, which because of the construction according to the invention is imposed on the backrest part when the user leans back. At this time, not only does the distance between the seat and the backrest support part vary, but a translational movement of the parts approximately parallel to one another takes place as well. The arrangement of the gas spring assures that in a particularly advantageous manner, the gas spring becomes effective both for damping the tilting movements and for the restoring movements. It can thus be dimensioned comparatively small and therefore be disposed in a space-saving manner and largely invisibly within the backrest support part or within the seat carrier, respectively.

Preferably the pivot axis between the backrest support part and seat carrier is disposed in accordance with claim 2; then the course of movement can be influenced by means of the precise location of the pivot axis.

A particular advantageous dimensioning of the location of the axes relative to one another and of the gas spring relative to the seat is in each case indicated in claims 3 and 4.

By embodying the seat carrier and the backrest support part according to patent claim 5 bearings are provided in a simple manner for the pivot shafts that are required; the functional interlocking of these parts becomes unproblematic; a high degree of static stability is attained; and finally this construction also pays appropriate attention to esthetic considerations.

The pivot shafts are particularly simple if embodied according to patent claim 6.

5 Providing gas springs used in office chairs with a locking device is known per se. However, when the gas spring is disposed as provided by the invention, the locking device according to patent claim 7 can be embodied particularly simply and effectively, especially in the form of a relatively
10 inexpensive, purely mechanical locking device according to patent claim 8.

Further characteristics, advantages and details of the invention will become apparent from the
15 ensuing description of a preferred form of embodiment, taken in conjunction with the drawings, in which

Fig. 1 is a schematic side view of an office chair;
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Fig. 2 is a schematic side view of the essential elements of the construction according to the invention in two different inclined positions; and
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Fig. 3 is a view from above of the backrest support part and the seat carrier.

30 An office chair shown in Fig. 1 includes a base 1 having a supporting column 2, which is joined to a seat carrier 4 receiving the cushioned seat 3. In Fig. 1, only the outer covering 5 of the seat carrier 4 is shown.

35 A backrest support part 7 is connected to the seat carrier 4 such that it is pivotable about

a pivot axis 6, and the backrest supporting column 9 that supports the backrest 8 is connected to the backrest support part 7.

5 The seat 3 is connected in an articulated manner, not shown in detail in the drawing, to the front end of the seat carrier 4 on the one hand and to the backrest support part 7 on the other. The articulated connection between the seat carrier
10 4 and the backrest support part 7 is furnished by means of a pivot bolt 10, which passes through the side walls 11, 12 and 13, 14 of the backrest support part 7 and the seat carrier 4. The backrest support part 7 and the seat carrier 4 each have
15 a U-shaped cross section, of which the transverse parts 15, 16 of the U point toward the top, that is, toward the seat, and the side walls 11, 12 of the backrest support part 7 partially overlap the side walls 13, 14 of the seat carrier 4.

20 At the front end of the seat carrier 4, a seat holder 19 is pivotably supported by means of a pivot bolt 17, which defines a pivot axis 18. The seat holder 19 has a substantially L-shaped
25 profile 20 having a bearing box 21 receiving the pivot bolt 17 and spacers 22 to which the seat 3 is rigidly secured.

A cone 23 for receiving the supporting column
30 2 is rigidly secured to the seat carrier 4, and an actuating lever 25 for adjusting the height of the seat, by means of a corresponding device not shown in detail, passes through a recess 24 in the vicinity of the cone 23.

Beginning at an angled edge 26, the backrest support part 7 tapers toward the back, where a guide element 27 for the backrest supporting column 9 is welded in place. A clamping screw 28 having an actuating lever 29 engages a bore 30 of the guide element 27, thereby making it possible to clamp the arms of the guide element 27, which is U-shaped in this embodiment, so as to fix the backrest supporting column in position. Two rubber buffers 32 are secured at one end to the transverse part 15 of the U of the backrest support part 7 and at the other to the rigid seat bottom 31 of the seat 3.

A gas spring 33 is articulated at one end on a bolt 34 which forms an articulation axis and which extends through bores 35 in the side walls 11, 12 of the backrest support part 7 and at the other end on a bolt 36 which forms a further articulation axis and which extends through a bore 37 of the side walls 13, 14.

The side wall 11 of the backrest support part 7 has a slit 39 extending in the form of a section of a circle, through which an actuating lever 40 for a locking device 38 passes so as to engage the slit.

If the seat 3 is urged in the direction of the arrow 41, or the backrest 8 is urged in the direction of the arrow 42, when a user shifts his weight backward, then the backrest support part 7 is pivoted about the pivot axis 6 counter to the spring force of the gas spring 33 about an angle α until a state of equilibrium is attained. Because the rubber buffer 32 joining the seat 3 and the backrest support part 7 is spaced farther from

the pivot axis 18 of the seat 3 than from the pivot axis 6 of the backrest support part 7, the angle α is larger than the angle β . At the same time, the seat holder 19 connected to the seat 3 is pivoted about the seat pivot axis 18 by the angle β .

As a result of this movement of the user, the backrest 8 and the seat 3 move out of the position shown in solid lines in Fig. 2 and assume the position shown in broken lines in Fig. 2. During this pivoting movement, the distance a between the lower edge 43 of the backrest 8 and the upper edge 44 of the cushion 45 of the seat 3 varies in such a manner that the corresponding new distance a' is smaller than the original distance; that is, in contrast to previously known constructions, the original distance a is not increased, and accordingly no tension is exerted upon the user's clothing.

If the user shifts his weight forward again, this does not as a rule suffice to assure that the backrest 8 will at each moment remain reliably in contact with the user's back. This return movement of the backrest 8 is assured in this phase, however, by the gas spring 33, which has engagement points on the backrest support part 7, on the one hand, and the seat carrier 4 on the other, such that a reliable return of the backrest 8 even from a severely backward-pivoted position to the original position is assured without requiring further springs.

The above advantages which are attainable in principle

as a result of the embodiment according to the invention are optimized by dimensioning the chair as follows:

- 5 The pivot axis 6 is disposed approximately in the middle between the seat pivot axis 18 and the articulation axis 34, which is embodied by the bolt 35.
- 10 The distance between the lower articulation axis (pivot bolt 36) of the gas spring 33 and the pivot axis 6 is approximately half as long as the distance between the pivot axis 6 and the seat pivot axis 18.
- 15 The angle γ between the longitudinal axis of the gas spring 33 and the transverse part 15 of the U of the backrest support part 7 is approximately 30°.
- 20 The distance between the rubber buffers 32 and the seat pivot axis 18 is approximately 2 1/2 times as long as the distance between them and the pivot axis 6.
- 25 The locking device 38 can be particularly simply embodied, in the context of the construction according to the invention, by providing that it includes a sheath part 46 and a piston part 47, the piston part being disposed such that it is longitudinally
- 30 displaceable in the sheath part. This device is disposed parallel to the gas spring 33; that is, the sheath part 46 is pivotably supported on the bolt 34 and the piston part 47 is pivotably supported on the bolt 36. On its free end, the actuating
- 35 lever 40 has a threaded bolt 48 which passes through

a threaded sheath 49, which is joined to the side wall 13 of the seat carrier 4. When the actuating lever 40 is tightened, the front end of the threaded bolt 48 presses against the telescoped piston and sheath parts 46 and 47 and clamps them together over a large surface area. Thus, despite the ease of manipulation, a high degree of surface pressure and thus reliable locking are attained, so that the pivotability of the seat 4 and backrest can be locked upon demand.

Patent Claims:

1. Chair, in particular office chair, having a base (1) and a seat (3) disposed thereon as well as a backrest (8), wherein the seat (3) and the backrest (8) are supported such that they are pivotable in a coordinated manner about horizontal axes (6, 18) in accordance with the shift in weight of a user, and wherein at least one energy storage device is provided for damping the pivoting movement and for attaining a restoring action, wherein a seat carrier (4) and a backrest support part (7) joined to the seat carrier in a manner pivotable about an axis (6) are provided, wherein a supporting column (2) of the base (1) is rigidly fixable on the seat carrier (4), wherein a seat holder (19) is provided projecting upward beyond the seat carrier (4) and being supported on the latter in a manner pivotable about an axis (18), wherein the seat (3), in the vicinity of a front section, is rigidly joined to the seat holder (19) and, in the vicinity of a section located behind the axis (6), is joined to the backrest support part (7), and wherein the energy storage device, extending obliquely with respect to the seat (3), is disposed on the backrest support part (7) in a manner pivotable about an articulation axis (shaft 34), on the one hand, and the seat carrier (4), on the other hand, characterized in that the seat (3) is joined to the backrest support part (7) via elastic buffers (32), in that the pivot axis (6) is arranged in an upper section of the seat carrier (4) and the backrest support part (7), in that the energy storage device is embodied by a gas spring (33) and is articulated on the seat carrier (4) in a manner pivotable about



an articulation axis (shaft 36), and in that the articulation axis (shaft 36) for the gas spring (33) is disposed on the seat carrier (4) below the pivot axis (6) and at a distance thereof between the backrest support part (7) and the seat carrier (4) and the articulation axis (shaft 34) of the gas spring (33) is disposed on the backrest support part (7) in the vicinity of the upper edge and the rear edge thereof.

2. Chair as defined by patent claim 1, characterized in that the pivot axis (6) between the backrest support part (7) and the seat carrier (4) is embodied approximately in the middle between the front end of the seat carrier (4) and the back end of the backrest support part (7).

3. Chair as defined by patent claim 1, characterized in that the distance between the seat pivot axis (18) of the seat holder (19) and the pivot axis (6) between the seat carrier (4) and the backrest support part (7) is at a ratio of approximately 2:1 to the distance between the pivot axis (6) and the articulation axis (36) of the gas spring (33) on the seat carrier (4).

4. Chair as defined by patent claim 1, characterized in that the angle of inclination (γ) of the gas spring (33) with respect to the seat (3) is approximately 30 to 45°.

5. Chair as defined by patent claim 1, characterized in that the seat carrier (4) and the backrest support part (7) are U-shaped in cross section, wherein the side walls (11, 12) of the backrest support part (7) intermittently overlap those of the seat carrier (4).



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6. Chair as defined by patent claim 5, characterized
in that the pivot axis (6) between the backrest
support part (7) and the seat carrier (4) is embodied
by a bolt (10) passing through the side walls (11,
5 12), and the articulation axis of the gas spring
(33) on the seat carrier (4) is embodied by a bolt
(36) secured to its side walls (13, 14), and the
articulation axis of the gas spring (33) on the
backrest support part (7) is embodied by a bolt
10 (34) passing through its side walls (11, 12).

7. Chair as defined by one of patent claims 1 to 6,
characterized in that associated with the gas spring
(33) is a locking device (38) having an actuating
15 lever (40).

8. Chair as devined by patent claim 7, characterized
in that the locing device (38) is embodied by a
sheath part and a piston part (46 and 47, respective-
20 ly), which are disposed parallel to the gas spring
(33) telescoping within one another and which can
be clamped together over a relatively large surface
area for locking purposes by means of the actuating
lever (40).

