(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 443 226 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90301736.6**

(51) Int. Cl.5: **A47C 3/24**, A47C 3/18

(22) Date of filing: **17.02.90**

(43) Date of publication of application:
28.08.91 Bulletin 91/35

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

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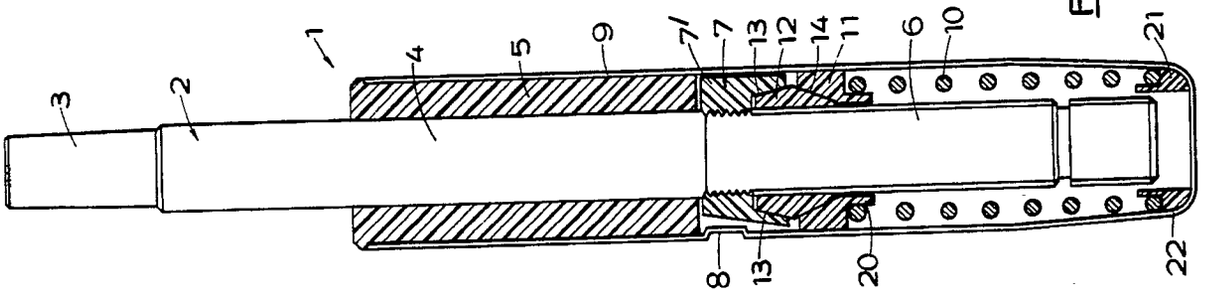
(54) Safety chair columns.

(57) A chair column has a spindle (2) for securing at its upper end (3) to a chair seat, the lower portion (6) of the spindle threadedly carrying a first clutch dog in the form of a nut (7). A second clutch dog is provided by an indent (8) in a tubular casing (9), the lower end (22) of which is secured in use to a chair base. In order to adjust the height of the chair seat relative to the base, the unoccupied seat is turned, and the interengaged clutch dogs will effect an adjustment. When a person sits on the seat the spindle moves down to compress a spring (10), and the clutch dogs are automatically disengaged.

In order to prevent inadvertent adjustment of the nut (7) by swivelling of the occupied chair seat, the nut (7) is arranged to be locked to the spindle (2) by a locking member (12) which is conically shaped in its upper half to have a wedging engagement with the spindle (2) and nut (7). The lower half of locking member (12) is also of conical shape but with a larger cone angle to provide a self-centring bearing with a spring abutment member (11).

FIG.1.



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This invention relates to chair columns for supporting a chair seat above a chair base, and particularly to columns of adjustable height.

Office chairs commonly comprise a base, usually a five-limbed (five star) base, a column and a chair seat, the lower end of the column being connected to the base, and the upper end of the column supporting the chair seat. Various arrangements have been devised for adjusting the length of the column.

Some columns incorporate a spindle threadedly engaged with an abutment nut. In the simplest arrangement of this type the nut is rigidly secured to the lower portion of the column, and the spindle to the upper portion, whereby on turning the chair seat, which is fast with the spindle, the seat is moved upwards and downwards. In another arrangement the threaded spindle is fast with the chair seat but is slidably keyed against turning relative to the lower portion of the column, and the nut is fast with a turnable collar which is rotatably mounted on the upper end of the column lower portion. To adjust the height of the chair seat relative to the base the collar is turned by hand when the user's weight is removed from the chair seat.

Other columns incorporate a ratchet adjustment to permit incremental adjustment of the seat height.

In recent years gas springs have been increasingly used in chair columns to provide a force which is sufficient to lift the chair seat when a locking mechanism is released, to the extent that the majority of adjustable chair columns now sold incorporate gas springs. Usually it is necessary for the user to take some of his or her weight off the seat whilst the locking mechanism is released. By restricting the gas flow during adjustment the seat is prevented from shooting to its maximum height. Gas springs have often been arranged to provide a degree of give or cushioning to the initial sitting-down force on the chair seat, and this feature has been appreciated by users.

However, such gas springs utilise gas under high pressure, approximately 200 psi, and there have been instances of explosion of such gas springs due to metal fatigue. Most gas springs are still considered to be safe, but the replacement or modification of some types has been recommended.

We consider that there is a requirement for an adjustable chair column which does not incorporate a gas spring but which can provide some of the advantageous features of gas spring chair columns. In particular we consider it desirable that a degree of cushioning be provided against the sitting-down force on the chair seat.

According to one aspect of the invention we provide a chair column of adjustable length (and which does not incorporate a gas spring) comprising a spindle adapted to be secured at its axially outer end to a chair seat or chair base, a mounting means adapted to be secured to the chair base or chair seat respectively and carrying a tubular casing which coaxially receives the inner end of the spindle, threaded adjustment means for adjusting the relative axial positions of the spindle and mounting member, characterised in that the adjustment means comprises a first clutch dog threadedly carried by an axially inner portion of the spindle, a second clutch dog carried by the tubular casing, a cylindrical mechanical spring, such as a helical coil spring or belleville washer stack, housed within the tubular casing and urging the first clutch dog relative to the mounting member in the direction towards the spindle outer end, the pre-loading of the spring and the arrangement being such that, when the the chair seat is unoccupied, the spring urges the first clutch dog and spindle in the direction away from the mounting member to hold the clutch dogs interengaged, whereby in that condition turning of the chair seat relative to the chair base will cause the spindle to screw relative to the first clutch dog thereby altering the height of the chair seat, but when a person sits down on the chair seat the spring is further deformed and the clutch dogs are disengaged.

The spring performs the dual functions of holding the clutch dogs interengaged when the seat is unoccupied, to permit adjustment of the unoccupied seat simply by turning the seat relative to the base, and cushioning the sitting-down force.

A locking means is preferably arranged to lock the first clutch dog to the spindle against relative turning movement when the clutch dogs are disengaged. This can prevent inadvertent adjustment of the mechanism during swivelling of the occupied chair seat.

The locking means preferably comprises a wedging engagement between a split annular locking member and the first clutch dog.

The annular locking member preferably has an external frusto-conical locking surface which cooperates with a complementary internal frusto-conical locking surface on the first clutch dog.

The annular locking member is preferably rotatably mounted on an abutment member against which the spring bears, whereby the abutment member assists in providing pivotal guidance for swivelling of the chair seat.

The abutment member and the locking member are preferably formed with complementary frusto-conical bearing surfaces, the cone angle of the bearing surfaces being sufficient to prevent locking of the abutment member to the locking member.

The spring is preferably a compression spring

but a tension spring might be employed.

According to a second aspect of the present invention a chair column of adjustable length (and which does not incorporate a gas spring) comprises an adjustable length portion incorporating length adjusting means which may be mechanical and/or hydraulic, one end of the adjustable length portion being supported by first support means on the chair base, and the second end of the adjustable length portion supporting the chair seat by second support means, at least one of said first and second support means comprising a resilient means in the form of a cylindrical mechanical spring, such as a helical coil compression spring or belleville washer stack, extending coaxially of the column, the spring being of a strength to lift the chair seat by a small amount when the user gets up from the seat, but being deformable on sitting-down of a user to provide a sitting-down cushioning action noticeable to the user when the length adjusting means is locked.

Thus a mechanical spring, preferably a compression spring, is arranged in series with the adjustable length portion of the column in the vertical force transmission path between the chair seat and the chair base to provide a degree of resilience when the adjustable length portion is locked against adjustment.

A chair column in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a vertical cross-section of the chair column shown with the column adjusted to provide a minimum height of the chair seat, not shown, and with no vertical load applied to the column,

Figure 2 is a side elevation of the first clutch dog,

Figure 3 is an enlarged vertical cross-section of the first clutch dog,

Figure 4 is a side elevation of the split locking member,

Figure 5 is a plan view of the locking member of Figure 4,

Figure 6 is a side elevation of a spring abutment member,

Figure 7 is an end view of the abutment member looking from the right in Figure 6, and

Figure 8 is a side elevation of a spring locator.

With reference to Figure 1, this shows a chair column 1 which is entirely mechanical in operation, incorporating neither a gas spring nor a hydraulic piston and cylinder assembly. A spindle 2 is adapted to be rigidly secured at its upper end 3 to a chair seat, and its mid-region 4 is axially slidable and rotatable in a plastics (NYLON) bushing 5 of substantial axial length. The lower portion 6 of the spindle 2 is screw-threaded and threadedly engaged by a clutch nut 7 (the first clutch dog) which normally makes a clutching engagement with a clutch formation (the second clutch dog) provided by an indent 8 in tubular steel housing 9. Clutch nut 7 has a single radially-projecting clutch lug 7^1.

The clutch nut 7 is urged axially by a coiled compression spring 10, acting through a spring abutment member 11 and an annular locking member 12. Member 11 has a clearance recess 11^1 to enable the member 11 to negotiate indent 8 during assembly.

The pre-load and rate of spring 10 are chosen such that when the chair seat is unoccupied the spring 10 holds the clutch nut 7 in axial registry with clutch formation 8 but when someone sits on the chair seat the spindle 2 and nut 7 move downwards sufficiently to carry nut lug 7^1 axially clear of formation 8 and to provide cushioning to the sitting-down force. Of course, if the spring pre-load and rate were not made sufficient, the seat would move downwards by an excessive amount until spring 10 is coil-bound. It is preferred to choose the spring characteristics such that this does not occur.

In order to adjust the height of the chair seat, the chair seat is simply turned round when it is unoccupied, the spindle 2 then screwing upwards or downwards through the nut 7 which is held against rotation by the lug 7^1 rotating into abutment with formation 8. When the chair is being used, turning of the chair seat does not result in adjustment of the seat height because the clutch is disengaged and because the nut 7 is arranged to be locked to the spindle 2 by locking member 12, as will now be explained.

Locking member 12 is formed of a suitable plastics material, such as a polyamide, and is provided with a first frusto-conical locking surface 13 having a cone angle of 30°, to provide a 15° locking taper, and a second frusto-conical bearing surface 14 having a cone angle of 46°. To enable the locking member 12 to be contracted radially to grip the spindle 2, the locking member 12 is provided with an axial break 15.

The clutch nut 7 is provided with a frusto-conical counterbore 16 to the threaded main bore 17, the cone angle of the counterbore 16 matching that of the locking surface 13 to provide a locking action between the locking member 12, spindle portion 6 and clutch nut 7 when the relative axial force between members 7 and 12 is increased on the application of a sitting-down force to the spindle 2. It will be appreciated that when a person sits down on the chair seat the spring 10 will be further compressed and accordingly the axial force exerted by spring 10 will be increased.

Spring abutment member 11 comprises a thick disk portion 19 and is provided with a frusto-conical

bore 18, and a depending skirt 20 for locating the adjacent end of spring 10. The diameter of disk portion 19 is such as to provide a sliding engagement between abutment member 11 and housing 9, and the cone angle of bore 18 is chosen to match that of bearing surface 14, so as to provide a substantial area of bearing contact with member 12. Surface 14 is provided with a series of annular grooves 14^1, Figure 4, but not shown in Figure 1, to retain a lubricant.

The guiding of member 12 in casing 9 and the frusto-conical bearing arrangement helps to hold the spindle portion 6 coaxially of the casing 9 during swivelling of the occupied or unoccupied chair seat.

It will be appreciated that the locking of nut 7 to spindle 2 when the seat is occupied is desirable to prevent the spindle from being screwed relative to nut 7 on swivelling of the occupied seat due to the turning resistance provided by spring 10.

Figure 8 shows a moulded plastics spring locator 21 which is a force-fit in the reduced-diameter lower end 22 of casing 9, this being assisted by the provision of four axial ribs 23 on the locator 21.

The lower end 22 of the casing 9 would be suitably attached in use to a chair base and accordingly constitutes a mounting means for the casing 9.

Since the loading of spring 10 is not affected by adjusting the spindle height relative to nut 7, the cushioning action felt by the user on siting down on the seat will also not be affected by the height of the seat.

In a modification, not shown, to the column of Figure 1, the compression spring 10 is replaced by an appropriately-positioned helical tension spring which pulls member 11 upwards relative to casing 9.

Claims

1. A chair column of adjustable length (and which does not incorporate a gas spring) comprising a spindle (2) adapted to be secured at its axially outer end to a chair seat or chair base, a mounting means (22) adapted to be secured to the chair base or chair seat respectively and carrying a tubular casing (9) which coaxially receives the inner end (6) of the spindle, threaded adjustment means (6, 7) for adjusting the relative axial positions of the spindle and mounting member, characterised in that the adjustment means comprises a first clutch dog (7, 7^1) threadedly carried by an axially inner portion (6) of the spindle, a second clutch dog (8) carried by the tubular casing (9), a cylindrical mechanical spring (10), such as a helical coil spring or belleville washer stack, housed within the tubular casing and urging the first clutch dog relative to the mounting member (22) in the direction towards the spindle outer end (3), the pre-loading of the spring and the arrangement being such that, when the the chair seat is unoccupied, the spring urges the first clutch dog and spindle in the direction away from the mounting member to hold the clutch dogs interengaged, whereby in that condition turning of the chair seat relative to the chair base will cause the spindle to screw relative to the first clutch dog thereby altering the height of the chair seat, but when a person sits down on the chair seat the spring is further deformed and the clutch dogs are disengaged.

2. A chair column as claimed in claim 1 comprising a locking means (12, 13) arranged to lock the first clutch dog (7) to the spindle (2) against relative turning movement when the clutch dogs are disengaged.

3. A chair column as claimed in claim 2 in which the locking means comprises a wedging engagement between a split annular locking member (12) and the first clutch dog.

4. A chair column as claimed in claim 3 in which the annular locking member has an internal frusto-conical locking surface (13) which cooperates with a complementary internal frusto-conical locking surface (16) on the first clutch dog.

5. A chair column as claimed in claim 3 or claim 4 in which the annular locking member is rotatably mounted on an abutment member (11) against which the spring bears, whereby the abutment member assists in providing pivotal guidance for swivelling of the chair seat.

6. A chair column as claimed in claim 5 in which the abutment member and the locking member are formed with complementary frusto-conical bearing surfaces (18, 14), the cone angle of the bearing surfaces being sufficient to prevent locking of the abutment member to the locking member.

7. A chair column as claimed in claim 5 or claim 6 in which the spring is a compression spring.

8. A chair column of adjustable length (and which does not incorporate a gas spring) comprising an adjustable length portion incorporating mechanical length adjusting means, one end of the adjustable length portion being supported

by first support means on the chair base, and the second end of the adjustable length portion supporting the chair seat by second support means, at least one of said first and second support means comprising a resilient means in the form of a cylindrical mechanical spring, such as a helical coil compression spring or belleville washer stack, extending coaxially of the column, the spring being of a strength to lift the chair seat by a small amount when the user gets up from the seat, but being deformable on sitting-down of a user to provide a sitting-down cushioning action noticeable to the user when the length adjusting means is locked.

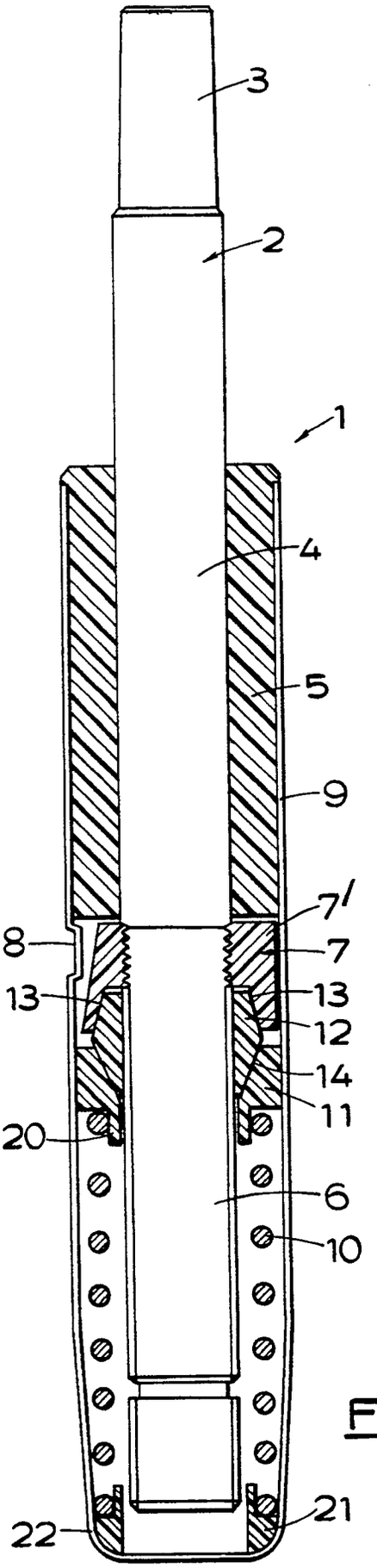

FIG.1.

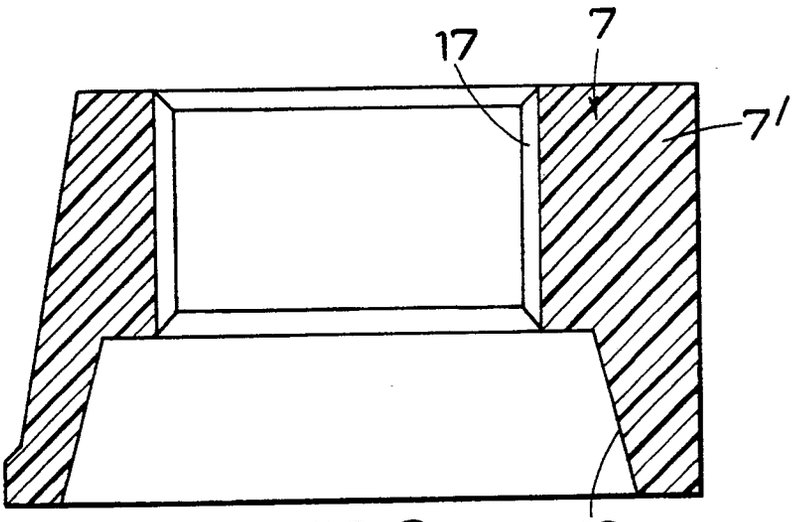

FIG.3.

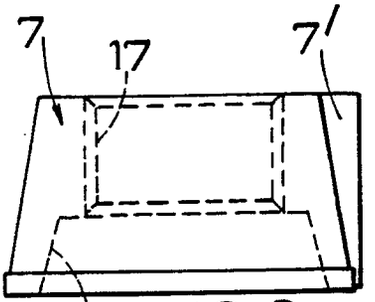

FIG.2.

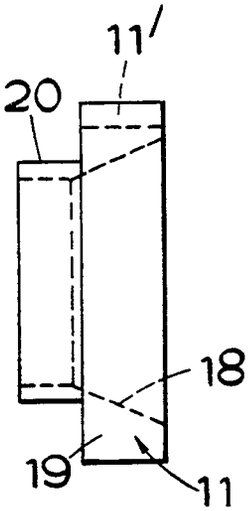

FIG.6.

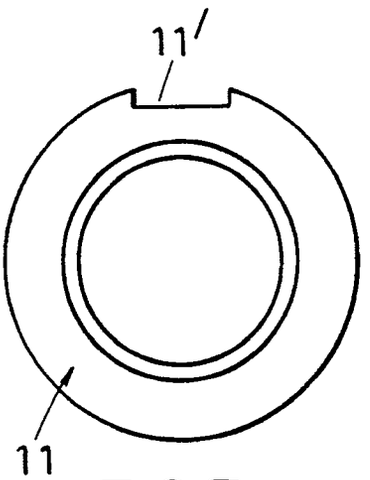

FIG.7.

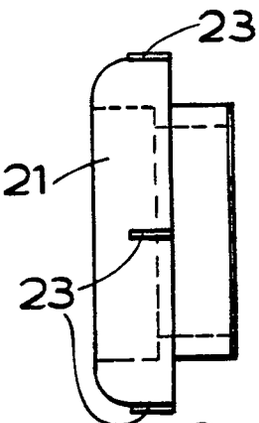

FIG.8.

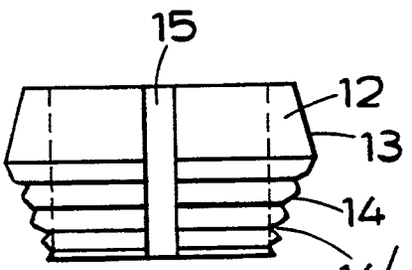

FIG.4.

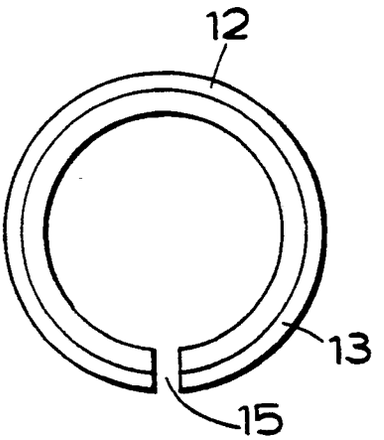

FIG.5.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 1736

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-2 137 178 (MERIVAARA) * Page 1, column 1, line 38 - column 2, line 8; page 1, column 2, line 20 - page 2, column 1, line 14; figure 2 *	1,2,3,4	A 47 C 3/24 A 47 C 3/18
A	---	5,7,8	
X	GB-A- 647 183 (VAN DEURS) * Page 1, line 82 - page 2, line 3; figure 1 *	1,2,3,4	
A	---	7,8	
X	DE-C- 600 417 (DRABERT) * The whole document *	1	
A	---	5,7,8	
A	US-A-3 059 888 (LIE) * Column 1, line 62 - column 3, line 9; figures *	5,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 47 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09-10-1990	VANDEVONDELE J.P.H.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

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