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(54) **MECHANISM FOR THE SYNCHRONOUS ADJUSTMENT OF THE HEIGHT OF THE SEAT AND OF THE INCLINATION OF THE BACKREST OF A CHAIR**

(57) Mechanism (10) for the synchronous adjustment of the height of the seat (202) and of the inclination of the backrest (201) of a chair (200), comprising a lower plate (101) configured to be attached to the seat (202), a central frame (102) attached to the lower plate (101), a tail plate (103) pivoted to the central frame (102) and to the lower plate (101) and configured to be connected to the backrest of said chair (200), a connection rod (104) connected to said central frame (102) and to said lower plate (101).

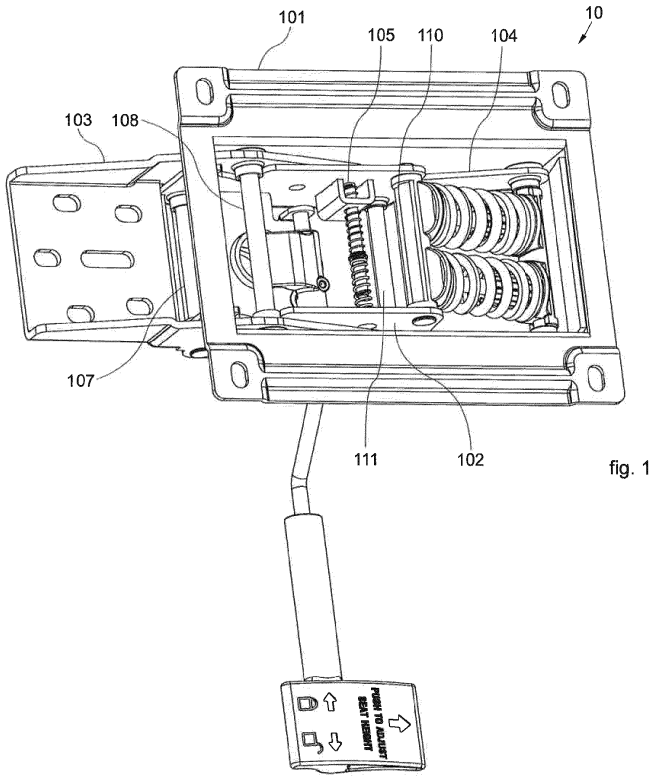

fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair, which can find application, as an example but with no limitation to generality, in the sector of office chairs which need to be adjusted in order to provide a high level of comfort to a user.

BACKGROUND OF THE INVENTION

[0002] Swivel chairs are known, normally used in the workplace, for example in offices or other similar places, which allow to raise the seat and incline the backrest, as well as to rotate the chair on itself around a substantially vertical axis.

[0003] As quality of life standards increase, users require greater comfort from chairs, especially in work environments, where sometimes a user remains seated even for several hours.

[0004] Usually, a known chair comprises a plurality of legs, each of which is provided with a wheel for contact with the floor, a pneumatic cylinder, a tube, an adjustment mechanism, a seat and a backrest.

[0005] The adjustment mechanism normally connects the backrest with the seat and with the tube, and it allows the user to make adjustments such as raising the seat and inclining the backrest.

[0006] However, the adjustment mechanisms of known chairs do not allow an effective synchronous adjustment of the height of the seat and of the inclination of the backrest and, moreover, their production is very complex and inefficient, and entails a high final cost of the mechanism.

[0007] In particular, in order to allow an effective synchronous adjustment of the height of the seat and of the inclination of the backrest, the mechanism should counteract the user's weight on the backrest by applying a contrast force.

[0008] One disadvantage of known devices is that the force applied on the backrest by them can sometimes be insufficient and can lead to a lack of comfort for the user positioned in the prone position which, if prolonged over time, can also lead the user to perspire profusely.

[0009] There is therefore the need to perfect a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair that can overcome at least one of the disadvantages of the state of the art.

[0010] In particular, one purpose of the present invention is to provide a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair which is simple to construct and cheap to produce.

[0011] Another purpose of the present invention is to provide a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair which has a reduced number of components.

[0012] Another purpose of the present invention is to provide a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair which allows to adjust the position of the backrest of the chair according to the user's weight.

[0013] Another purpose of the present invention is to provide a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair which is simple to use to switch from one inclination of the backrest to another.

[0014] Another purpose of the present invention is to provide a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair which allows to increase the comfort of the user on the chair.

[0015] Another purpose of the present invention is to provide a mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair which is safe for the user.

[0016] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0017] The present invention is set forth and characterized in the independent claims. The dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0018] In accordance with the above purposes, a mechanism according to the present invention for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair comprises a lower plate configured to be attached to the seat, a central frame attached to the lower plate, a tail plate pivoted to the central frame and to the lower plate and configured to be connected to the backrest of the chair, a connection rod connected to the central frame and to the lower plate.

[0019] In accordance with another aspect of the present invention, the mechanism also comprises elastic reset means connected to the lower plate, to the tail plate and to the connection rod, and configured to generate a resistant shape in response to a rotation of the tail plate, caused for example by the application of a force on the backrest by the user.

[0020] In accordance with another aspect of the present invention, the mechanism also comprises a first shaft hinged to the rear end of the central frame and to the tail plate, and a second shaft hinged to the rear end of the lower plate and to the tail plate, in front of the first shaft.

[0021] In accordance with another aspect of the present invention, the mechanism also comprises a third shaft hinged to a front end of the central frame, a fourth

shaft hinged to the front end of the central frame and to the rear end of the connection rod, and a fifth shaft connected to the front end of the connection rod and to the front end of the lower plate.

[0022] In accordance with another aspect of the present invention, the elastic reset means comprise two compression springs having one end connected to the fourth shaft and the opposite end connected to the fifth shaft by two respective connection devices configured to constrain the springs allowing their longitudinal axial compression.

[0023] In accordance with another aspect of the present invention, a chair comprises a backrest and a seat, and a mechanism as described heretofore, in which the lower plate is connected to the seat and the tail plate is connected to the backrest.

[0024] In accordance with another aspect of the present invention, the chair also comprises a plurality of legs connected to a tubular element, which is in turn connected to the central frame.

DESCRIPTION OF THE DRAWINGS

[0025] These and other aspects, characteristics and advantages of the present invention will become apparent from the following description of an embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a three-dimensional view of an embodiment of the mechanism for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair in accordance with the present invention;
- fig. 2 is another three-dimensional view of the mechanism of fig. 1;
- fig. 3 is a schematic lateral view of the mechanism of fig. 1;
- fig. 4 is an exploded three-dimensional view of the mechanism of fig. 1;
- fig. 5 is an exploded lateral view of the mechanism of fig. 1.

[0026] We must clarify that in the present description the phraseology and terminology used, as well as the figures in the attached drawings also as described, have the sole function of better illustrating and explaining the present invention, their function being to provide a non-limiting example of the invention itself, since the scope of protection is defined by the claims.

[0027] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can be conveniently combined or incorporated into other embodiments without further clarifications.

DESCRIPTION OF SOME EMBODIMENTS OF THE PRESENT INVENTION

[0028] With reference to the attached drawings, a mechanism 10 for the synchronous adjustment of the height of the seat and of the inclination of the backrest of a chair according to the present invention is suitable to be inserted in a chair 200 comprising a backrest 201, a seat 202 and a tubular element 203 which is connected to a plurality of support legs (not shown).

[0029] We must clarify that, here and hereafter, the term "rear" refers to a first direction which goes toward the backrest 201 of the chair 202, while the term "front" refers to a second direction, opposite to the first direction.

[0030] The mechanism 10 comprises a lower plate 101 configured to be attached to the lower part of the seat 202.

[0031] Below the lower plate 101 there is disposed a central frame 102 configured to be connected to the tubular element 203. Moreover, between the lower plate 101 and the central frame 102 there is disposed a tail plate 103 configured to be connected to the backrest 201.

[0032] The mechanism 100 also comprises a connection rod 104 hinged to the front end of the central frame 102 and to the front end of the lower plate 101.

[0033] A bushing 106 is also connected to the lower portion of the central frame 102, configured to be connected in turn to the tubular element 203. Preferably, the tubular element 203 is of the pneumatic type and allows to raise or lower the seat 202.

[0034] The mechanism 10 also comprises a first shaft 107 hinged to the rear end of the central frame 102 and to the tail plate 103, and a second shaft 108 hinged to the rear end of the lower plate 101 and to the tail plate 103, in front of the first shaft 107.

[0035] In this way, when the tail plate 103 is inclined backward or forward in response to a force applied to the backrest 201 by the user, the second shaft 108 rotates around the first shaft 107 so as to thrust on the rear end of the lower plate 101 which, consequently, is taken upward or downward.

[0036] Because the rear end of the lower plate 101 is raised or lowered by the movement of the second shaft 108, the front end of the lower plate 101 will also move upward and downward, and the amplitude of the movement of the front end of the lower plate 101 is larger than that of the rear end of lower plate 101.

[0037] In order to allow a collision-free rotation of the second shaft 108 with respect to the central frame 102, a slot 109 is created on the latter that has a development coinciding with the trajectory that the second shaft 108 travels with respect to the central frame 102 when the tail plate 103 is moved in response to the application of a force on the backrest 201.

[0038] The mechanism 10 also comprises a third shaft 110 hinged to the front end of the central frame 102 and to the tail plate 103, a fourth shaft 111 hinged to the front end of the central frame 102 and to the rear end of the connection rod 104, and a fifth shaft 112 hinged to the

front end of the connection rod 104 and to the front end of the lower plate 101.

[0039] The mechanism 10 also comprises elastic reset means connected to the lower plate 101, to the tail plate 103 and to the connection rod 104.

[0040] In the example given here, the elastic reset means comprise two compression springs 116 having one end connected to the fourth shaft 111 and the opposite end connected to the fifth shaft 112 by two respective connection devices 113 and 114 which are configured to constrain the springs, allowing only their longitudinal axial compression.

[0041] When the rear end of the lower plate 101 moves upward or downward, it causes the front end of the lower plate 101 to move upward or downward, and the latter moves the fifth shaft 112 with it, which moves upward or downward. In this way, the fifth shaft 112 and the front end of the connection rod 104 rotate around the fourth shaft 111. At the same time, the movement of the fifth shaft 112 drives the connection device 114 to move toward the backrest 201, in such a way as to compress the spring 116 which exerts a contrasting elastic force.

[0042] This allows to adjust the inclination of the backrest 201 according to the user's weight. In fact, the greater the weight of the user, the greater the elastic reaction of the elastic reset means will be.

[0043] Preferably, the elastic reset means comprise spiral compression springs 116 that can contrast strong pressures and that have a high elastic coefficient.

[0044] In the event that the user inclines the backrest 201 of the chair 200 to a maximum angle of inclination, the response of the spring 116 will in any case be greater than the weight applied on the backrest 201 by the user.

[0045] In fact, the elastic force of the spring 116 is always comparable with the force applied on the backrest 201 and on the lower plate 101 by the user, thus guaranteeing maximum comfort for the user.

[0046] The mechanism 10 of the present invention offers a simple structure, a constructive design with few parts, the possibility of automatically adjusting the position of the backrest 201 based on the user's weight, and it has elastic reset means which efficiently counteract the change in weight.

[0047] Furthermore, the mechanism 10 of the present invention allows for a high level of safety, thereby limiting the possibility of injury to the user.

[0048] It is clear that modifications and/or additions of parts may be made to the mechanism 10 for seats as described heretofore, without departing from the field and scope of the present invention, as defined by the claims.

[0049] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art will be able to achieve other equivalent forms of mechanism for seats, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

[0050] In the following claims, the sole purpose of the references in brackets is to facilitate their reading and they must not be considered as restrictive factors with regard to the field of protection defined by the very claims.

Claims

1. Mechanism (10) for the synchronous adjustment of the height of the seat (202) and of the inclination of the backrest (201) of a chair (200), wherein said mechanism (10) comprises a lower plate (101) configured to be attached to said seat (202), a central frame (102) attached to said lower plate (101), a tail plate (103) pivoted to said central frame (102) and to said lower plate (101) and configured to be connected to said backrest (201), a connection rod (104) connected to said central frame (102) and to said lower plate (101).

2. Mechanism (10) as in claim 1, **characterized in that** it also comprises elastic reset means connected to said lower plate (101), to said tail plate (103) and to said connection rod (104), and configured to generate a resistant shape in response to a rotation of said tail plate (103).

3. Mechanism (10) as in claim 1 or 2, **characterized in that** it also comprises a first shaft (107) hinged to the rear end of said central frame (102) and to said tail plate (103), and a second shaft (108) hinged to the rear end of said lower plate (101) and to said tail plate (103), in front of said first shaft (107).

4. Mechanism (10) as in any claim hereinbefore, **characterized in that** it comprises a third shaft (110) hinged to a front end of said central frame (102), a fourth shaft (111) hinged to the front end of said central frame (102) and to the rear end of said connection rod (104), and a fifth shaft (112) connected to the front end of said connection rod (104) and to the front end of said lower plate (101).

5. Mechanism (10) as in any claim from 2 to 4, **characterized in that** said elastic reset means comprise two compression springs (116) having one end connected to said fourth shaft (111) and the opposite end connected to said fifth shaft (112) by two respective connection devices (113, 114) configured to constrain said springs (116) allowing their longitudinal axial compression.

6. Chair (200) comprising a backrest (201) and a seat (202), **characterized in that** it comprises a mechanism (10) as in any claim hereinbefore and in which said lower plate (101) is connected to said seat (202) and said tail plate (103) is connected to said backrest (201).

7. Chair (200) as in claim 6 which also comprises a

plurality of support legs connected to a tubular element (203), **characterized in that** said tubular element (203) is connected to said central frame (102).

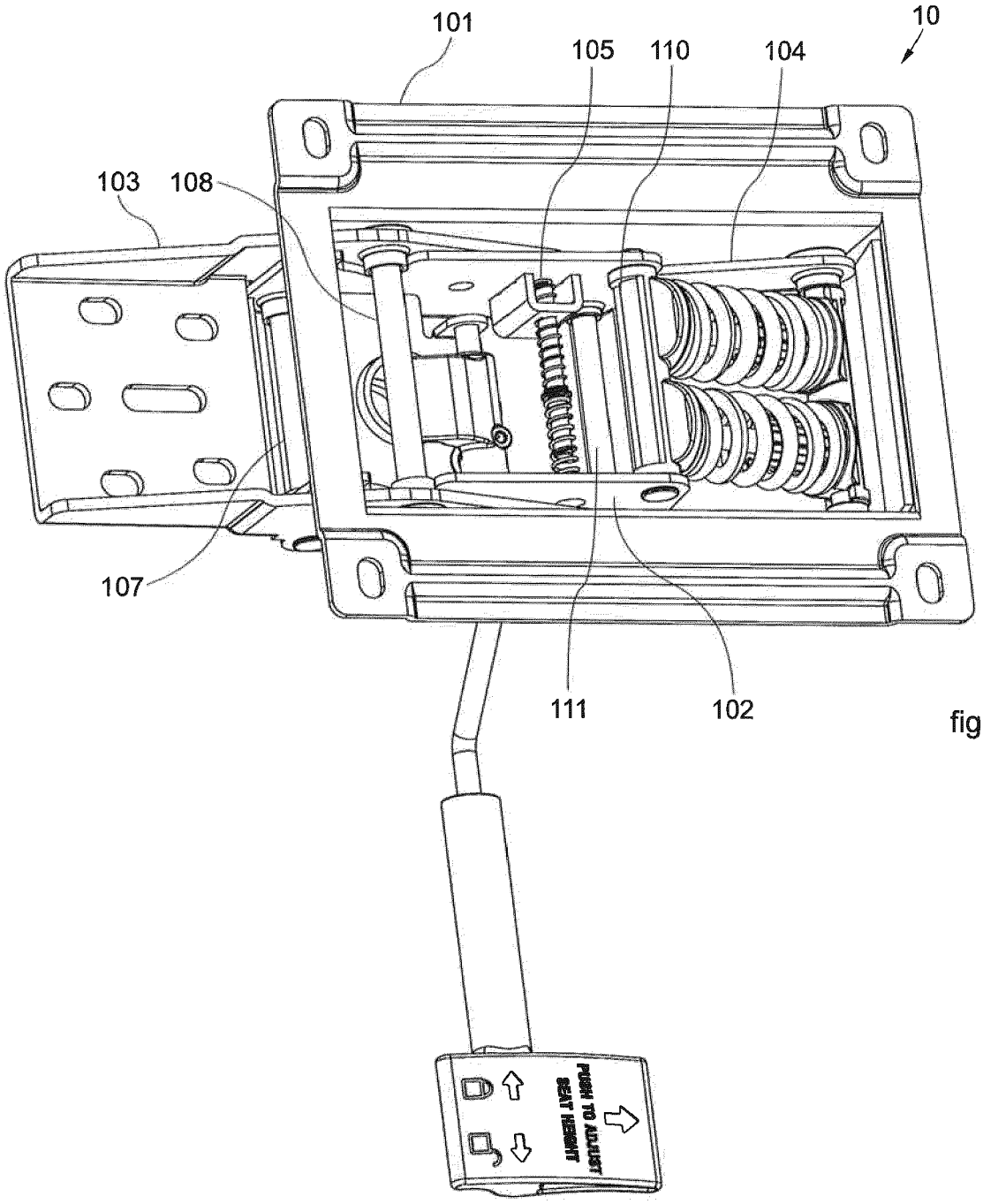

101
10
105
110
104
103
108
107
111
102
PUSH TO ADJUST
SEAT HEIGHT

fig. 1

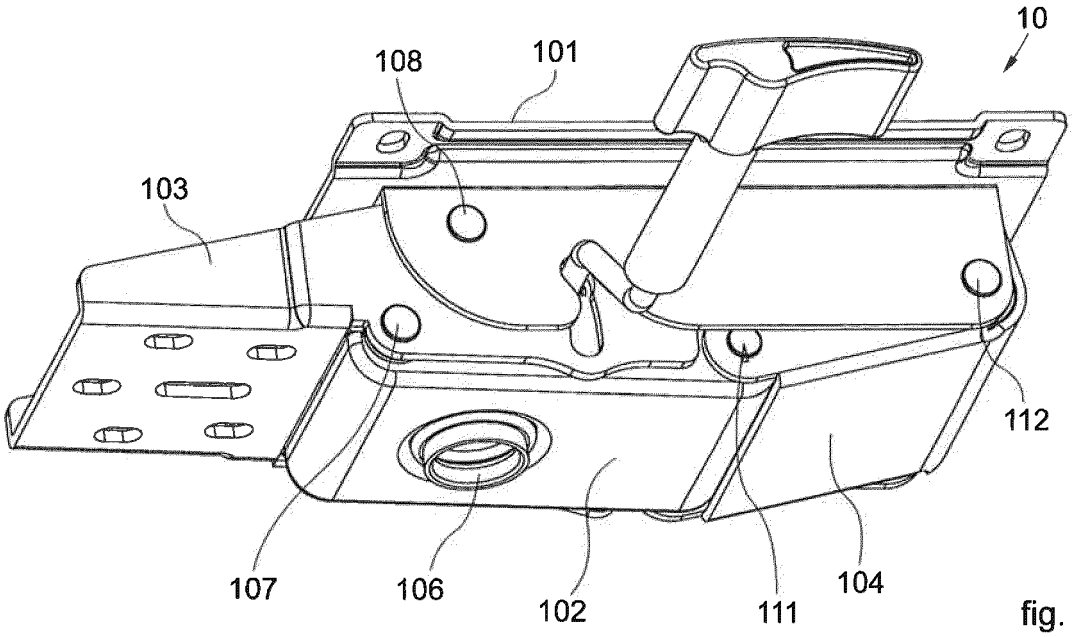

10
108
101
103
112
107
106
102
111
104

fig. 2

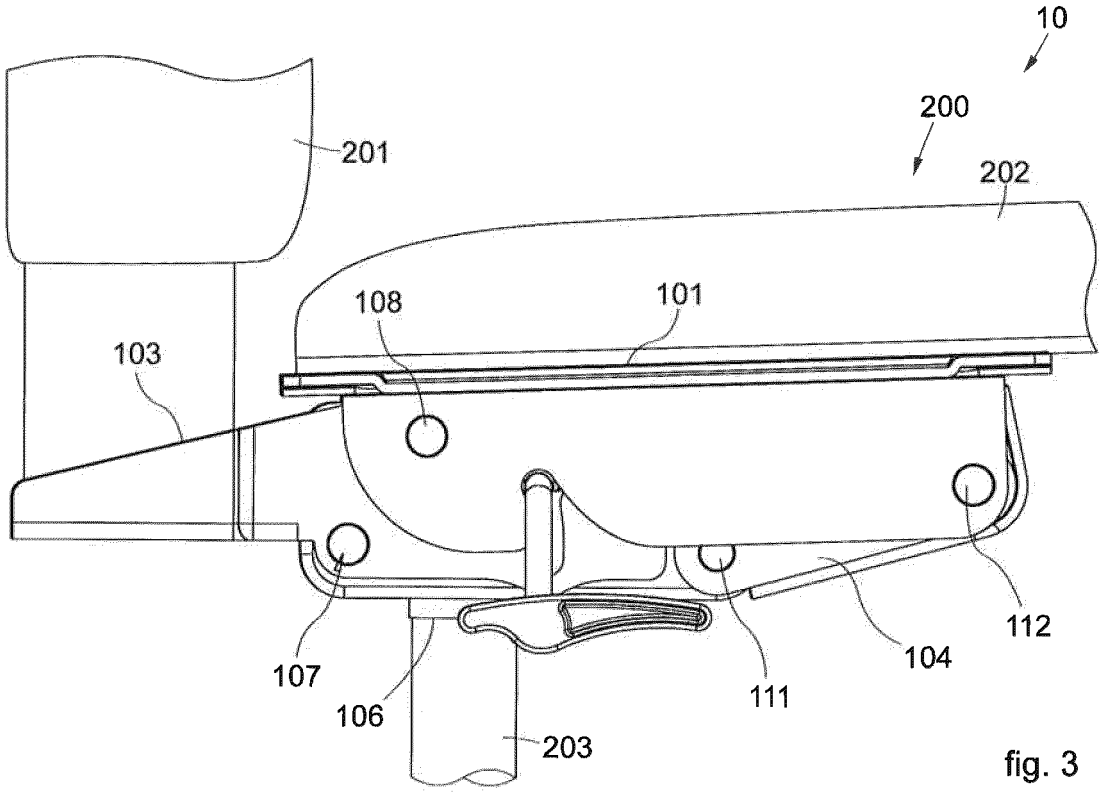
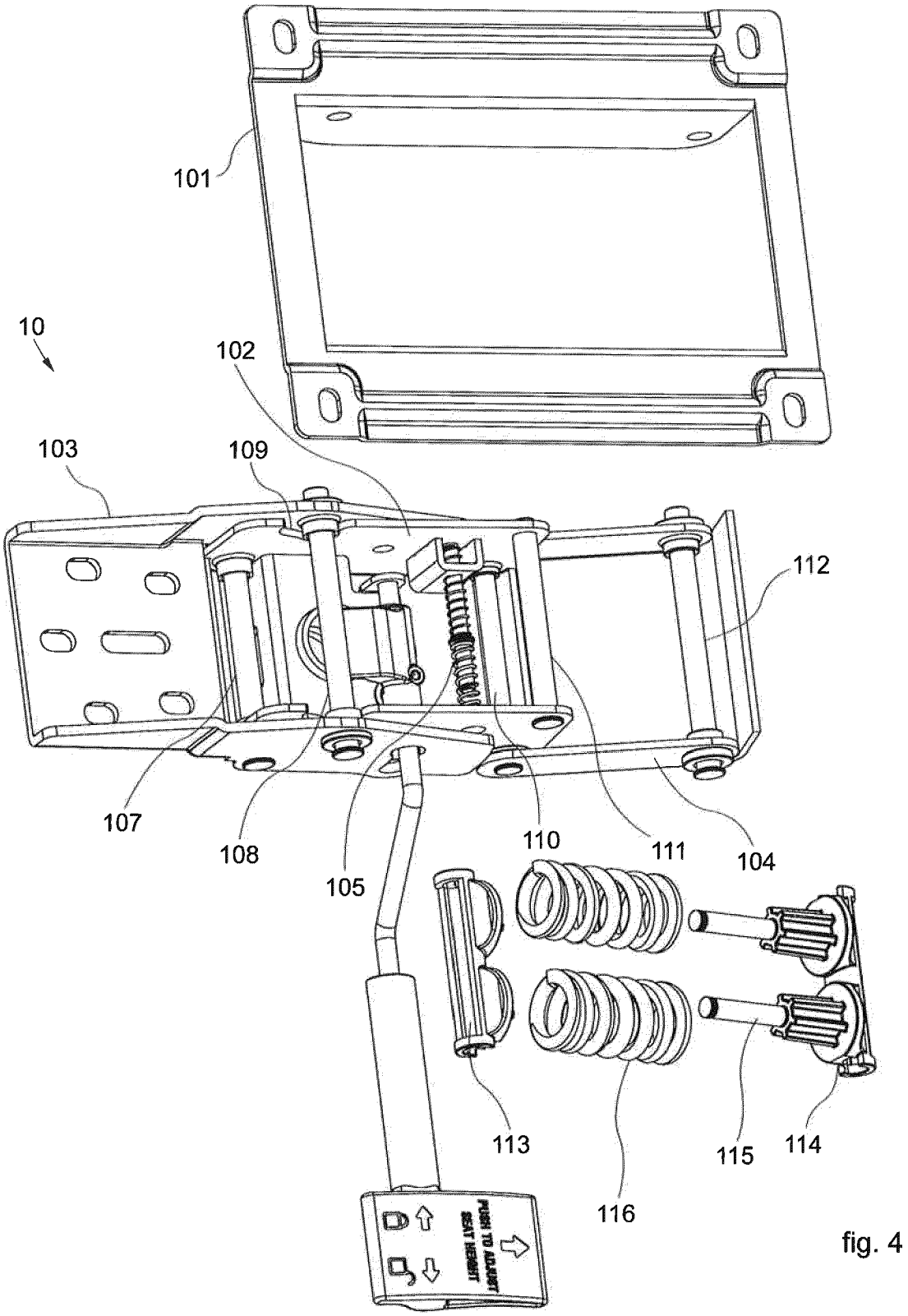

10
200
201
202
108
101
103
112
104
107
106
111
203

fig. 3


101
10
102
103
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112
107
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111
104
113
115
114
116
PUSH TO ADJUST
SEAT HEIGHT

fig. 4

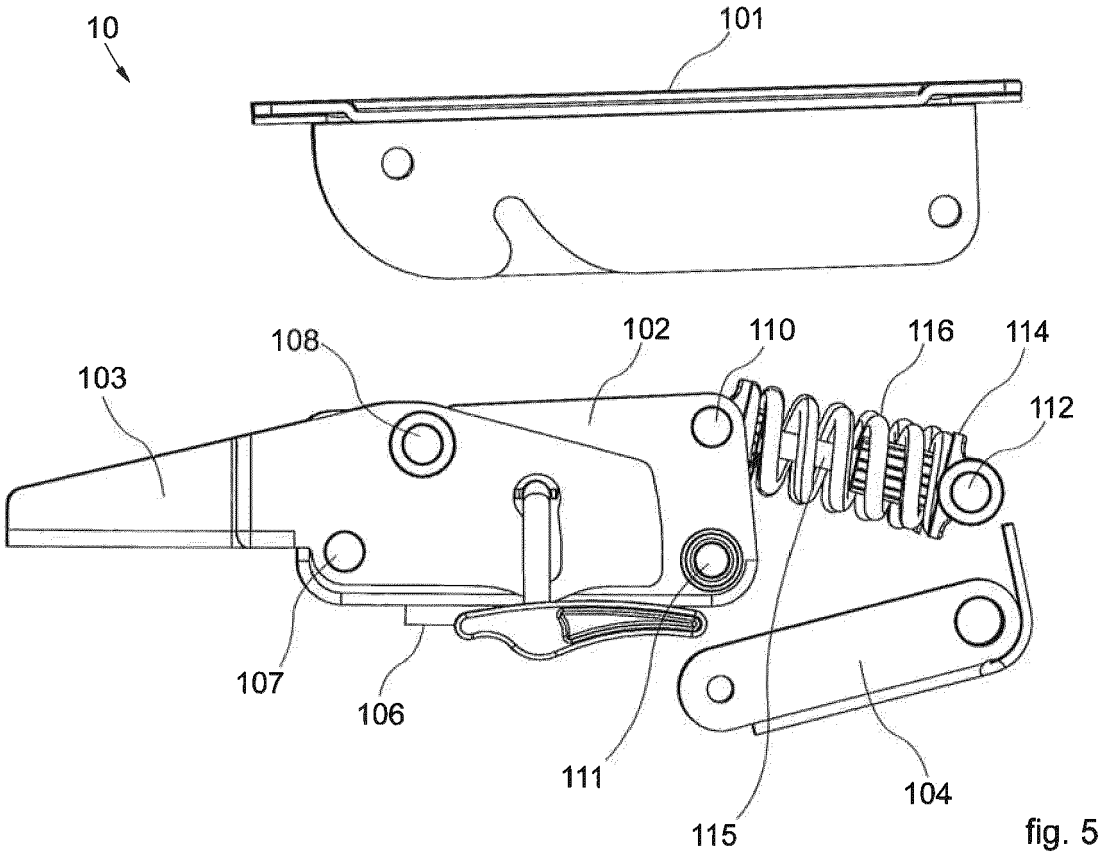

fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 23 16 8118

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 214 711 564 U (ZHONGSHAN JIWEN FURNITURE CO LTD) 16 November 2021 (2021-11-16) * the whole document *	1-7	INV. A47C1/032
X A	WO 2019/082219 A1 (CO FE MO IND S R L [IT]) 2 May 2019 (2019-05-02) * page 8, line 15 - line 20; figures 1,2 *	1,3,4,6,7 2,5	
X A	JP 2003 024164 A (TAKANO CO LTD) 28 January 2003 (2003-01-28) * paragraph [0043]; figures 1,2,6 *	1,2,6,7 3-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 August 2023	Pössinger, Tobias

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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02-08-2023

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