



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.04.2013 Bulletin 2013/17

(51) Int Cl.:
A47C 7/40 (2006.01)

(21) Application number: **12189288.9**

(22) Date of filing: **19.10.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **19.10.2011 IT UD20110167**

(54) **Height adjustment device for chair backrest**

(57) Device to adjust the height of a backrest (13) of a chair (11), which comprises a support structure (15) provided with a guide channel (25; 127) through which a support element (14; 114) solidly associated with the backrest (13) is free to slide. The device comprises an interference element (27, 28; 127) provided with an in-

terference surface (33; 151) and at least an actuation member suitable to act on the interference element (27, 28; 127) in order to determine a condition of interference between the interference surface (33; 151) and the support element (14; 114) and to allow the selective adjustment of the height of the backrest (13).

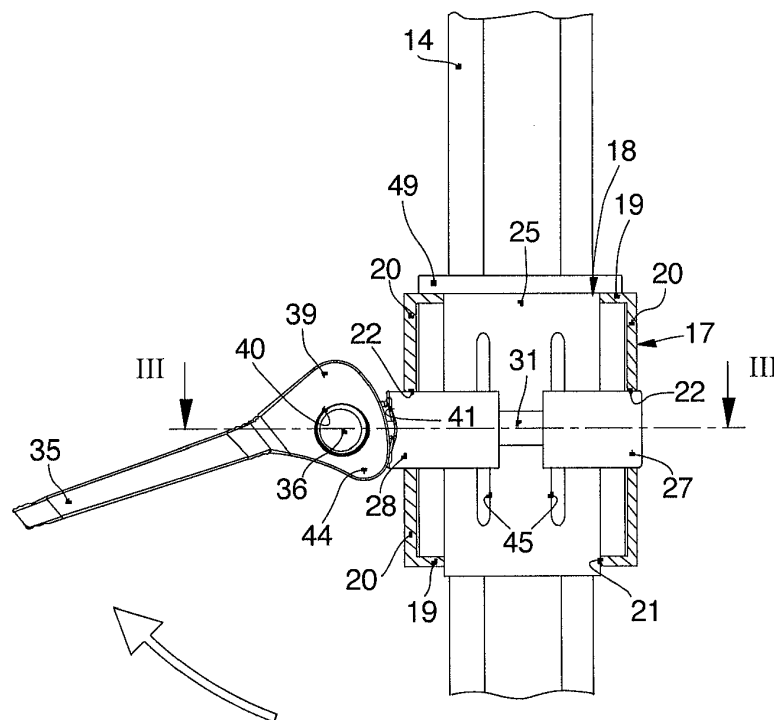


fig.2

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a device to adjust the height of the backrest of a chair, such as for example an office chair, an armchair, a seat or similar structure for sitting on.

[0002] The present invention also concerns the chair that includes the adjustment device.

BACKGROUND OF THE INVENTION

[0003] Chairs of the type identified above are known, in which a backrest can be adjusted in height with respect to a seat element, to improve the ergonomic conditions and comfort for the user.

[0004] It is also known that this adjustment in height of the backrest is actuated by means of adjustment devices, which cooperate with a guide element which is attached to the seat element and a support element, oblong in shape, such as for example a bar, a tube, a profile or suchlike, to which the backrest is attached. In particular, the guide element is provided with a through seating, shaped in a manner mating with the cross section of the support element of the backrest, so that the latter can be inserted inside the through seating and can slide longitudinally. A device to adjust the height is solidly associated with the seat element in correspondence with the guide element and is provided with abutment elements which are disposed in correspondence with the through seating of the guide element, and are suitable to act directly on the peripheral surface of the support element. Each abutment element is provided with interference surfaces conformed in mating manner with the internal surface of the through seating and cooperating, during use, with the support element of the backrest. A connecting screw reciprocally connects the abutment elements with each other in order to determine a reciprocal approaching/distancing movement.

[0005] The connecting screw is in turn associated with an actuation member, for example a knob which, by screwing/unscrewing, determines the reciprocal positioning of the two abutment elements.

[0006] More specifically, acting on the knob determines a reciprocal movement nearer to each other of the abutment elements, and the interference surfaces of the latter contact the external surface of the support element, generating a condition of interference. In this way it is therefore possible to determine the adjustment of the height of the backrest of the chair.

[0007] The knob is positioned in proximity to the seat element, at the rear with respect to where the user sits and, to be driven, is rotated around the axis of rotation of the screw.

[0008] One disadvantage of the known adjustment device is that it is difficult to access and actuate given that usually the knob is disposed in a very confined space

near the seat element. Therefore, there may be problems with the chafing of the user's hands against the seat element that can cause grazes for the user and in any case operating difficulties.

[0009] Devices to adjust the height of the backrest of a chair are also known, for example from documents US-A-4.497.092 and JP-U-H02.124057, comprising an actuation lever that acts on interference elements provided with a surface that almost completely surrounds the external surface of the support element of the backrest.

[0010] These adjustment devices, on which the preamble to the main claim is based, are complex to make and do not guarantee the correct positioning and maintenance over time of the height of the backrest with respect to the seat. Furthermore, the adjustment devices described in said documents are not easy to actuate and are difficult to access.

[0011] One purpose of the present invention is to obtain a device to adjust the height of a backrest of a chair that is easily accessible and that does not require complex operations to actuate.

[0012] Another purpose of the present invention is to obtain a device to adjust the height of a backrest of an office chair that is economical and simple to make.

[0013] Another purpose of the present invention is to obtain an adjustment device that allows the user to adjust the height of the backrest of the chair quickly, easily and safely, even if the user is sitting on it.

[0014] 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

[0015] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0016] In accordance with the above purposes, a device to adjust the height of a backrest of a chair is advantageously applied to office-type chairs, armchairs or other.

[0017] The chair to which the invention is applied comprises a support structure provided with a guide channel through which a support element is able to slide, solidly associated with the backrest.

[0018] The adjustment device comprises an interference element provided with an interference surface, and at least an actuation member suitable to act on the interference element in order to determine a condition of interference between the interference surface and the support element and to allow the selective adjustment of the height of the backrest.

[0019] The actuation member is the lever type and is suitable to assume a first operating condition in which the support element of the backrest can slide freely in the guide channel so as to determine the desired height

of the backrest with respect to the seat part, and a second operating condition in which the actuation member, acting on the interference element, blocks the support element with respect to the guide channel, thus fixing the height of the backrest to the desired value.

[0020] According to one feature of the present invention, the interference element comprises two independent blocks, disposed reciprocally adjacent and connected to each other by a tie-rod element. Furthermore, the actuation member is associated to the tie-rod element and is configured, when driven by the user, to move the interference blocks nearer to/away from each other so that they act, with respective interference surfaces, against the support element in order to clamp or respectively release the position of the support element in the guide channel.

[0021] In this way, a user can adjust the height of the backrest simply and quickly by acting directly on the lever-type actuation member with a single opening/closing movement, without any risk of chafing against the parts of the chair that are very close to the seat part.

[0022] Using a lever-type actuation member allows to exploit the very limited spaces available between the seat part and the backrest, and also to dispose the latter so as to prevent the user from hurting himself as it passes from its first to its second operating condition.

[0023] According to another feature of the present invention, the lever-type actuation member is provided with a cam terminal suitable to cooperate with one of the interference blocks so as to put the tie-rod element under traction and to move the interference blocks closer to each other.

[0024] When the tie-rod element is put under traction, it takes the interference surface of each interference block into contact with the support element, thus determining the stable positioning of the backrest.

[0025] The cam terminal, defining an eccentricity with respect to the fulcrum of the actuation lever, selectively puts the tie-rod element under traction in order to establish the stable positioning of the backrest, while when the actuation member is in its first operating condition, the tie-rod element is not under traction and it is therefore possible to determine the adjustment in height of the backrest.

[0026] According to another form of embodiment, the device comprises a guide element or tube, insertable in the guide channel of the support structure in which the support element of the backrest is inserted during use.

[0027] In another form of embodiment, the first and second interference blocks are disposed outside the tube and, when the actuation member is in the second operating condition, they act on the tube to achieve a condition of interference between the latter and the support element. In this form of embodiment the elastic pliability of the tube is exploited to transmit the pressure imparted by the interference blocks against the support element of the backrest.

[0028] Some forms of embodiment of the invention pro-

vide that the guide element or tube is provided with at least a notch suitable to increase the pliability of the tube and increase the holding effect of the support element, thus guaranteeing the height of the backrest is maintained over time.

[0029] The present invention also concerns the chair that includes a device to adjust the height of the backrest as described above.

10 BRIEF DESCRIPTION OF THE DRAWINGS

[0030] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of a chair including a device to adjust the height of a backrest according to the present invention;
- fig. 2 is a partly sectioned lateral view of the device to adjust the height of a backrest according to the present invention, in a first operating condition;
- fig. 3 is a section view of fig. 2 from III to III;
- fig. 4 is a partly sectioned lateral view of the device to adjust the height of a backrest according to the present invention, in a second operating condition;
- fig. 5 is a section view of fig. 3 from V to V;
- fig. 6 shows a detail of fig. 2 according to a first variant;
- fig. 7 is a first variant of fig. 3 to which the detail in fig. 6 is applied;
- fig. 8 shows a detail of fig. 2 according to a second variant;
- fig. 9 is a second variant of fig. 3 to which the detail in fig. 8 is applied.

[0031] 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 form of embodiment can conveniently be incorporated into other forms of embodiment without further clarifications.

45 DETAILED DESCRIPTION OF SOME FORMS OF EMBODIMENT

[0032] With reference to the attached drawings, an adjustment device according to the present invention is denoted in its entirety by the reference number 10 and is associated with a chair 11.

[0033] The chair 11 comprises, in a known manner, a seat part 12 and a backrest 13 which is associated with the seat part 12 and is selectively positionable in height with respect to the latter, by means of the adjustment device 10.

[0034] A support element is also associated in a known manner to the backrest 13, in this case an oblong profile

which extends longitudinally beyond the bulk of the backrest 13 and which, during use, is suitable to cooperate with the adjustment device 10.

[0035] The seat part 12 is associated with a frame 15 that provides both to support the seat part 12 and also to connect it to a support base 16 of the chair 11. The frame 15, toward its rear part, is provided with a tubular body 17, hollow inside, substantially prismatic in shape, on which the adjustment device 10 is mounted.

[0036] More specifically, the tubular body 17 (figs. 2 - 5) comprises first sides 19 disposed substantially parallel to the seat part 12, and second sides 20 disposed orthogonal to the first sides 19.

[0037] The first sides 19 are each provided with a first shaped hole 21, while the second sides 20 are each provided with a second shaped hole 22.

[0038] The first shaped holes 21 and respectively the second shaped holes 22 are made substantially coaxial with respect to each other. The first shaped holes 21 define together a guide channel 18 in which the profile 14 is inserted in a guided manner.

[0039] Through the first shaped holes 21 a guide element is disposed through, in this case a tube 25, through which the profile 14 of the backrest 13 is inserted.

[0040] In other forms of embodiment, the function of the guide element can be carried out only by the first shaped holes 21 made on the tubular body 17.

[0041] The tube 25 is provided with a through seating 26, having a shape and sizes mating with the cross section of the profile 14.

[0042] The tube 25 is made of elastically pliable material, such as for example plastic, aluminum or other metal materials.

[0043] The adjustment device 10 comprises a first interference block 27 and a second interference block 28, each provided with a through hole 30. The through holes 30, during use, are substantially coaxial with respect to each other, and a tie-rod element is inserted through them, in this case a screw 31, which provides to connect them so as to move them reciprocally closer/farther apart.

[0044] The first 27 and the second interference blocks 28 lie substantially on the same plane, and can be moved toward and away from each other, as will be explained hereafter, to respectively clamp and release the profile 14 and consequently clamp the backrest in position or release it.

[0045] Both the first 27 and the second interference blocks 28 are provided with a shaped surface 33, with an active function of interference, and having shape and sizes mating with at least a portion of the external surface of the tube 25.

[0046] The ends of the first 27 and the second interference blocks 28 are suitable to be inserted into the second shaped holes 22 of the tubular body 17.

[0047] The screw 31 has a threaded end that protrudes with respect to the second interference block 28. An actuation member is associated to the screw 31, and comprises an actuation lever 35 and a pin 36 around which

the actuation lever 35 is made to rotate.

[0048] The pin 36 is provided with a threaded hole 37 made transverse to its longitudinal axis. The threaded end of the screw 31 is screwed into the threaded hole 37.

5 **[0049]** The actuation lever 35 is provided with an end portion 39 in which a through hole 40 is made. The pin 36 is inserted into the through hole 40. The end portion 39 is shaped so as to define a cam terminal 44 having an eccentricity with respect to the axis of the through hole 40.

10 **[0050]** A groove 43 is made in the end portion 39 of the actuation lever 35, in correspondence with the cam terminal 44, and extends transversely to the through hole 40.

15 **[0051]** The groove 43 has a depth such as to reach at least the through hole 40 and a width such as to allow the screw 31 to pass through it.

[0052] In one side of the second interference block 28 a concavity 41 is made which, during use, is suitable to cooperate directly with the cam terminal 44 of the end portion 39 of the actuation lever 35.

[0053] In order to increase the effect of interference with the profile 14, the tube 25 is provided with longitudinal grooves or notches 45, which increase its elastic pliability in order to optimize the action exerted by the first 27 and second interference blocks 28. In particular, the notches 45 are made in correspondence with action zones of the first 27 and second interference blocks 28.

20 **[0054]** In other forms of embodiment, for example the one shown in fig. 6, the tube 25 is provided with a notch 45 that extends longitudinally to the axial development of the tube 25, and is open toward its lower part so as to increase its elastic pliability.

25 **[0055]** Some forms of embodiment (fig. 7) provide that the notch 45 defines two lateral edges 47, substantially parallel to each other and each provided with a ridge 48 in correspondence with the external surface of the tube 25.

30 **[0056]** The ridge 48 cooperates during use with the first 27 and second blocks 28 and, during use, compresses each of the lateral edges 47 toward the profile 14.

35 **[0057]** In other forms of embodiment, for example the one shown in fig. 8, the notch 45 is U-shaped, that is, it has two substantially vertical segments, parallel to each other and to the longitudinal development of the tube, and a horizontal segment that connects the two substantially vertical segments. The notch 45 defines a tongue 46 that, during use, goes into contact with the profile 14 and is disposed in proximity to the action zone of the first 27 and second blocks 28.

40 **[0058]** In the form of embodiment in fig. 9, the tongue 46 has a conformation rounded toward the outside so that, during use, the first 27 and second blocks 28 are suitable to act on it.

45 **[0059]** In this way, in the forms of embodiment in figs. 7 and 9, the action of mechanical interference is determined both by the mechanical interference that the internal surface of the tube 25 exerts on the profile 14, and

also by the action of compression of the ridge 48 or the rounded tongue 46 on the external surface of the profile 14.

[0060] The tube 25 (figs. 2, 4, 6 and 8) is provided with an abutment edge 49 that, during use, is disposed resting on the tubular body 17 and determines its positioning inside the first shaped holes 21.

[0061] To assemble the adjustment device 10 according to the present invention, the tube 25 is inserted into the first shaped holes 21 of the tubular body 17 and the first 27 and second interference blocks 28 are inserted through the second shaped holes 22 of the tubular body 17 so as to dispose the shaped surface 33 of the first 27 and second interference blocks 28 substantially in contact with the external surface of the tube 25.

[0062] Then the screw 31 is inserted into the through holes 30 of the first 27 and second interference blocks 28 so that the threaded end protrudes from the second interference block 28.

[0063] The pin 36 is inserted into the through hole 40 of the actuation lever 35 so as to position its threaded hole 37 facing the groove 43 of the end portion 39.

[0064] Then the screw 31 is screwed into the threaded hole 37 to take the end portion 39 of the actuation lever 35 into contact with the concavity 41 of the second interference block 28.

[0065] Finally, the backrest 13 is associated with the seat part 12, inserting the profile 14 inside the tube 25.

[0066] By suitably adjusting the depth to which the screw 31 is screwed into the threaded hole 37, it is possible to determine the intensity of reciprocal movement of the first 27 and second interference blocks 28 toward/away from each other and therefore the level of interference exerted by the tube 25 on the profile 14.

[0067] In fact, the actuation lever 35 can be taken to a first operating condition (figs. 2 and 3) in which it is possible to adjust the height of the backrest 13 with respect to the seat part 12, and a second operating condition (figs. 4 and 5) in which the position assumed by the backrest 13 is clamped.

[0068] When the actuation lever 35 is in its first operating condition (figs. 2 and 3) the first 27 and second interference blocks 28 are disposed substantially in contact against the tube 25 but do not exert any pressure against it. The cam terminal 44 does not cooperate directly with the concavity 41 of the second interference block 28 and the screw 31 is not under traction. The profile 14 can slide freely inside the tube 25 without interference with it and in this way the operations to adjust the backrest 13 are allowed.

[0069] When the actuation lever 35 is taken to its second operating condition (figs. 4 and 5), that is, starting from its first operating condition, by rotating it in an anti-clockwise direction, the cam terminal 44 is put into cooperation with the concavity 41.

[0070] In this condition the cam terminal 44 puts the screw 31 under traction, bringing the first 27 and second interference blocks 28 reciprocally closer in order to exert

a compression on the tube 25, which in turn exerts a compression on the profile 14, determining the adjustment in height of the backrest 13.

[0071] It is clear that modifications and/or additions of parts may be made to the device to adjust the height of a backrest of a chair as described heretofore, without departing from the field and scope of the present invention.

[0072] 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 shall certainly be able to achieve many other equivalent forms of to adjust the height of a backrest of a chair, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Device to adjust the height of a backrest (13) of a chair (11), the chair (11) comprising a support structure (15) provided with a guide channel (18) through which a support element (14) solidly associated with said backrest (13) is free to slide, said adjustment device comprising an interference element and at least an actuation member of the lever type suitable to act on said interference element in order to determine a condition of interference between said interference element and said support element (14) and to allow the selective adjustment of the height of said backrest (13), **characterized in that** said interference element comprises two interference blocks (27, 28) independent from each other, disposed reciprocally adjacent and reciprocally connected by a tie-rod element (31), and **in that** said actuation member (35) is associated with said tie-rod element (31) and is able to be selectively activated to move said interference blocks (27, 28) nearer to/away from each other so as to take the respective interference surfaces (33) respectively against or far from said support element (14) so as to clamp, or respectively release, said support element (14).
2. Device as in claim 1, **characterized in that** said actuation member (35) of the lever type is provided with a cam terminal (44) suitable to cooperate with one of said interference blocks (27, 28) so as to put said tie-rod element (31) under traction and bring said interference blocks (27, 28) nearer each other.
3. Device as in claim 2, **characterized in that** a pin (36), around which said actuation member (35) is able to rotate, is associated with said cam terminal (44).
4. Device as in claim 3, **characterized in that** said tie-rod element comprises a screw (31), suitable to screw onto said pin (36) in a threaded hole (32) there-

of, made transverse to its axial development.

5. Device as in any claim hereinbefore, **characterized in that** said interference blocks (27, 28) are each provided with a through hole (30) through each of which said tie-rod element (31) is inserted. 5
6. Device as in any claim hereinbefore, **characterized in that** it comprises a guide element (25) able to be inserted into said guide channel (18) of the support structure (15) and through which said support element (14) is able to be inserted in guided manner. 10
7. Device as in claim 6, **characterized in that** said interference blocks (27, 28) are disposed externally to said guide element (25), and are configured to act on said guide element (25) to achieve a condition of interference between said guide element (25) and said support element (14). 15
20
8. Device as in claim 6 or 7, **characterized in that** said guide element comprises a tube (25) provided with at least a longitudinal notch (45) disposed in correspondence with the action zone of the interference blocks (27, 28). 25
9. Device as in claim 8, **characterized in that** on the external surface of said tube (25) and in correspondence with said notch (45) there are ridges (48) cooperating with said interference blocks (27, 28). 30
10. Device as in claim 8, **characterized in that** said notch (45) is shaped so as to define, in said tube (25), a tongue (46). 35
11. Device as in claim 10, **characterized in that** said tongue (46) has a rounded conformation toward the outside, and **in that** said interference blocks (27, 28) are disposed so as to act on said tongue (46). 40
12. Chair comprising a device to adjust the height of the backrest as in any claim hereinbefore. 45
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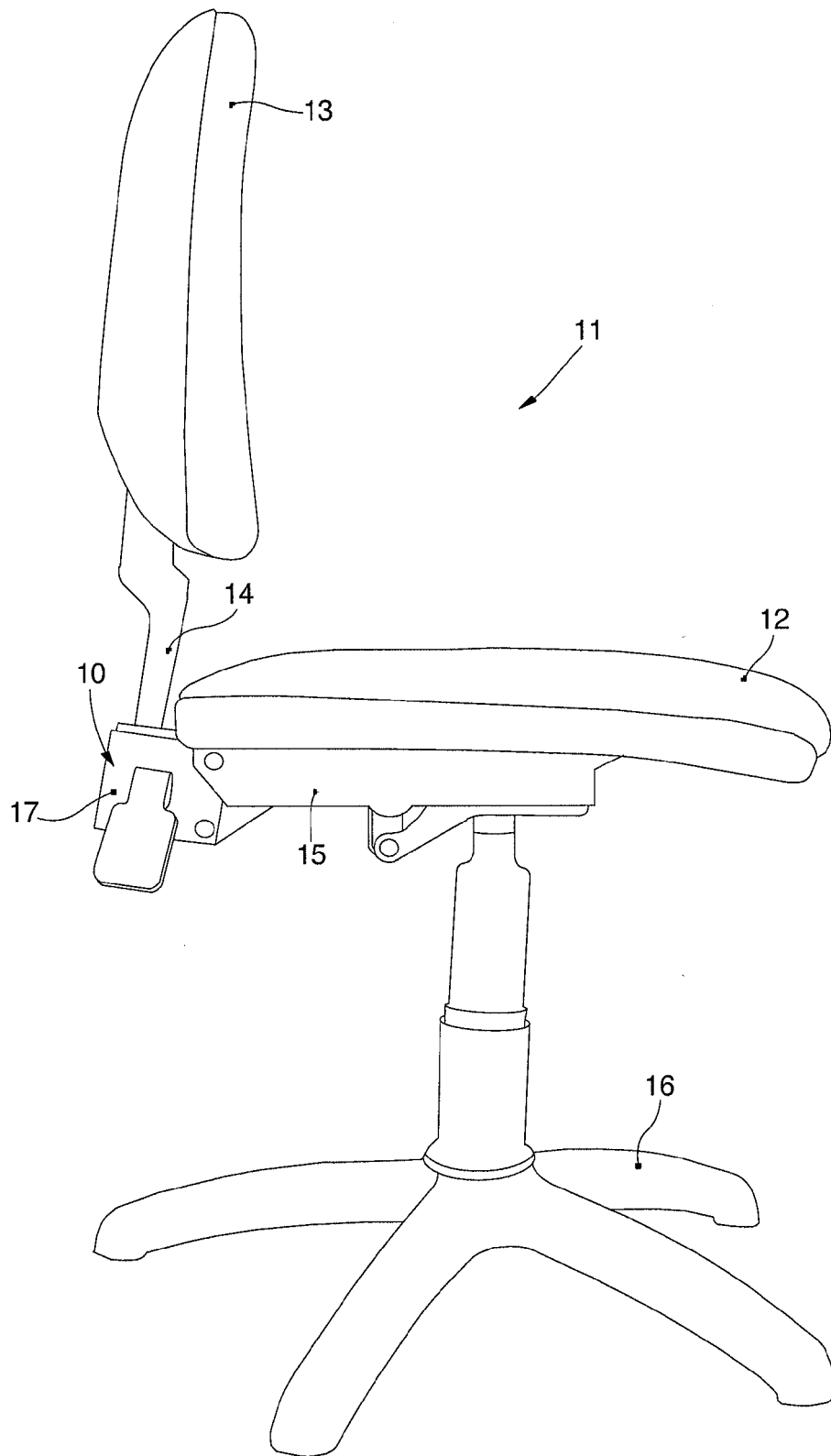


fig.1

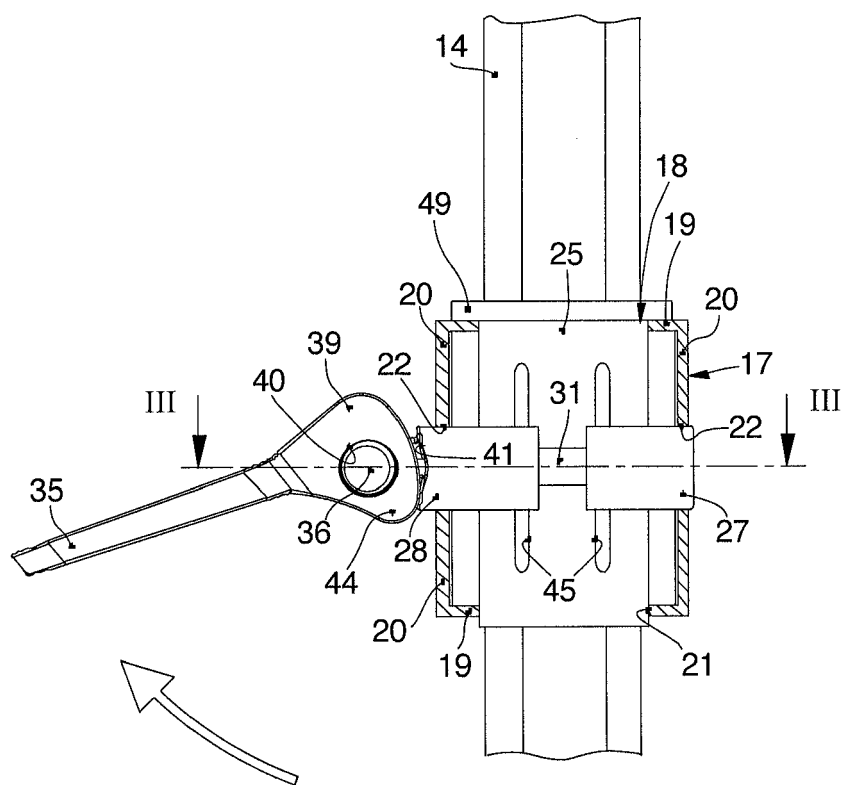


fig.2

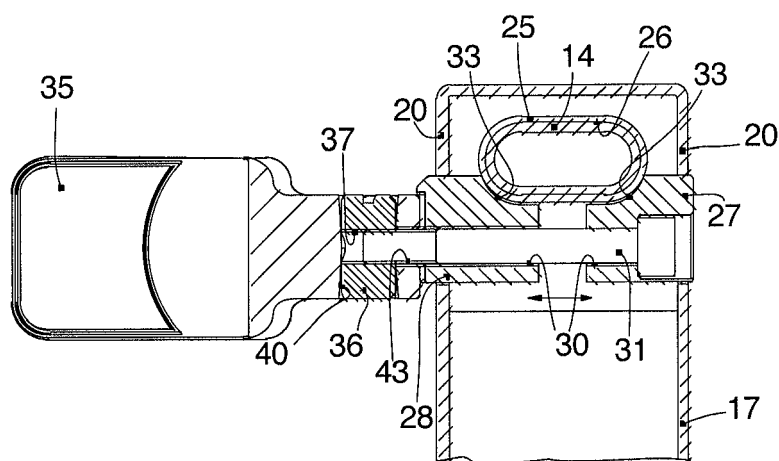


fig.3

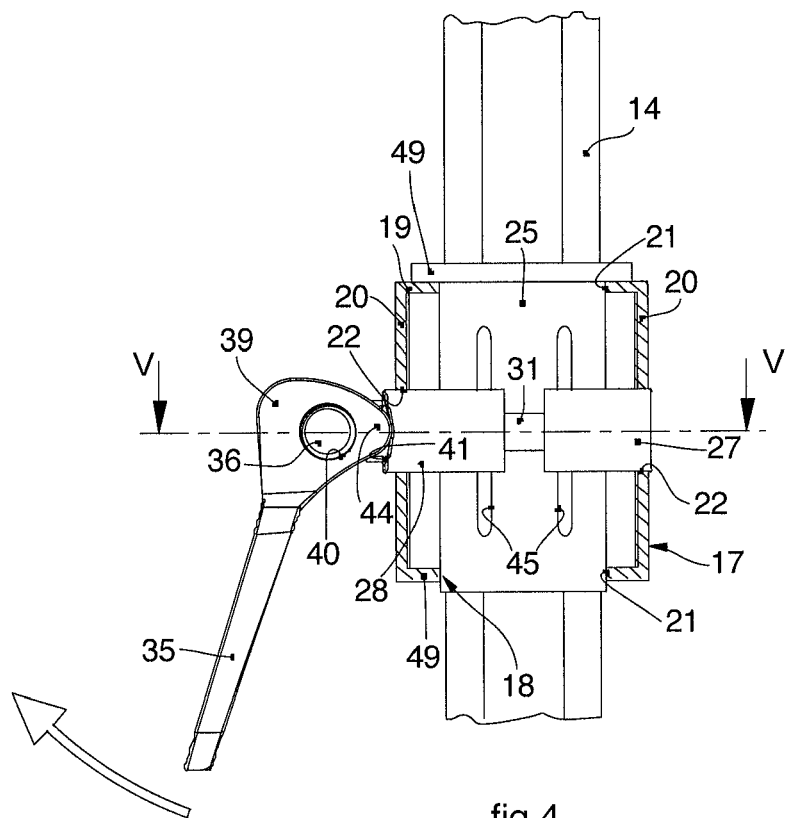


fig.4

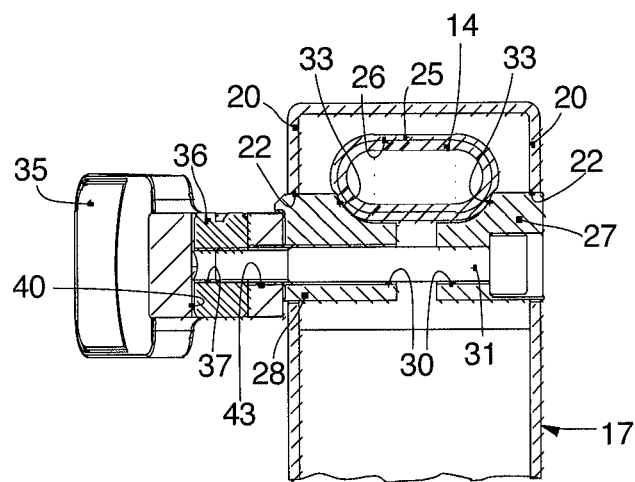


fig.5

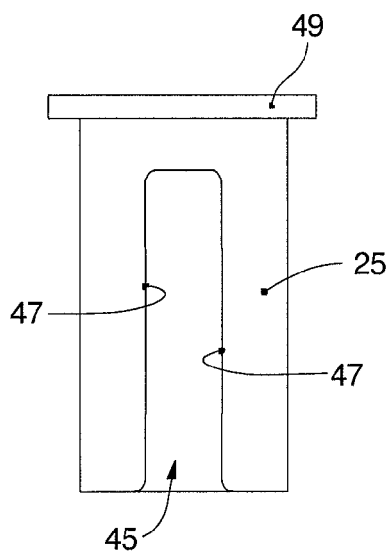


fig. 6

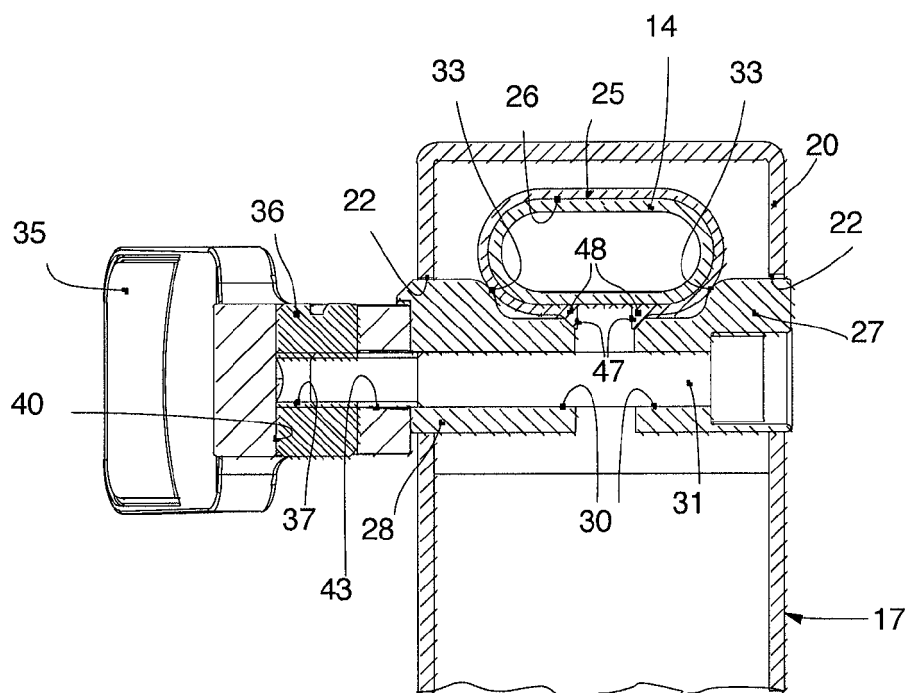


fig. 7

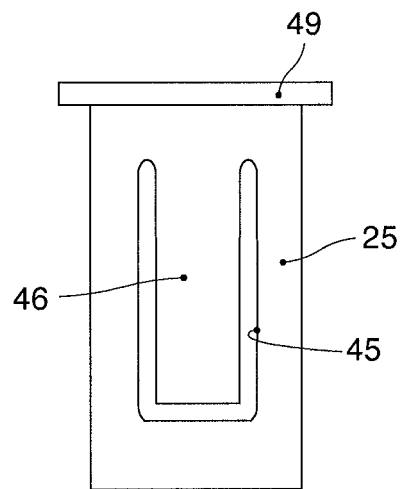


fig. 8

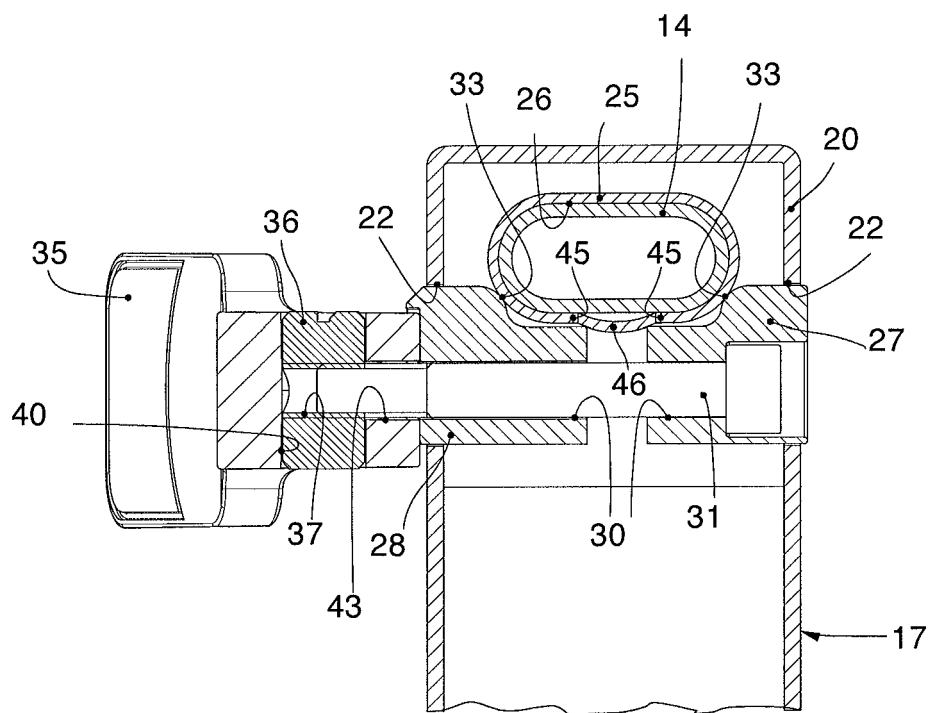


fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 12 18 9288

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	JP 55 175361 U (-) 16 December 1980 (1980-12-16) * figures 4,5 * -----	1,12	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47C F16B
Place of search		Date of completion of the search	Examiner
The Hague		18 December 2012	Kus, Sławomir
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 18 9288

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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