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

(11) EP 2 384 665 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.11.2011 Bulletin 2011/45

(51) Int Cl.:
A47B 9/12 *(2006.01)* ***A47B 9/20*** *(2006.01)*

(21) Application number: **10162013.6**

(22) Date of filing: **05.05.2010**

(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 SE SI SK SM TR
Designated Extension States:
BA ME RS

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(54) Height-adjustment arrangement of a support device

(57) An arrangement for height-adjustment of a support device (2) like e.g. a tabletop equipped with at least one telescope leg (3) consisting of at least two tubes (4,5,6) slideable mounted within each other. The arrangement comprises a curved casing (8) extending between the support device (2) and the uppermost of the tubes (6) of the telescope leg (3), a bendable elongated pressure member (19) which via said casing (8) and the telescope leg (3) is extending from a first end (20) on the support device (2) to a second end (21) in the lowermost of the tubes (4) of the telescope leg (3), and a drive set (10, 13, 14, 15, 16, 17, 18) for displacing either the first or the second end (20;21), respectively, of the pressure member (19) from one position to another one during a height adjusting operation. The height-adjustment arrangement according to the invention has a simple and non-expensive construction, which is easy and securely to operate and is adapted for synchronously adjusting the length of all the telescope legs of the support device which thereby is exactly parallel displaced during a height adjusting operation.

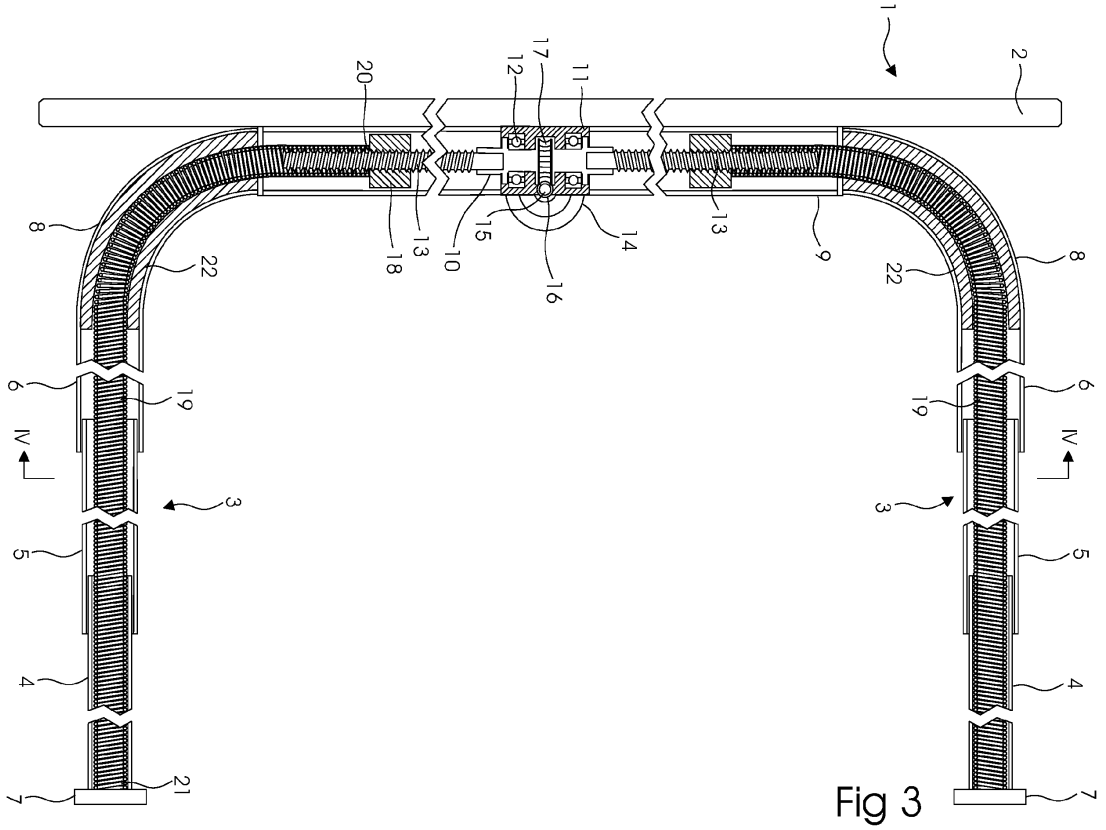

Fig 3

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Description

[0001] The present invention relates to an arrangement for height-adjustment of a support device equipped with at least one telescope leg consisting of at least two tubes slideable mounted within each other.

[0002] The invention also relates to a use of the height-adjustment arrangement.

[0003] The term "support device" is used herein for stating that the device is adapted for supporting a load.

[0004] The support device may for example be a tabletop, a bed bottom or a chair seat adapted to be height-adjusted for thereby obtaining the most advantageous and comfortable working posture for a person.

[0005] During the day it also can be pleasant for to change posture for example between a sitting and a standing posture.

[0006] It is well known that working in an ergonomic incorrect posture can cause the working person serious work-related injuries, which can result in heavy expenses for both the individual as for the community in general.

[0007] During the years great efforts therefore have been exercised for improving existing height-adjustment arrangements.

[0008] Many of those known arrangements are using a compression spring for adjusting the length of the telescope legs of e.g. a table. The adjusting operation is however both time-consuming and troublesome to carry out and is moreover more or less dangerous.

[0009] The invention described in the US Patent Application No. 2007/0137535 tries to solve said problems by means of an arrangement which comprises a flexible strand which at one end is fixed to the inner side of the upper tube of a telescope leg of a table and at the other end to an upper part of a compression spring placed in a lower tube of the telescope leg whereby the strand is wound around a pulley which has such a shape that the force acting between the upper and lower tube of the telescope leg is constant irrespective of the actual level of the tabletop of the table.

[0010] This known height adjustment-arrangement is easy and safe to operate but has unfortunately an extremely complicated and costly structure contributing too to reducing the lifetime of the arrangement.

[0011] From the SE Publication No. 513577 is known a table with telescope legs consisting each of an upper and lower leg part. A toothed belt is connected to the top of the lower leg part and led about a toothed wheel in the bottom of the upper leg part and further about a toothed wheel on the tabletop and from the last-mentioned toothed wheel further to a drive set upon the underside of the tabletop. The toothed belt is, by activating the drive set, imparted a drawing power whereby the two leg parts of each telescope leg are drawn from each other and the level of the tabletop thereby is raised.

[0012] Also the arrangement of this known table has a complicated and costly structure and the telescope legs of the arrangement have an inappropriate shape and an ugly appearance. The function of the telescope legs as columns is moreover unstable. The long belts of the arrangement furthermore imply that the telescope legs not always will get exactly the same length during height adjusting the tabletop, which therefore is not able to maintain a desired horizontal or inclined position in different levels.

[0013] The above-mentioned disadvantages of the prior art arrangement for height-adjustment of a support device is according to the invention remedied by,

in a first aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph, which has a simple and non-expensive structure,

in a second aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph, which is adapted to synchronously adjusting the length of all the telescope legs of the support device,

in a third aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph which is quickly, easy and securely to operate,

in a fourth aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph which can be operated with a minimum of effort,

in a fifth aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph which has a stable structure,

in a sixth aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph which has a long life.

in an seven aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph which is strong and durable,

in an eight aspect of the invention providing a height-adjustment arrangement of the kind mentioned in the opening paragraph which can be used for height-adjusting a tabletop of a table, a bed bottom of a bed and a chair seat of a chair.

[0014] Other aspects of the invention will be apparent during the course of the following description.

[0015] The novel and unique features wherein these and further features are achieved consists in the fact that the height-adjustment arrangement comprises a curved casing extending between the support device and the uppermost of the tubes of the telescope leg, a bendable elongated pressure member which via said casing and the telescope leg is extending from a first end on the support device to a second end in the lowermost of the tubes of the telescope leg, and a drive set for displacing either the first or the second end of the pressure member from one position to another position during a height-adjusting operation.

[0016] The height-adjustment arrangement of the invention thereby advantageously obtains a simple and non-expensive structure, which quickly, easy and se-

curely can be used for height-adjusting a support device such as for example a tabletop of a table, a bed bottom of a bed and a seat of a chair.

[0017] In a preferred embodiment according to the invention can the drive set advantageously be adapted to displace the first end of the pressure member either towards or away from the curved casing during height-adjusting the tabletop.

[0018] The curved casing can according to the invention moreover be formed as a curved extension of the uppermost of the tubes of the telescope leg whereby a strong and simple construction of the respective telescope leg is achieved.

[0019] According to the invention can a sleeve of a material with a low coefficient of friction moreover be placed in the casing in the space between the inner side of the casing and the outer side of the bendable pressure member for thereby reducing the energy used for a height-adjusting operation to a minimum and obtain a long life for the respective components of the height-adjustment arrangement.

[0020] The term "bendable pressure member" is used herein for stating that the member is adapted for transmitting a pressure between the first and second end of the pressure member, which can be bended too for being capable to slidingly passing through the curved casing during a height-adjusting operation.

[0021] The pressure member can, in an advantageous embodiment according to the invention, be an incompressible and elastic wire wound to a spring with a pitch similar or equal to the thickness of the wire.

[0022] This structure implies that the spring is able to transmit a pressure between its first end on the support device to the second end in the lowermost of the tubes of the telescope legs owing to the fact that the windings of the spring is abutting each other in the straight position of the spring and also in the bended position on the inner side of the bending while there otherwise is a distance between the windings allowing the bending of the pressure member to take place.

[0023] In another embodiment according to the invention can the pressure member be a chain whereby is obtained a non-expensive pressure member.

[0024] In a simple embodiment according to the invention can the pressure member be a bendable plastic rod or plastic tube with a round or flat cross section.

[0025] The pressure member can according to the invention be covered with a flexible hose of a material with a low coefficient of friction for further reducing the friction between the pressure member and the casing.

[0026] When the first end of the pressure member is connected to the support device and the second end to the lowermost of the tubes of the telescope leg will the support devise be raised if the first end of the pressure member is moved into the direction towards the casing and lowered if said first end is moved into the direction away from the casing.

[0027] In a preferred embodiment according to the invention is said displacing of the first end of the pressure member performed by means of an elongated screw, which can be manually operated or be operated by means of a drive set actuated by a motor.

[0028] In an expedient embodiment according to the invention comprises the drive set a worm gearing whereby is obtained that advantage that the drive set is self-locking so that the normal used locking means for keeping the support device in position not is needed and the height adjusting operation therefore quickly and easy can be carried out. The expenses of said locking means are moreover advantageously saved.

[0029] A simple and non-expensive structure of the drive set can according to the invention be achieved by means of a worm gearing having the worm mounted onto the output shaft of a motor and the worm wheel mounted onto a drive shaft connected to an elongated screw matching a nut connected to the first end of the pressure member.

[0030] In an expedient embodiment according to the invention can the spring be directly in mesh with the elongated screw, which then can have the same pitch as the spring. In this case is the spring itself functioning as the nut.

[0031] The thread of the elongated screw can within the scope of the invention be of any kind but is in a preferred embodiment according to the invention a trapezoidal thread whereby is obtained a secure and precise displacement of the nut during a height-adjusting operation and also a diminutive attrition of the co-operating screw and nut.

[0032] When the suppose devise is equipped with two opposite telescope legs can the elongated screw according to the invention be connected to each their end part of the same drive shaft whereby one of the screws is provided with a right-handed thread and the other screw with a left handed thread.

[0033] The two telescope legs thereby is adjusted exactly equally whereby advantageously is obtained that the inclination, if any, of the supply device in relating to a horizontal plane securely will be maintained in all levels of the supply device.

[0034] The same advantage is according to the invention obtained if the support device is equipped with two pair of such opposite telescope legs and the worm gear of each pair is connected to the same drive set.

[0035] The invention will be explained in greater details below, giving further advantageous features and technical effects and describing exemplary embodiments with reference to the drawing, in which

Fig. 1 is a perspective view of the height-adjustment arrangement according to the invention with a support device placed in a lower level,

Fig. 2 is a perspective view of the height-adjustment arrangement according to the invention with the support device placed in a higher level,

Fig. 3 is seen in section a fragmentarily lateral view of the height-adjustment arrangement seen in fig. 1 and 2 with the support device placed in an intermediary level, and

Fig. 4 is a cross section taken along he line IV - VI in fig. 3.

[0036] In the following description is by way of example referred to an embodiment of the height-adjustment arrangement in form of a table 1 showed in perspective in fig. 1 and 2 with the tabletop 2 placed in a lower and higher position, respectively.

[0037] The tabletop is in this case equipped with two opposite telescope legs 3. Each leg consists of a lower tube 4, an intermediate tube 5 and an upper tube 6. Each leg has moreover a foot 7.

[0038] Fig. 3 shows in section a fragmentarily lateral view of the height-adjustment arrangement for height adjusting the tabletop 2 of the table 1.

[0039] The tubes 4, 5 and 6 are slideable mounted within each other in such a way that they in the uppermost position of the tabletop still is partly overlapping each other with a portion long enough for securing the stability of the respective telescope leg.

[0040] In the shown embodiment has the upper tube 6 a larger diameter than the intermediate tube 5, which again has a larger diameter than the lower tube 4, but it may in another embodiment be the other way about.

[0041] The upper tube 6 of each telescope leg 3 is in this case connected to or integral with a curved tube 8 extending over an angle of 90° if the tabletop 2 is horizontally and the telescope leg 3 vertically extending.

[0042] In other cases may said angle be another angle than 90° so that one of the ends of the curved tube is extending into the same direction as the upper tube 6 of the telescope leg 3 and the other end is extending into the same direction as the tabletop.

[0043] The curved tube 8 is connected to a straight tube 9 extending along the underside of the tabletop 2. The straight tube 9 may have a circular or a square cross-section.

[0044] A drive shaft 10 is by means of ball bearings 12 rotationally mounted in a housing 11 inserted in the straight tube 9. In another embodiment may the drive shaft be rotationally mounted in the housing by means of a slide bearing, (not shown).

[0045] An elongated screw 13 is by height-adjusting the tabletop 2 rotated by means of an actuator 14, e.g. an electric motor with an output shaft 15 with a worm 16, which is in mesh with a worm wheel 17 mounted on the drive shaft 10.

[0046] In another embodiment may the actuator be a rod with a handle (not shown) for manually rotating the elongated screw 13. This application is non-expensive and well suited for tables, which only seldom need to be height-adjusted.

[0047] The elongated screw 13 is in mesh with a nut 18 which movable is placed in the straight tube 9 in such a way that the nut is prevented from being rotated by means of e.g. a key and slot arrangement (not shown) or because the profile of the straight tube 9 is square and the periphery of the nut 18 fits to this profile.

[0048] A spring 19 with a pitch similar or equal to the thickness of the wire of the spring is passed through the curved tube 8 and the tubes 6, 5 and 4 of the telescope leg 3.

[0049] The wire of the spring is made of an incompressible and elastic material such as steel.

[0050] The spring 19 is with a first end 20 moreover secured to the nut 18 placed in the straight tube 9 on the underside of the tabletop 2 and with a second end 21 to a connection in the lowermost tube 4. The spring thereby can transmit a compressive force from the nut on the tabletop to the lowermost tube 4 of the telescope leg 3 so that a rigid connection between the tabletop and the lowermost tube 4 of the telescope leg 3 is formed. Said compressive force is similar to the weight of the height-adjustment arrangement, the tabletop and the load, if any, which is resting on the tabletop.

[0051] The spring 19 is able to transmit such compressive force owing to the fact that adjacent windings of the incompressible wire of the spring are abutting each other.

[0052] In the straight parts of the spring 19, which at a given moment is placed in the straight tube 9 and the tubes 4,5,6 of the telescope leg 3, respectively, are the windings of the spring 19 such completely abutting each other and in the bent part, which simultaneously is placed in the curved tube 8 are said windings still abutting each other on the pressure side of the bend.

[0053] Within the scope of the invention can the curved tube 8 extend along two or more curves, which may extend in the same or in different planes. The specific structure of the spring allows advantageously the spring to follow such curves when slidingly passing through the curved tube 8.

[0054] The height-adjustment arrangement of the invention functions in the following way:

[0055] By activating the motor 14 is the worm 18 on the output shaft 15 of the motor 14 rotating the worm wheel 17 on the drive shaft 10 whereby the elongated screw 13 which is connected to the drive shaft 10 also is rotated with the result that the nut 18 is displaced into the direction towards or away from the curved tube 8, respectively.

[0056] When the nut 18 is displaced towards the curved tube 8 is the spring 19, which with its first end 20 is connected to the nut 18, pushed into the direction downwards in the telescope leg 3 whereby the tabletop 2 is raised and when the nut 18 is displaced in the opposite direction, that is away from the curved tube 8, is the spring 19 pulled into the direction upwards in the telescope leg 3 whereby the tabletop 2 is lowered.

[0057] The friction between the spring 19 and the curved tube 8 has in this case effectively been reduced by placing a sleeve 22 of a material with a low coefficient

of friction in the space between the spring 19 and the inner side of the curved tube 8.

[0058] A hose (not shown) of a material, which also has a low coefficient of friction, may additionally be covering the spring.

[0059] The operation of the height-adjustment arrangement is easy and quickly to carry out.

[0060] Using of a worm gearing moreover causes the advantage that the height-adjustment arrangement of the invention is self-locking so that the tabletop securely will maintain an adjusted level when stalling the motor.

[0061] Within the scope of the invention can also other kinds of drive sets however be used for operating the height-adjustment arrangement, for example a toothed gearing and instead of a spring can other pressure members be used, such as a chain.

[0062] In the embodiment of the table 1 shown in fig. 1, 2 and 3 is the tabletop 2 equipped with two telescope legs 3.

[0063] In this case is an elongated screw 13 connected to each their end part of the same drive shaft 10 whereby one of the screws 13 is provided with a right-handed thread and the other screw with a left handed thread.

[0064] The two telescope legs thereby is adjusted exactly equally whereby advantageously is achieved an exactly parallel displacement of the tabletop during a height adjusting operation.

[0065] Fig. 4 shows, seen in fraction from below, a table 23 with a tabletop 24 equipped with four telescope legs 3, which consists of two pairs of the pair of telescope legs shown in fig. 1, 2 and 3. For same parts are therefore used same numerals.

[0066] It is preferred that the tabletop 24 with four telescope legs is exactly parallel displaced during a height-adjusting operating just like the tabletop 2 of the table 1 shown in fig. 1, 2 and 3 with only one pair of opposite telescope legs.

[0067] For obtaining this feature is in this case used a motor 25 with two opposite output shafts 26. Upon the end of each output shaft 26 is mounted a worm 16 in mesh with the worm wheel 17 on the drive shaft 10 of each pair of telescope leg 3.

[0068] Thereby is the two drive shafts 10 of the table 24 rotated exactly equally so that adjusting of the length of all four telescope legs 3 synchronously takes place and the tabletop 24 therefore is exactly parallel displaced during a height adjusting operation.

[0069] In another embodiment (not shown) of the synchronous adjustment arrangement of the four telescope legs of the table is the worm of each worm gearing interconnected with a common shaft, which via a gearing is connected with the output shaft of the motor.

[0070] Also other arrangement for synchronously adjusting more telescope legs of a table is within the scope of the invention possible.

[0071] Above and in the drawing is the height-adjustment arrangement described on the assumption that a worm gearing is used for during a height adjusting operation rotating a longitudinal screw in mesh with a nut connected to the first end of the spring, which is passed through the curved tube and the tubes of the respective telescope leg.

[0072] Instead of this arrangement can, within the scope of the invention, be used a toothed wheel which is mounted on the output shaft of the actuator and is in mesh with a toothed bar connected to the first end of the spring.

Claims

1. An arrangement for height-adjustment of a support device (2) equipped with at least one telescope leg (3) consisting of at least two tubes (4,5,6) slideable mounted within each other, **characterized in that** the arrangement comprises a curved casing (8) extending between the support device (2) and the uppermost of the tubes (6) of the telescope leg (3), a bendable elongated pressure member (19) which via said casing (8) and the tubes (4,5,6) of the telescope leg (3) is extending from a first end (20) on the support device (2) to a second end (21) in the lowermost of the tubes (4) of the telescope leg (3), and a drive set (10, 13, 14, 15, 16, 17, 18) for displacing either the first or the second end (20;21), respectively, of the pressure member (19) from one position to another position during a height-adjustment operation.

2. An arrangement according to claim 1, **characterized in that** the drive set (10, 13, 14, 15, 16, 17, 18) is adapted to displace the first end (20) of the pressure member (19) towards the curved casing (8) or away from the curved casing (8) during a height-adjustment operation.

3. An arrangement according to claim 1 or 2, **characterized in that** the uppermost of the tubes (6) of the telescope leg (3) is merging into or is integral with the curved casing (8).

4. An arrangement according to any of the claims 1 to 3, **characterized in that** a sleeve (22) of a material with a low coefficient of friction is placed between the curved casing (8) and the pressure member (19).

5. An arrangement according to any of the claims 1 to 4, **characterized in that** the drive set (10, 13, 14, 15, 16, 17, 18) comprises an elongated screw (13) adapted to move a nut (18) along the support device (2) by being rotated, whereby the elongated screw (13) is connected to a drive shaft (10) rotationally mounted in a housing (11) on the support device (2) and the nut (18) is connected to the pressure member (19).

6. An arrangement according to claim 5, **character-**

ized in that the drive set (13, 14, 15, 16, 17, 18) comprises a worm gearing (16,17) having the worm (16) mounted on an actuator (14) and the worm wheel (17) on the drive shaft (10) .

7. An arrangement according to any of the claims 1 to 6 and where the support device (2) is equipped with a pair of opposite telescope legs (3), **characterized in that** the elongated screws (13) belonging to each of the two telescope leg (3) are connected with each their end part of the same drive shaft (10) and that one of the elongated screws (13) is provided with a right-handed thread and the other one with a left-handed thread.

8. An arrangement according to claim 7 where the support device (2) is equipped with two opposite pairs of opposite telescope legs (3), **characterized in that** the worm gearing (16,17) of each pair of opposite telescope legs (3) is connected to the same actuator (14).

9. An arrangement according to claim 6, 7 or 8, **characterized in that** the actuator (14) is a motor (14).

10. An arrangement according to any of the claims 1 to 9, **characterized in that** the pressure member (19) is an incompressible and elastic wire wound to a spring (19) with a pitch similar or equal to the thickness of the wire.

11. An arrangement according to claim 10, **characterized in that** the spring (19) is adapted as a nut (18) in mesh with the elongated screw (13).

12. An arrangement according to any of the claims 10 or 11, **characterized in that** the spring (19) is covered with a flexible hose of a material with a low coefficient of friction.

13. An arrangement according to any of the claims 1 to 9, **characterized in that** the pressure member (19) is a chain (19).

14. An arrangement according to any of the claims 1 to 9, **characterized in that** the pressure member (19) is a bendable plastic rod or plastic tube.

15. A use of the height-adjustment arrangement according to claims 1 - 14 for a table, a bed or a chair.

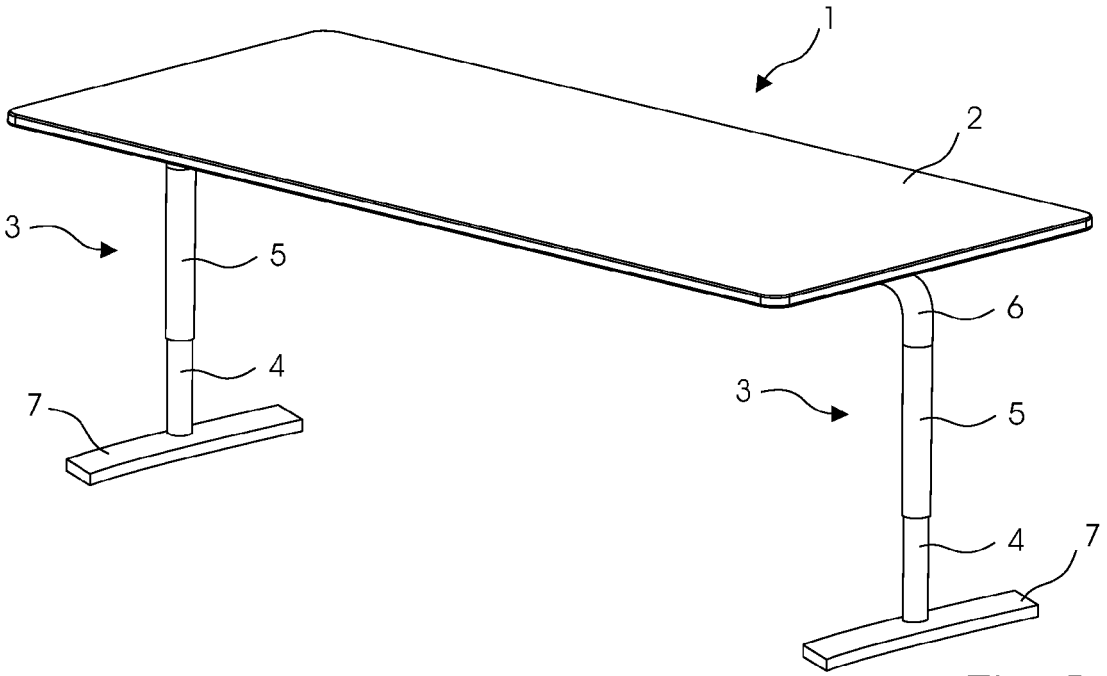

Fig 1

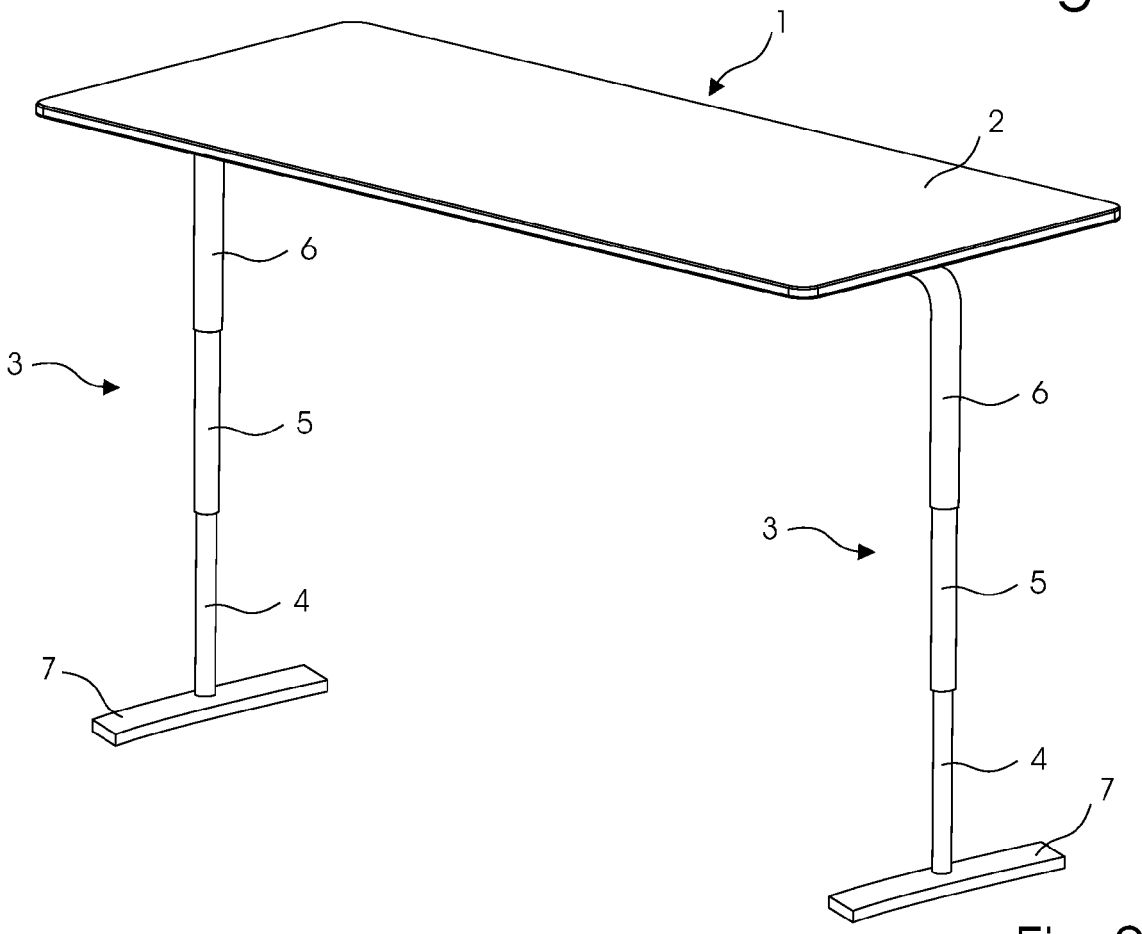

Fig 2

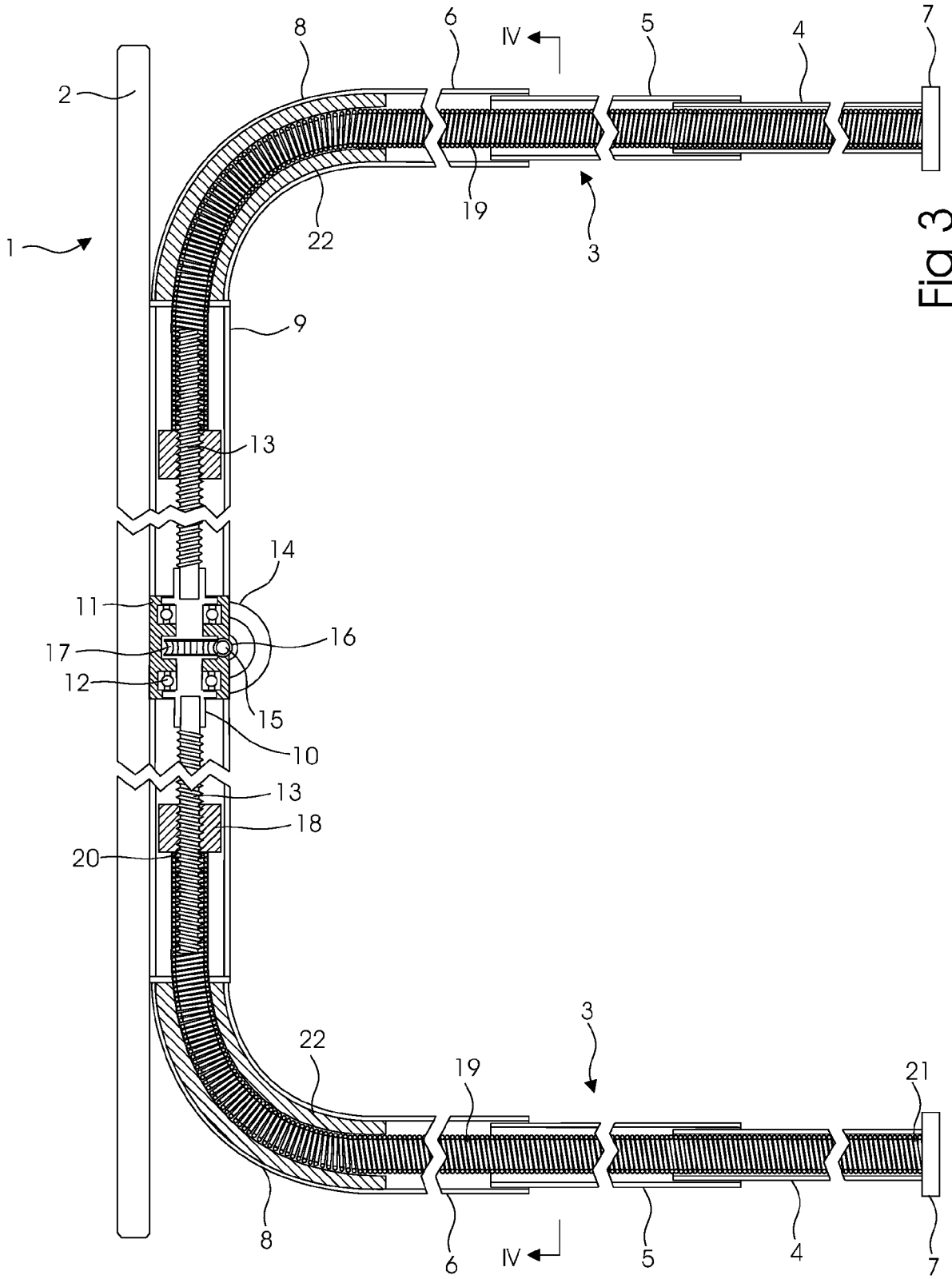

Fig 3

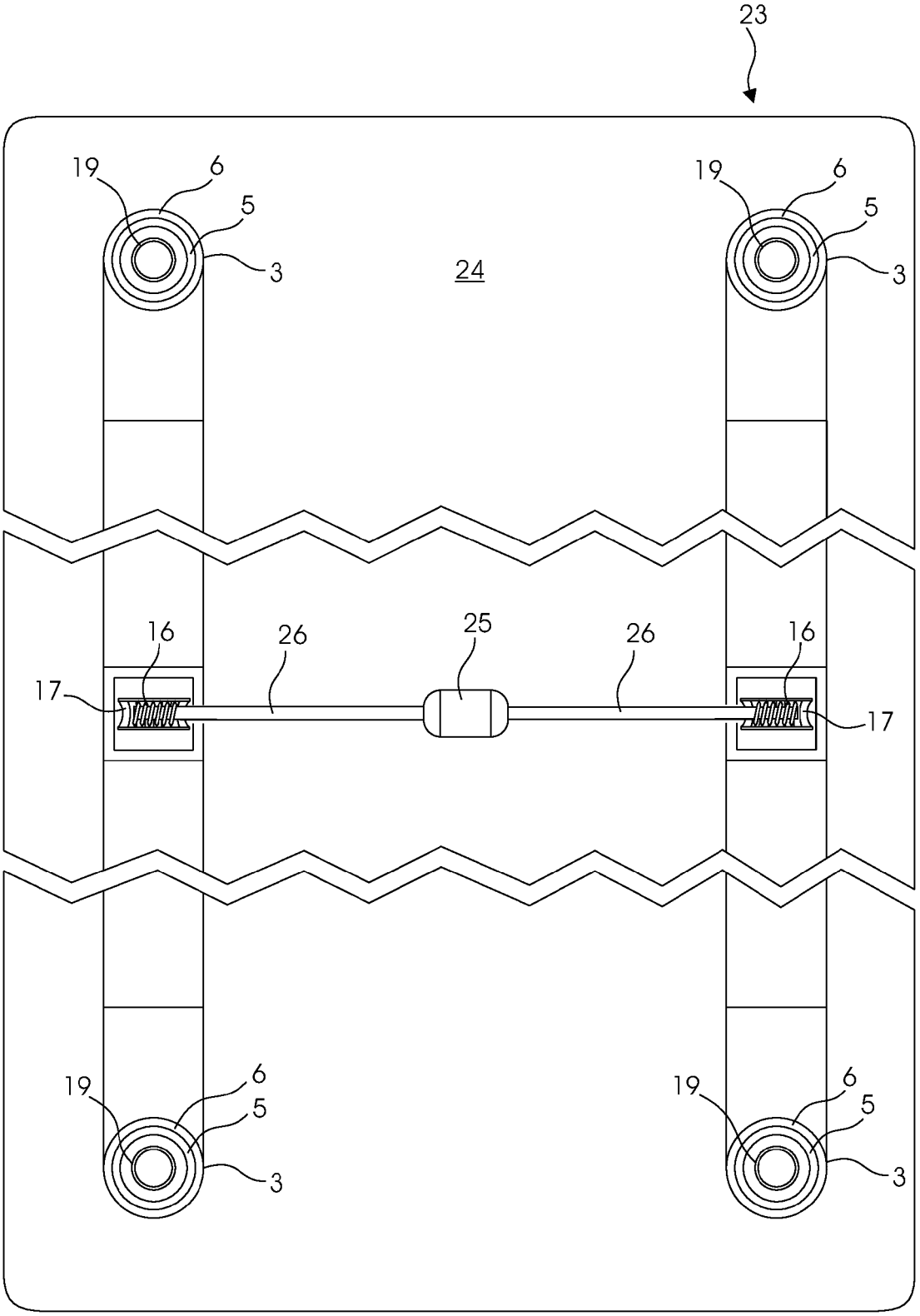

Fig 4

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EUROPEAN SEARCH REPORT

Application Number
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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	GB 766 805 A (S B WHITFIELD & CO LTD; CHRISTOPHER GILBERT WHITFIELD) 23 January 1957 (1957-01-23) * page 1, line 51 - page 2, line 14; figures 1-5 * -----	1-15	INV. A47B9/12 A47B9/20
X	DE 11 87 351 B (KARST & GUNKEL) 18 February 1965 (1965-02-18) * column 1, line 46 - column 3, line 9; figures 1-4 * -----	1-15	
X	GB 394 848 A (WILLY HECKT) 6 July 1933 (1933-07-06) * page 1, line 61 - page 2, line 19; figures 1-4 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC) A47B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 October 2010	Klintebäck, Daniel

CATEGORY OF CITED DOCUMENTS

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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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18-10-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 766805 A	23-01-1957	NONE	
DE 1187351 B	18-02-1965	NONE	
GB 394848 A	06-07-1933	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- SE 513577 **[0011]**