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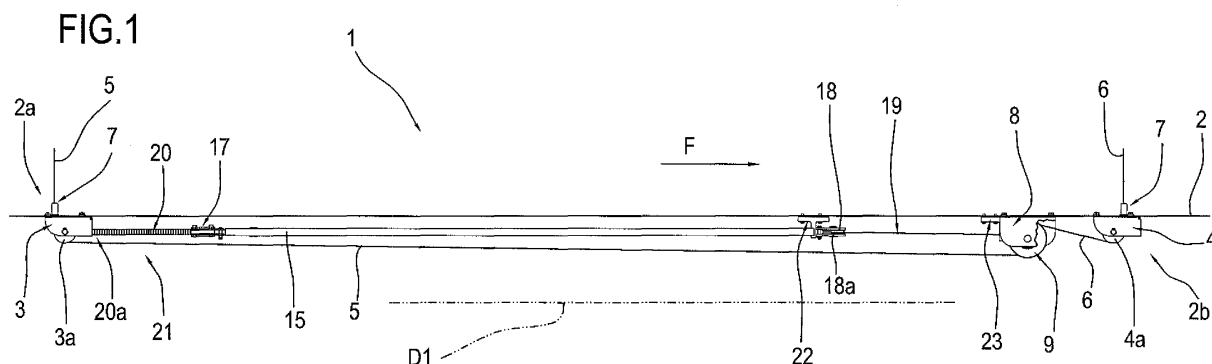
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(54) **Suspended height adjustment device**

(57) The suspended height adjustment device comprises a mounting frame (2), two suspension cords (5, 6), two helical springs (15, 16), a cord (19) for tensioning

the springs (15, 16) and a pulley (9), mounted on the frame (2) and designed to wind the suspension cords (5, 6) and the tensioning cord (19).



## Description

**[0001]** This invention relates to a suspended height adjustment device.

**[0002]** In particular, the invention addresses a suspended height adjustment device for lamps and the like.

**[0003]** Devices for adjusting a hanging object, for example a pendant lamp, instantly and at any height from the floor are well known.

**[0004]** This specification refers specifically to height adjustment devices for pendant lamps but without in any way limiting the scope of the invention.

**[0005]** The devices concerned are normally used for hanging chandeliers or lamps and enable the height of the light source from the floor to be varied so as to change the characteristics of the light emitted with respect to the objects illuminated.

**[0006]** A typical example is the use of a suspended height adjustment device for a pendant lamp in a home kitchen. The device allows the light to be raised to illuminate the dining table and a large area all around it, and lowered when more light is needed to illuminate a smaller area where specific work is being done.

**[0007]** Suspended height adjustment devices known in prior art can be broadly divided into two different categories: on the one hand those with pulleys and mobile counterweights and, on the other, those having spring-operated cable reels with friction surfaces.

**[0008]** Both types of suspended height adjustment devices have inherent disadvantages.

**[0009]** In devices of the first type, the size of the device depends largely on the weight of the object to be balanced: thus, the heavier the object, the heavier and bigger the counterweight needed, with obvious consequences for the overall dimensions of the device.

**[0010]** Also, the possible adjustment of the suspended object is limited by the stroke of the counterweight which is often a relatively short stroke.

**[0011]** As to height adjustment devices that fall into the second category, the friction surfaces are subject to wear which, over time, reduces their working efficiency and tends to make the adjustment device ineffective or unsuitable for keeping the suspended object at the required height.

**[0012]** The aim of this invention is to provide a suspended height adjustment device that is free of the above mentioned disadvantages, being at once simple in structure and limited in size and practical and effective to use.

**[0013]** The technical characteristics of the invention, in accordance with the above-mentioned aim, may be clearly inferred from the contents of the appended claims, in particular from claim 1 and, preferably, from any of the claims directly or indirectly dependent on claim 1.

**[0014]** Also, the advantages of the invention are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention merely by way of example, without limiting the scope of the inventive

concept, and in which:

- Figure 1 is a schematic side elevation view of a preferred embodiment of the suspended height adjustment device according to this invention;
- Figure 2 is a schematic plan view from below of the device of Figure 1;
- Figure 3 illustrates a detail from Figure 2 in a scaled-up view for greater clarity;
- Figure 4 is an exploded view of the device illustrated in the drawings listed above;
- Figure 5 is a perspective view of a component mounted on the device illustrated in the drawings listed above.

**[0015]** With reference to the accompanying drawings, the numeral 1 denotes in its entirety a suspended height adjustment device made in accordance with this invention.

**[0016]** The device 1 illustrated, described below, can be applied directly to any hanging object, such as a lamp for example, whose distance from a defined suspension point needs to be varied.

**[0017]** The suspended height adjustment device 1 comprises a mounting frame which, in the embodiment illustrated, consists of a plate 2 extending principally lengthways along a first defined line D1.

**[0018]** Where the height adjustment device 1 is, for example and without limiting the scope of the invention, applied to a lamp or chandelier, the frame 2 is advantageously built into the body of the lamp itself, the lamp body being designed to hide the device 1 from view and to protect it from dust and other extraneous matter.

**[0019]** As illustrated in Figures 1 and 2, the device 1 comprises two first brackets 3, 4 located at the ends 2a, 2b of the frame 2 on which they are stably mounted.

**[0020]** The first brackets 3, 4 rotatably mount respective return sheaves 3a, 4a having suspension cords 5, 6 forming part of the device 1 running in them.

**[0021]** Only the bottom section of each suspension cord 5, 6 is illustrated in the drawings, while, for clarity, the opposite end, which is fixed stably for example to the ceiling of a room, is not illustrated.

**[0022]** Each first bracket 3, 4 comprises a cylinder 7 with a hole in it for guiding a respective suspension cord 5, 6, the cylinder 7 being designed to route the cord 5, 6 onto the respective return sheave 3a, 4a.

**[0023]** The suspended height adjustment device 1 comprises a second bracket 8, fixed to the frame 2 and interposed between the two first brackets 3, 4.

**[0024]** The second bracket 8 mounts a pulley 9 designed to turn freely about a respective axis of rotation A1. As illustrated in detail in Figure 5, the pulley 9 comprises two first helical grooves 10, 11 extending in spiral fashion and two second helical grooves 12, 13 extending in cylindrical fashion.

**[0025]** The second grooves 12, 13 run side by side and are separated from each other and from the outside by

three circular walls 14.

**[0026]** The two first, spiral helical grooves 10, 11 extend outwards from the outer circular walls 14; the spiral of each first groove 10, 11 narrowing towards the outer end, away from the respective circular wall 14.

**[0027]** With reference to Figures 1, 2 and 4, the suspended height adjustment device 1 comprises two elastic helical traction springs 15, 16 extending lengthways, parallel with each other, along the above mentioned line D1.

**[0028]** The springs 15, 16 have respective first ends 15a, 16a fixed stably to a carriage 17 and respective second ends 15b, 16b connected to a plate 18.

**[0029]** The plate 18, besides two respective elements for fixing the springs 15, 16, mounts a return sheave 18a for a cord 19 used to tension the springs 15, 16 and whose function is described in more detail below.

**[0030]** The tensioning cord 19 has two ends 19a, 19b, each of which is fastened to a respective inner wide end of the spiral, that is to say, an end of the spiral proximal to a wall 14, of one of the spiral helical grooves 10, 11 of the pulley 9.

**[0031]** The carriage 17 comprises a central body 17a and two lateral appendages adapted for connection to the first ends 15a, 16a of the helical springs 15, 16.

**[0032]** Inside the central body 17a there is a threaded hole designed to be screwably engaged with a threaded rod 20 whose opposite end 20a is rotatably secured to the above mentioned bracket 3 located at the end 2a of the frame 2.

**[0033]** The carriage 17 and the threaded rod 20 together constitute means 21 for pre-tensioning the two helical springs 15, 16.

**[0034]** The two springs 15, 16 together constitute extensible elastic means.

**[0035]** The grooves 10, 11 describe two opposite spiral helices, one left-hand and the other right-hand, so that when the pulley 9 turns in one direction - for example clockwise with reference to Figure 1 - the two suspension cords 5, 6 are unwound and, at the same time, the ends 19a, 19b of the tensioning cord 19 are wound onto the pulley 9 itself, from the narrow end towards the wide end of the spirals of the respective first grooves 10, 11. On the other hand, when the pulley 9 turns in the opposite direction - that is, anticlockwise in Figure 1 - the two suspension cords 5, 6 are wound onto the respective second cylindrical helical grooves 12, 13, while the ends of the tensioning cord 19 are unwound from the respective spiral helical grooves 10, 11.

**[0036]** With reference to Figures 1 and 4, the mounting plate 2 has fixed to it two blocks 22, 23 for limiting the stroke of the mobile return sheave 18a of the tensioning cord 19.

**[0037]** In use, when a user lowers the suspended object with the height adjustment device 1, the suspension cords 5, 6 are unwound from the respective second, cylindrical helical grooves 12, 13 and, simultaneously, the tensioning cord 19 is wound onto the respective first, spiral helical grooves 10, 11.

**[0038]** The winding of the tensioning cord 19 causes the two helical springs 15, 16 to be elongated in the direction indicated by the arrow F, the springs advantageously following a linear law whereby the force of elastic reaction is proportional to the elongation of the springs 15, 16 themselves.

**[0039]** The more the tensioning cord 19 is wound, the higher, proportionally, the force of elastic reaction acting on the pulley 9, through the tensioning cord 19 itself, exerting on the pulley a torque about the axis A1, which opposes the unwinding of the suspension cord 5, 6 from the pulley 9 itself.

**[0040]** The arm of the elastic reaction force relative to said torque is given by the instantaneous radius of the spiral helical groove 10, 11 at the point of tangency of the respective portion of the tensioning cord 19; since the tensioning cord 19 is wound on the spiral helical grooves 10, 11 from the wide end to the narrow end, as the force of elastic reaction increases, its arm decreases and, as a result, the torque operating on the pulley 9 can be kept substantially constant by suitably dimensioning the spirals and selecting the elastic constant of the springs 15, 16.

**[0041]** Depending on the total weight of the suspended height adjustment device 1 and of the object, for example a pendant lamp, to be supported, the above mentioned means 21 for pre-tensioning the springs 15, 16, composed of the carriage 17 and rod 20, advantageously enable the reaction force of the springs 15, 16 to be adjusted.

**[0042]** Pre-tensioning the springs has two basic purposes:

- fine tuning the system so as to reach the exact point of equilibrium of the suspended object;
- overcoming the initial force in order to change the springs 15, 16 from a state of rest to a tensioned state; the force needed to move the suspended object is slightly greater than the frictional forces that keep it in a state of equilibrium, and the movement itself is smooth and without jerking.

**[0043]** The suspended height adjustment device 1 according to the invention can easily be used even with only one of the two suspension cords 5, 6 and with the mounting plate 2 set in a vertical position, not illustrated.

**[0044]** In this non-illustrated arrangement, although only one suspension cord is wound onto the pulley 9, the rotation of the pulley 9 is still opposed by the force of elastic reaction applied by the two ends 19a, 19b of the tensioning cord 19, wound on the respective first spiral helical grooves 10, 11. If the device 1 is used with only one suspension cord, one of the two first brackets 3, 4 becomes superfluous and can be removed from the device 1 together with the respective sheave 3a, 4a.

**Claims**

1. A suspended height adjustment device comprising:
  - a mounting frame (2);
  - at least one suspension cord (5, 6);
  - extensible elastic means (15, 16) made integral with the frame (2) by a first end of them (15a, 16a);
  - a cord (19) for tensioning the elastic means (15, 16), said cord (19) being connected to a second end (15b, 16b) of the elastic means (15, 16);
  - a pulley (9) designed to at least partially wind the suspension cord (5, 6) and tensioning cord (19), said pulley (9) being rotatably mounted on the frame (2).
2. The device according to claim 1, **characterized in that** the pulley (9) comprises a first helical groove (10, 11) for winding the tensioning cord (19).
3. The device according to claim 2, **characterized in that** the helical groove (10, 11) for winding the tensioning cord (19) extends in spiral fashion.
4. The device according to claim 2 or 3, **characterized in that** the pulley (9) comprises two helical grooves (10, 11) for winding two respective tensioning cords (19a, 19b).
5. The device according to any of the foregoing claims from 1 to 4, **characterized in that** the pulley (9) comprises a second helical groove (12, 13) for winding the suspension cord (5, 6).
6. The device according to claim 5, **characterized in that** the second helical groove (12, 13) extends in cylindrical fashion.
7. The device according to claim 5 or 6, **characterized in that** the pulley (9) comprises two second cylindrical helical grooves (12, 13) for winding two respective suspension cords (5, 6).
8. The device according to any of the foregoing claims from 1 to 7, **characterized in that** the extensible elastic means comprise at least one helical spring.
9. The device according to any of the foregoing claims from 1 to 8, **characterized in that** it comprises means (21) for pre-tensioning the extensible elastic means.
10. A room illumination lamp **characterized in that** it comprises a suspended height adjustment device according to any of the foregoing claims from 1 to 9.
11. A pulley for winding cords in suspended height adjustment devices, comprising two first helical grooves (9, 10) extending in spiral fashion and two second helical grooves (12, 13) extending in cylindrical fashion, said second grooves (12, 13) being located side by side and interposed between the first spiral helical grooves (9, 10).

FIG.1

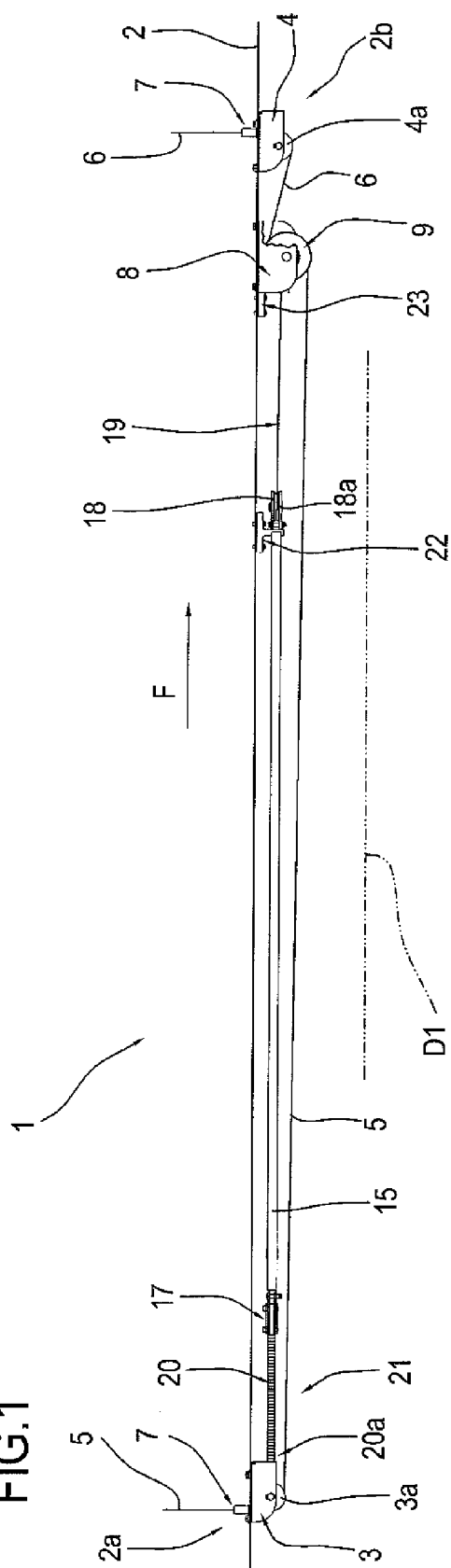
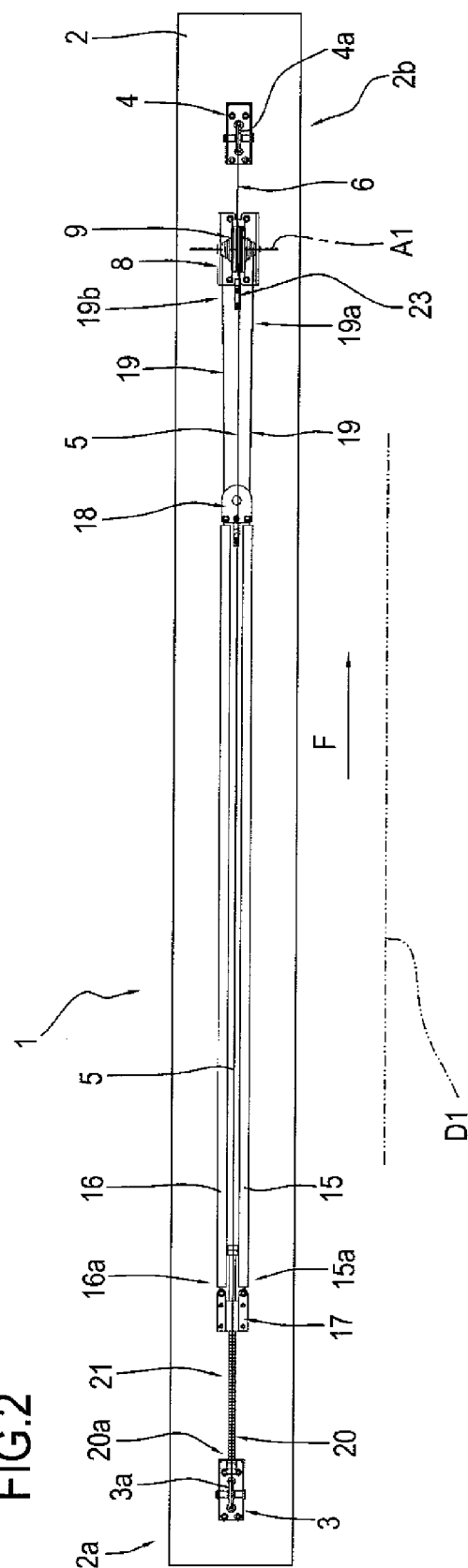


FIG.2



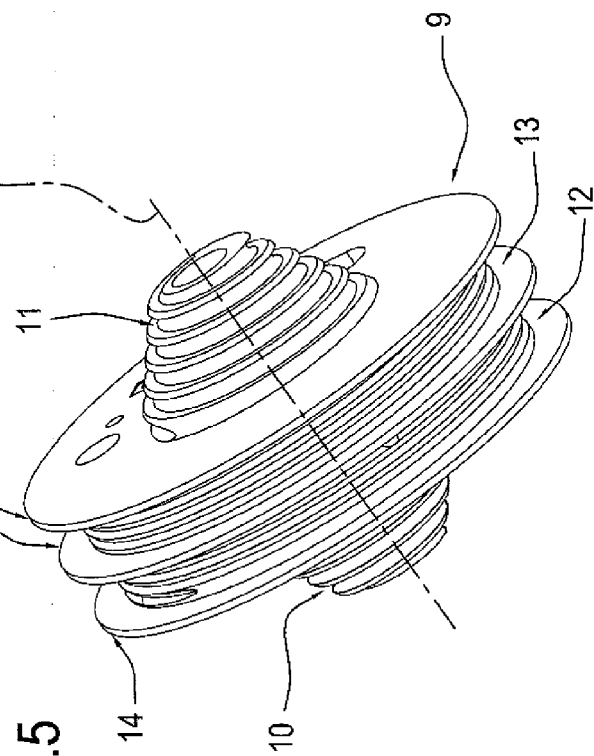
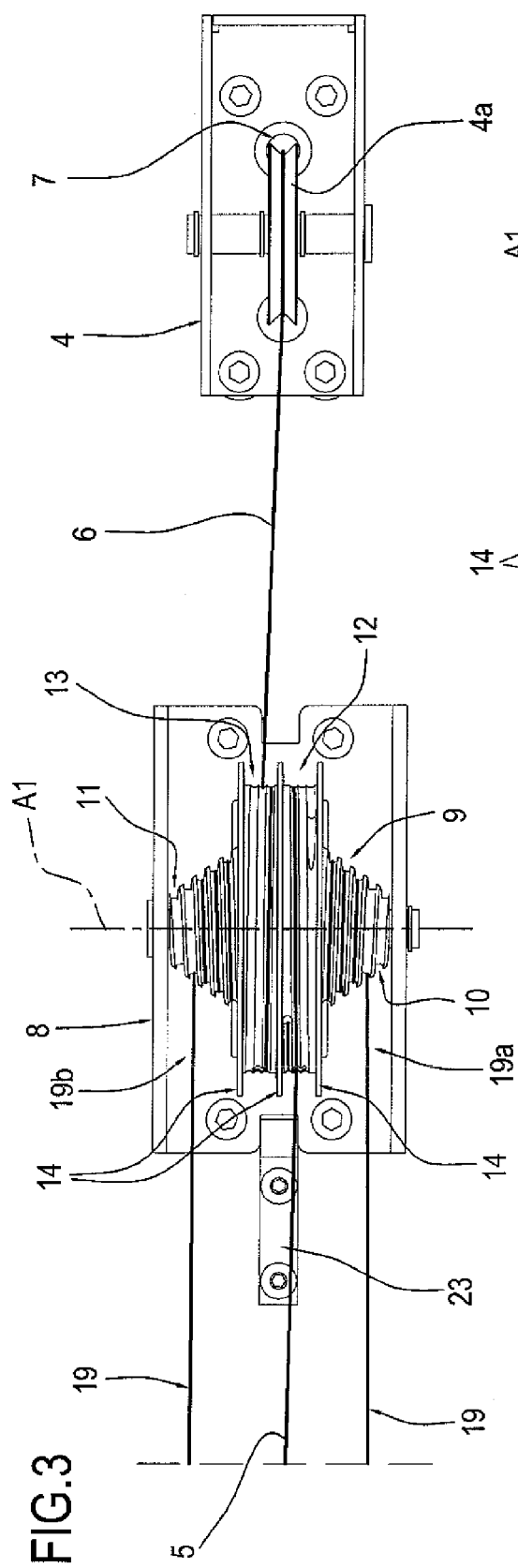
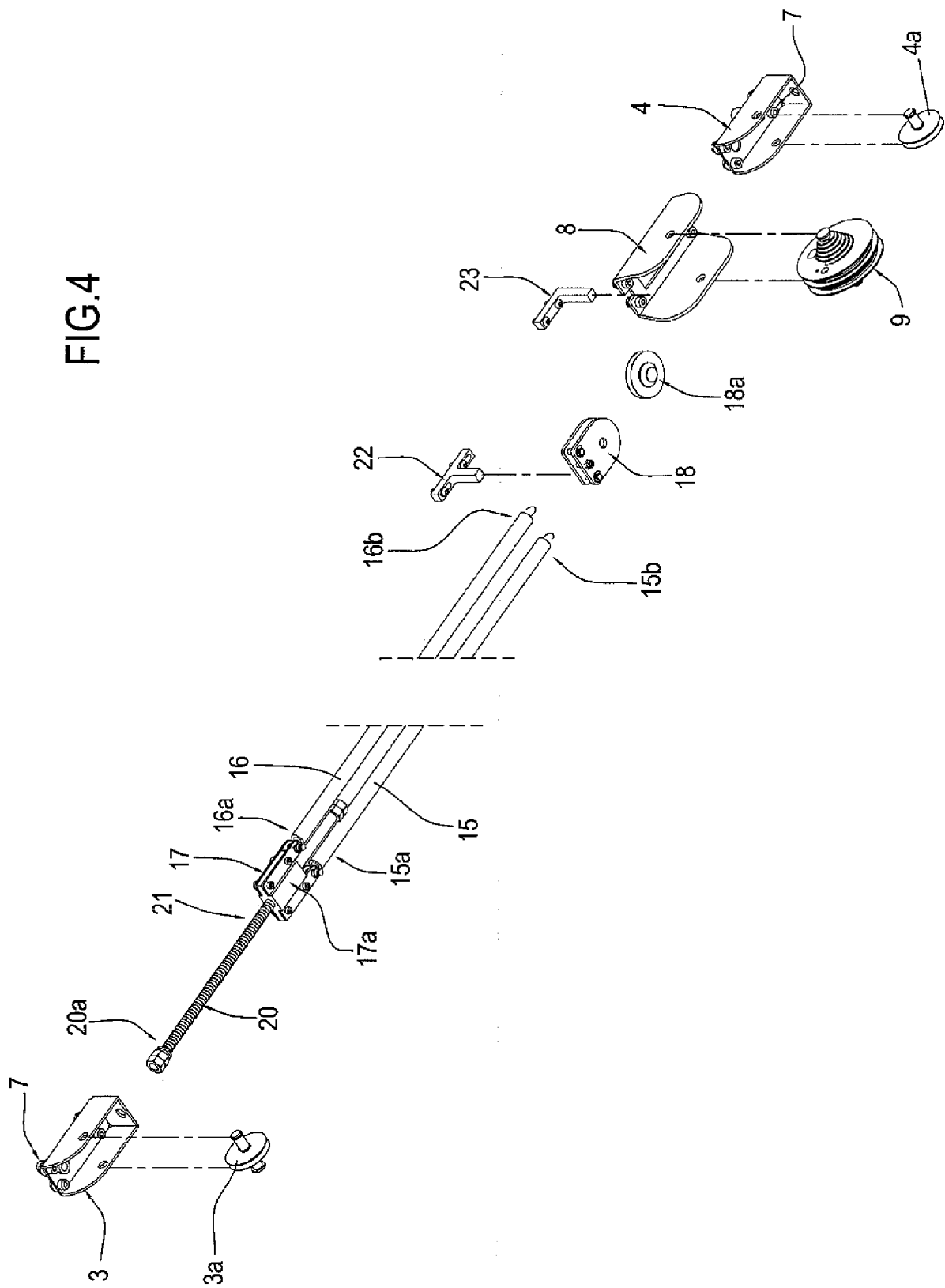


FIG.4





## EUROPEAN SEARCH REPORT

Application Number  
EP 08 16 9308

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	FR 2 867 797 A (SCHERRER JEAN MARC [FR]; SCHERRER JEAN PAUL [FR]) 23 September 2005 (2005-09-23) * abstract * * figure 1 *	1-11	INV. F21V21/38
A	US 6 464 190 B1 (ARAMAKI NORIYOSHI [JP]) 15 October 2002 (2002-10-15) * abstract * * figure 1 *	1-11	
A	NL 7 808 815 A (HADON ZONWERINGSIND) 27 February 1980 (1980-02-27) * page 2, line 10 - line 34 * * figure 1 *	1-11	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F21V
Place of search		Date of completion of the search	Examiner
The Hague		23 December 2008	Amerongen, Wim
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 08 16 9308

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23-12-2008

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