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

(11) EP 2 631 401 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.08.2013 Bulletin 2013/35

(51) Int Cl.:
E05D 13/00 *(2006.01)*

(21) Application number: **13155456.0**

(22) Date of filing: **15.02.2013**

(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

(30) Priority: **23.02.2012 NL 2008338**

(71) Applicant: **Doco International B.V.**
6136 KV Sittard (NL)

(72) Inventors:
- **Blom, Robert Petrus Dievera**
  6321 AM Wijlre (NL)
- **Stadhouders, Johnny Cornelia Johannes**
  6467 AZ Kerkrade (NL)

(74) Representative: **Veldman-Dijkers, Cornelia G. C.**
Ab Ovo Patents B.V.
Platz 1 Limbricht
6141 AT Sittard-Geleen (NL)

(54) Door system comprising a door leaf which is movably mounted in guide sections on both long sides as well as a counterweight device, a cable tension compensation device suitable for use with such a door system

(57) A door system comprises a door leaf (4) which is movably mounted in guide sections (5) on both long sides, as well as a counterweight device (11) provided with a cable unit (12) comprising at least two cable parts (13) extending substantially parallel to each other. The cable unit is connected to the movable door leaf with a first end (16), whilst a second end (22) takes up a stationary position, said cable unit at least extending over a movable pulley (20)between said first and said second end, which counterweight device further comprises a spring unit (14) which engages the movable pulley, as well as a cable tension compensation device (41) working in concert with the cable unit for loading the cable parts substantially equally. The cable tension compensation device is provided with a compensation element (42) disposed between two cable parts, which is provided with a cable guide on either side thereof, against each of which cable guides a cable part abuts. The compensation element (42) is movable at least in a direction substantially transversely to the longitudinal direction of the cable parts under the influence of cable forces exerted on the compensation element by the cable parts.

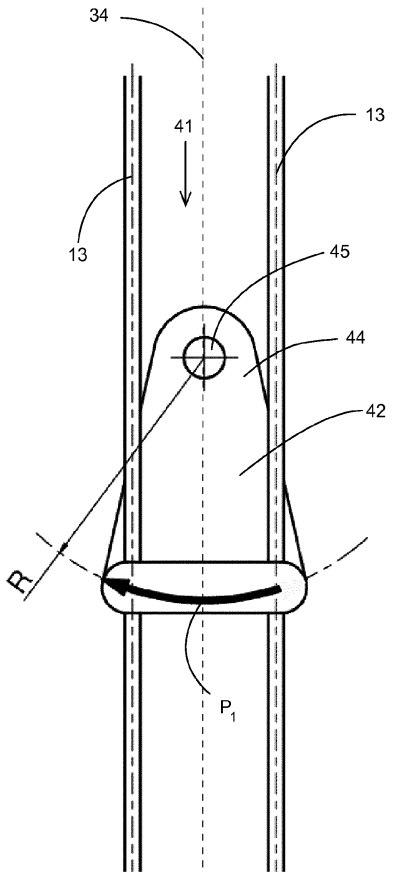

Fig. 4A

EP 2 631 401 A1

Description

[0001] Door system comprising a door leaf which is movably mounted in guide sections on both long sides as well as a counterweight device, a cable tension compensation device suitable for use with such a door system

[0002] The invention relates to a door system comprising a door leaf which is movably mounted in guide sections on both long sides, as well as a counterweight device provided with a cable unit comprising at least two cable parts extending substantially parallel to each other, which cable unit is connected to the movable door leaf with a first end, whilst a second end takes up a stationary position, said cable unit at least extending over a movable pulley between said first and said second end, which counterweight device further comprises a spring unit which engages the movable pulley, as well as a cable tension compensation device working in concert with the cable unit for loading the cable parts substantially equally.

[0003] The invention further relates to a cable tension compensation device suitable for use with such a door system.

[0004] Such door systems are used as sectional doors, rolling doors, swing-up doors etc, the door leaf being movable from a closed position to an open position, in which a passage is released, and vice versa. The cable unit and a spring unit working in concert with the cable unit realise a counterweight to the weight of the door leaf.

[0005] In such a door system, which is known from WO2011/032649, the cable unit comprises one cable which is passed over a bolt, so that a cable part is present on either side of the bolt. The bolt takes up a stationary position. The ends of the cable are connected together via a shrink element and subsequently fixed to the door leaf. In a situation in which the bolt has not been tightened yet, the cable will be moved over the bolt under the influence of the weight of the door leaf until the two cable parts are equally loaded. The bolt is then tightened. The known door system further comprises a safety system. The safety system comprises a plate spaced from the bolt, which is provided with relatively small passages through which the cable parts extend. The two cable parts are provided with a thickening between the bolt and the passages, which thickenings have a diameter which is larger than that of the openings. Said thickenings form part of the safety system.

[0006] In the case of breakage of one of the cable parts, the other cable part, which is still intact, will suddenly be loaded more heavily. The still-intact cable part will then move away from the bolt until the thickening abuts against the opening in the plate.

[0007] A drawback of said known door system is the fact that in the case of elongation of one of the cable parts, for example, the two cable parts are not automatically loaded equally. In such a situation the bolt needs to be loosened and, once the cable has readjusted itself, be tightened again.

[0008] Another drawback is the fact that the known door system must be provided with a safety system in addition to a cable tension compensation device. Said safety system is necessary because otherwise there is a risk in case of a breakage that the clamped connection between the bolt and the still-intact cable part becomes undone as a result of the sudden increase in the force on the still-intact cable part.

[0009] Because of the cable tension compensation device and the safety system, the known door system is relatively complicated.

[0010] The object of the invention is to provide a door system in which the forces on the two cable parts are averaged out in a relatively simple manner.

[0011] This object is achieved with the door system according to the invention in that the cable tension compensation device is provided with a compensation element disposed between two cable parts, which is provided with a cable guide on either side thereof, against each of which cable guides a cable part abuts, which compensation element is movable at least in a direction substantially transversely to the longitudinal direction of the cable parts under the influence of cable forces exerted on the compensation element by the cable parts.

[0012] If one of the cable parts is longer than the other cable part, for example due to installation inaccuracies or due to elongation, the shorter cable part will be loaded more heavily.

[0013] Each cable part abuts against a cable guide of the compensation element. The shorter cable part will exert a larger cable force in a direction transversely to the longitudinal direction of the cable parts on the compensation element than the longer cable part. As a result of the difference in said cable forces, the compensation element will be movable at least in a direction transversely to the longitudinal direction of the cable parts. Said direction extends in a direction away from the shorter cable part. As a result of movement of the compensation element, the distance to be covered by the shorter cable part between the first and the second end of the cable unit will decrease, whilst the distance that the longer cable part must cover will increase. The movement of the compensation element will continue until the two cable parts are loaded substantially equally.

[0014] Another advantage of the cable tension compensation device according to the invention is that it is relatively easy to install, also with existing door systems.

[0015] One embodiment of the door system according to the invention is **characterised** in that the distance between the cable guides of the compensation element is larger than the average distance between the cable parts of the cable unit.

[0016] The cable parts extend substantially parallel to each other, a predetermined distance apart, between the first and the second end of the cable unit. Since the distance between the cable guides of the compensation element is larger than the average distance between the cable parts of the cable unit, the cable parts will at all

times abut against the cable guides of the compensation element on either side. In such an embodiment, the cable guides face away from each other, as a result of which the compensation element can be of relatively simple design.

[0017] Another embodiment of the door system according to the invention is **characterised in that** the cable guides of the compensation element are disposed near the first or the second end of the cable unit, with the compensation element being connected to the door leaf or to the guide section, respectively.

[0018] In this way the compensation element will not interfere with the movement of the door leaf from the closed position to the open position.

[0019] Another embodiment of the door system according to the invention is **characterised in that** the compensation element is capable of translating movement in the direction substantially transversely to the longitudinal direction of the cable parts.

[0020] As a result of the cable forces being exerted on the cable guides of the compensation element, the compensation element will undergo a translating movement in the direction substantially transversely to the longitudinal direction of the cable parts. Such a translatable compensation element is relatively easy to produce.

[0021] Yet another embodiment of the door system according to the invention is **characterised in that** the compensation element is pivotable about a pivot pin disposed between the cable parts, which pivot pin is spaced from the cable guides, seen in the longitudinal direction of the cable parts.

[0022] The compensation element will undergo a pivoting movement about the pivot pin as a result of the cable forces being exerted on the cable guides of the compensation element. Since the angular displacement that will occur upon said movement is relatively small, for example in the order of 20° in either direction, the cable guides will essentially undergo a translating movement in the direction transversely to the longitudinal direction of the cable parts. Such a pivotable compensation element, too, is relatively easy to produce.

[0023] Yet another embodiment of the door system according to the invention is **characterised in that** the first or the second end of the cable unit is connected to a shaft that is coaxial with the pivot pin of the compensation element.

[0024] The cable guides are in that case spaced from the shaft by a small distance. In this way a compact construction is obtained.

[0025] Yet another embodiment of the door system according to the invention is **characterised in that** the door system is provided with a counterweight device on both long sides of the door leaf.

[0026] As a result, the weight of the door leaf can be distributed substantially evenly over the two sides of the door leaf. The counterweight devices can be positioned in or beside the guide sections, so that a compact construction is obtained. Furthermore, as a result of the substantially even distribution of the weight of the door leaf over the two counterweight devices, an out-of-true position of the door leaf is prevented in a simple manner.

[0027] The invention will now be explained in more detail with reference to the drawing, in which:

Figure 1 is a perspective view of a door system according to the prior art;
Figure 2 is a larger-scale perspective detail view of the prior art door system shown in figure 1;
Figures 3A-3C show a first embodiment of a compensation element according to the invention, comprising, respectively, a left-hand cable part which is longer than a right-hand cable part, a left-hand cable part which is just as long as a right-hand cable part, and a left-hand cable part which is shorter than a right-hand cable part;
Figures 4A-4B show a front view and a perspective side view, respectively, of a second embodiment of the compensation element according to the invention;
Figures 5A-5B show a front view and a perspective side view, respectively, of a third embodiment of a compensation element according to the invention;
Figure 6 is a perspective detail view of a door system according to the invention, comprising a compensation element according to the third embodiment of the invention.

[0028] Like parts are indicated by the same numerals in the figures.

[0029] Figures 1 and 2 show perspective views of a door system 1 according to the prior art, comprising a number of pivotally interconnected, elongate door panels 2, 2'. Each panel 2, 2' is provided with a guide wheel at both short ends. The panels 2 together form the door leaf 4. The door system 1 further comprises guide sections 5 on both long sides of the door leaf 4, which guide sections are connected to a wall of a building. Each guide section 5 comprises a vertically extending guide 6, an arcuate guide 7 connected to the vertical guide 6, and a horizontally extending guide 8 connected to the arcuate guide 7. The guide section 5 further comprises an arcuate guide 9 disposed above the arcuate guide 7 and a horizontally extending guide 10 connected to the arcuate guide 9. At the upper side, the horizontally extending guide 10 abuts against the horizontally extending guide 8. The guide wheels 3 of all panels 2, with the exception of the uppermost panel 2', are supported in the guides 6, 7, 8 that are contiguous to each another. The guide wheels 3 of the uppermost panel 2' are supported in guides 9, 10 that are contiguous to each another. Because of this, the door leaf 4 is movable from a closed position to an open position, in which a passage is released.

[0030] Such guides 5 are known per se and will not be discussed in more detail herein, therefore.

[0031] The door system 1 further comprises a coun-

terweight device 11 at both guide sections 5, which device is provided with a cable unit 12 comprising two separate, parallel cable parts 13, and a spring unit 14, which works in concert with the cable unit 12 and which comprises two parallel draw springs 15.

[0032] As is clearly shown in figure 2, the first end 16 of the cable unit 12, and thus of the cable parts 13, is connected to a shaft 17 of the guide wheel 3 of the lowermost panel 2. The door system 1 further comprises a pulley 18, which is fixedly connected to a guide section 5, and a freely movable pulley 20, which is provided with a connecting plate 19. The cable parts 13 extend from the first end 16 over the fixedly disposed pulley 18, via the pulley 19, to a stationary fixing element 21. The second end 22 of the cable unit 12, and thus of the cable parts 13, is connected to the stationary fixing element 21. The connecting plate 19 of the movable pulley 20 is connected to first ends 23 of the two draw springs 15. The second ends 24 of the draw springs 15 remote from the first ends 23 are connected to a positioning element 25. The positioning element 25 is provided with two hooks 26, which can be positioned in positioning openings 27 in a section 28 extending parallel to the guide 6. By changing the position of the hooks 26 in the section 28, the force exerted on the door leaf 4 by the draw springs 15 via the pulleys 18, 19 and the cable parts 13 is changed and can thus be easily adapted to the weight of the door leaf 4. The counterweight devices 11 counterbalance the weight of the door leaf 4, as a result of which the door leaf 5 will remain stationary in any position.

[0033] Since the cable unit 12 comprises two cable parts 13 and the spring unit 14 comprises two draw springs 15, the counterweight device 11 will still function in the case of breakage of one of the cable parts 13 or one of the draw springs 15.

[0034] Such counterweight devices are known per se and will not be discussed in more detail herein, therefore. A drawback of the door system 1 shown in figures 1 and 2 is the fact that if the cable parts 13 of the cable unit 12 are different in length, for example due to production tolerances, only the shorter cable part will be exposed to forces and the longer cable part will only be loaded after breakage of the shorter cable part.

[0035] In order to distribute the forces evenly over the two cable parts 13 of the cable unit 12, the door system according to the invention comprises a cable tension compensation device.

[0036] Figures 3A-3C show a first embodiment of a cable tension compensation device 31 according to the invention, which is provided with a compensation element 32 disposed between two cable parts 13, which compensation element is provided with a cable guide 33 or on either side thereof. In the absence of a compensation element 32 between the cable parts 13, the cable parts 13 would extend on either side of and parallel to a baseline 34, being spaced an average distance b (not shown) apart. The dimension B of the compensation element 32 in a direction transversely to the baseline 34 is greater than the distance b, so that the cable parts 13 are forced apart by the compensation element 32 at the location of the compensation element 32. As a result, the cable parts 13 abut firmly against the cable guides 33. The cable parts 13 are not connected to the compensation element 32 and can freely move relative to the compensation element 32. The compensation element 32 is movable in a direction transversely to the baseline 34 as indicated by arrow P0, and in the opposite direction. Said directions are substantially identical to the directions transversely to the cable parts 13.

[0037] If the lengths L1, L2 of the two cable parts 13 between the first end 16 and the second end 22 are identical, i.e. L1 = L2, the same tensile force will be exerted on the two cable parts 13. Since the two cable parts 13 include the same angle α of more than 0 degrees with the baseline 34 at the location of the compensation element 32, the force component of the tensile force in a direction transversely to the baseline 34 will also be the same for the two cable parts, as a result of which the centre M of the compensation element 32 is and will remain located on the baseline 34. Said force component forms the cable force. This situation is shown in figure 3B.

[0038] If the compensation element 32 is spaced from the end 16 or 22 by a distance of 100 mm, for example, and has a width of 30 mm, the angle α = 8.5 degrees.

[0039] In figure 3A a situation is shown in which the length L1 of the left-hand cable part 13 is greater than the length L2 of the right-hand cable part 13, i.e. L1 > L2. If a basic position in which the centre M of the compensation element 32 is located on the baseline 34 is taken as a starting point, the weight of the door leaf 4 will exert a tensile force on the cable unit 12 which is only transmitted by the right-hand, shorter cable part 13. Because the two cable parts 13 include the same angle α of more than 0 degrees with the baseline 34 at the location of the compensation element 32 in the basic position, the cable force of the right-hand, shorter cable part 13 will be greater than that of the left-hand, a longer cable part 13, as a result of which a resulting cable force will be exerted on the compensation element 32 in the direction of the left-hand, longer cable part 13. Because of said resulting cable force, the compensation element 32 will be moved in the direction of the left-hand, longer cable part 13, and the left-hand, longer cable part 13 abutting against the compensation element 32 will be pushed to the left. As a result, the distance between the ends 16, 22 and over the cable guide 33 on the left-hand side of the compensation element 32 will increase, whilst the distance between the ends 16, 22 and over the cable guide 33 of the compensation element 32 on the right-hand side of the compensation element 32 will decrease. At the same time, the angle α between the right-hand, shorter cable part 13 and the baseline 34 will decrease to an angle β, whilst the angle α between the left-hand, longer cable part 13 and the baseline 34 will increase to an angle γ. The cable force exerted on the compensation element 32 by the right-hand cable part 13 will thus decrease,

whilst the cable force exerted on the compensation element 32 by the left-hand cable part 13 will increase. The movement to the left of the compensation element 32 will continue just as long until a new equilibrium is found, wherein $\gamma > \beta$ and the cable forces exerted in a direction transversely to the baseline 34 by the two cable parts 13 are equal.

[0040] The movement in the direction indicated by arrow P1 usually amounts to a few mm.

[0041] Similarly, if the length L1 of the left-hand cable part 13 is smaller than the length L2 of the right-hand cable part 13, i.e. L1 < L2, the compensation element 32 will be moved to the right until the angle γ that the left-hand cable part 13 includes with the baseline 34 is smaller than the angle β that the right-hand cable part 13 includes with the baseline 34 and a new equilibrium is found, wherein $\beta > \gamma$ and the cable forces exerted by the two cable parts 13 in the direction transversely to the baseline 34 are equal.

[0042] Figures 4A and 4B show a second embodiment of a cable tension compensation device 41 according to the invention, which comprises a compensation element 42 disposed between two cable parts 13, which compensation element is provided with a cable guide 43 on either side. The compensation element 42 comprises a triangular baseplate 44, which is provided on one side thereof with a passage 45 in which a pivot pin (not shown) can be positioned. The pivot pin may be connected either to the door leaf 4 or be stationarily connected to the fixed world. At a location spaced from the passage 45, the baseplate 44 is provided with a T-shaped part 46, which forms the cable guides 43 on either side thereof. A cable part 13 extending in the U-shaped guides thus formed is securely guided therethrough past the compensation element 42.

[0043] The operation of the compensation element 42 in large measure corresponds to that of the compensation element 32. Instead of making a translating movement, however, the compensation element 42 will undergo a rotary, pivoting movement in or opposite to the direction indicated by arrow P1 in case of a difference in the cable forces exerted on the compensation element 42 by the cable parts. As a result of said pivoting, the cable guides 43 will undergo a movement not only in a direction transversely to the baseline 34 but also in a direction parallel to the baseline 34, with the cable guides 43 being moved in opposite directions parallel to the baseline 34. The proportion between the movement parallel to the baseline 34 and the movement transversely to the baseline 34 will decrease as the radius R between the passage 45 and the cable guides 43 increases.

[0044] Figures 5A and 5B show a third embodiment of a cable tension compensation device 51 according to the invention, which comprises a compensation element 52 disposed between two cable parts 13, which compensation element is provided with a cable guide 53 on either side thereof.

[0045] The compensation element 52 is H-shaped, with the U-shaped ends of the compensation element 52 forming the cable guides 53. A bridge part 54 of the compensation element 52, which is located between the cable guides 53, is provided with an elongate slot 55, which extends transversely to the baseline 34. The cable tension compensation device 51 further comprises a pin 56 disposed in the slot 55, along which the compensation element 52 is movable in and opposite to the direction indicated by arrow P2, transversely to the baseline 34. The pin 56 preferably has an elongated shape corresponding to that of the slot 55, but a dimension in a direction transversely to the baseline 34 which is smaller. The operation of the compensation element 52 corresponds to that of the compensation element 32. If the cable forces exerted on the compensation element 52 by the cable parts 13 differ from each other, the compensation element 52 will make a translating movement.

[0046] Although the cable parts 13 appear to extend substantially parallel to each other at the location of the compensation element 42, 52 in figures 4A and 4B and also in figures 5A and 5B, the spacing between the cable guides 43, 53 is in actual fact larger than the average spacing between the cable parts 13, so that the cable parts 13 will at all times abut against the cable guides 43, 53 with some force.

[0047] Figure 6 shows the use of the cable tension compensation device 51 in a door system as shown in figures 1 and 2. The cable parts 13 are connected to the stationary fixing element 21 with their second end 22. At a location spaced a short distance therefrom, the pin 56 of the cable tension compensation device 51 is stationarily connected to the section 28 via a baseplate 57. In case of a difference in the cable forces, the compensation element 52 will move relative to the pin 56 in or opposite to the direction indicated by arrow P2.

[0048] It is also possible to mount the cable tension compensation devices on the door leaf 4.

[0049] It is also possible to use the shaft 17 of the guide wheel 3 of the lowermost panel 2 both for securing the first end of the cable unit 12 thereto and as a pivot pin for the compensation element 42. The shaft 17 can in that case be optimised for the tensile force in the cable parts 13, since the forces exerted on the shaft 17 by the compensation element 42 are relatively limited. The compensation element 42 can be optimised for compensating the differences in length in the cable parts 13 and compensating the tensile forces in the cable parts. Moreover, installation is relatively easy, first the cable parts 13 can be connected to the shaft, for example, after which the compensation element 42 is slipped over the shaft 17 and the cable guides are positioned between the cable parts.

[0050] It is also possible for the spacing between the cable guides of the compensation element to be smaller than the average spacing between the cable parts of the cable unit, in which case the cable guides will be directed towards each other. The cable forces exerted on the compensation element by the cable parts will be directed

away from each other in that case.

Claims

1. A door system (1) comprising a door leaf (4) which is movably mounted in guide sections (5) on both long sides, as well as a counterweight device (11) provided with a cable unit (12) comprising at least two cable parts (13) extending substantially parallel to each other, which cable unit (12) is connected to the movable door leaf (4) with a first end (16), whilst a second end (22) takes up a stationary position, said cable unit (12) at least extending over a movable pulley (20) between said first and said second end (16, 22), which counterweight device (11) further comprises a spring unit (14) which engages the movable pulley (20), as well as a cable tension compensation device (31, 41, 51) working in concert with the cable unit (12) for loading the cable parts (13) substantially equally, **characterised in that** the cable tension compensation device (31, 41, 51) is provided with a compensation element (32, 42, 52) disposed between two cable parts (13), which is provided with a cable guide (33, 43, 53) on either side thereof, against each of which cable guides (33, 43, 53) a cable part abuts, which compensation element (32, 42, 52) is movable at least in a direction substantially transversely to the longitudinal direction of the cable parts (13) under the influence of cable forces exerted on the compensation element (32, 42, 52) by the cable parts (13).

2. A door system (1) according to claim 1, **characterised in that** the distance (B) between the cable guides (33, 43, 53) of the compensation element (32, 42, 52) is larger than the average distance between the cable parts (13) of the cable unit (12).

3. A door system (1) according to claim 1 or 2, **characterised in that** the cable guides (33, 43, 53) of the compensation element (32, 42, 52) are disposed near the first or the second end (16, 22) of the cable unit (12), with the compensation element (32, 42, 52) being connected to the door leaf (4) or to the guide section (5), respectively.

4. A door system (1) according to claim 1, 2 or 3, **characterised in that** the compensation element (32, 52) is capable of translating movement in the direction substantially transversely to the longitudinal direction of the cable parts (13).

5. A door system (1) according to claim 1, 2 or 3, **characterised in that** the compensation element (42) is pivotable about a pivot pin (45) disposed between the cable parts (13), which pivot pin is spaced from the cable guides (43) by a distance (R), seen in the longitudinal direction of the cable parts (13).

6. A door system (1) according to claim 5, **characterised in that** the first or the second end (22) of the cable unit (12) is connected to a shaft (17) that is coaxial with the pivot pin of the compensation element (32, 42, 52).

7. A door system (1) according to anyone of the preceding claims, **characterised in that** the door system (1) is provided with a counterweight device (11) on both long sides of the door leaf (4).

8. A cable tension compensation device (31, 41, 51) suitable for use with a door system (1) according to any one of the preceding claims, **characterised in that** the cable tension compensation device (31, 41, 51) is provided with a compensation element (32, 42, 52) that can be positioned between two cable parts (13), which is provided with a cable guide (33, 43, 53) on either side thereof, against each of which cable guides (33, 43, 53) a cable part is to be placed into abutment, which compensation element (32, 42, 52) is movable at least in a direction substantially transversely to the longitudinal direction of the cable parts (13) under the influence of cable forces to be exerted on the compensation element (32, 42, 52) by the cable parts (13).

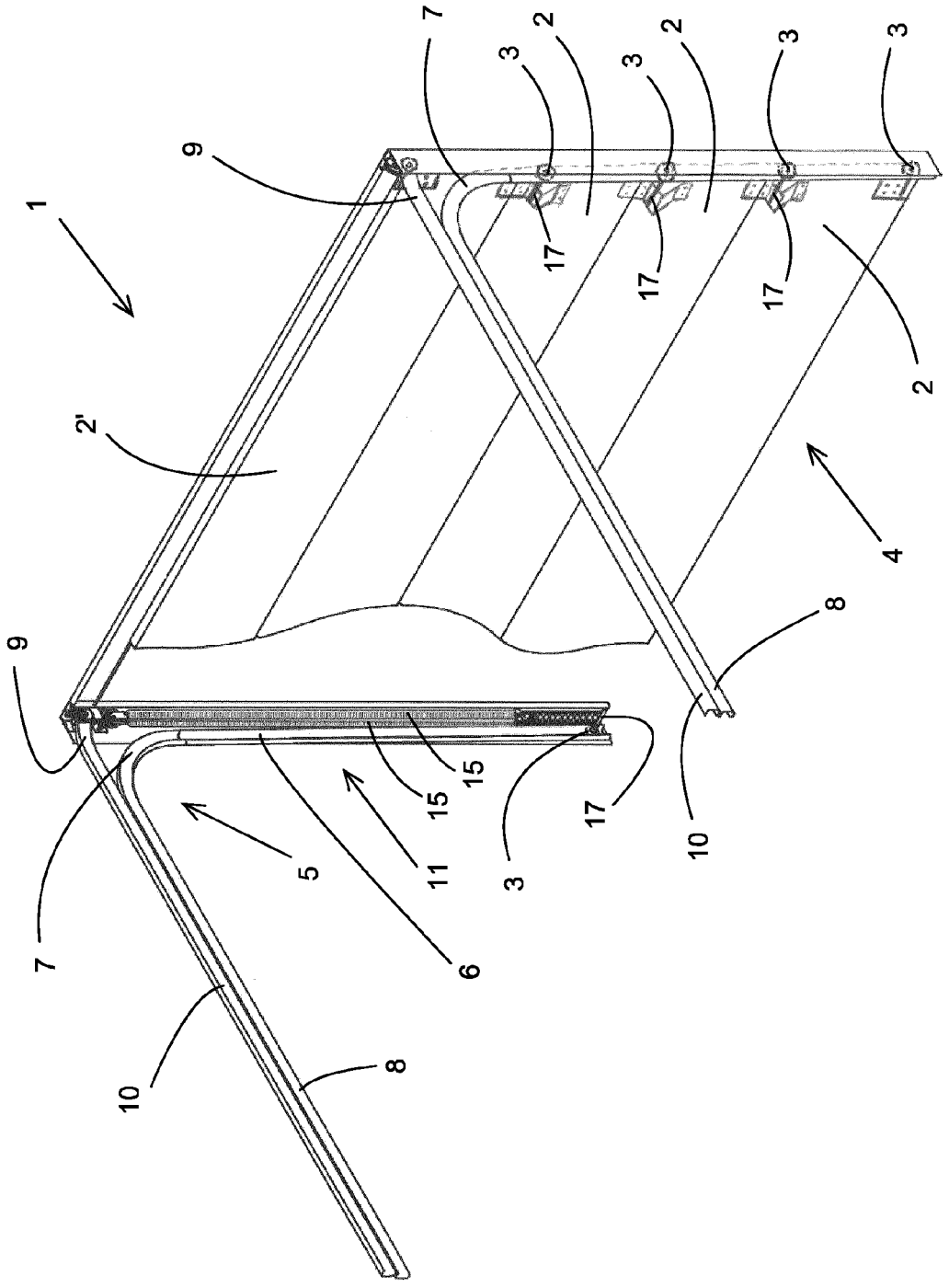

Fig. 1

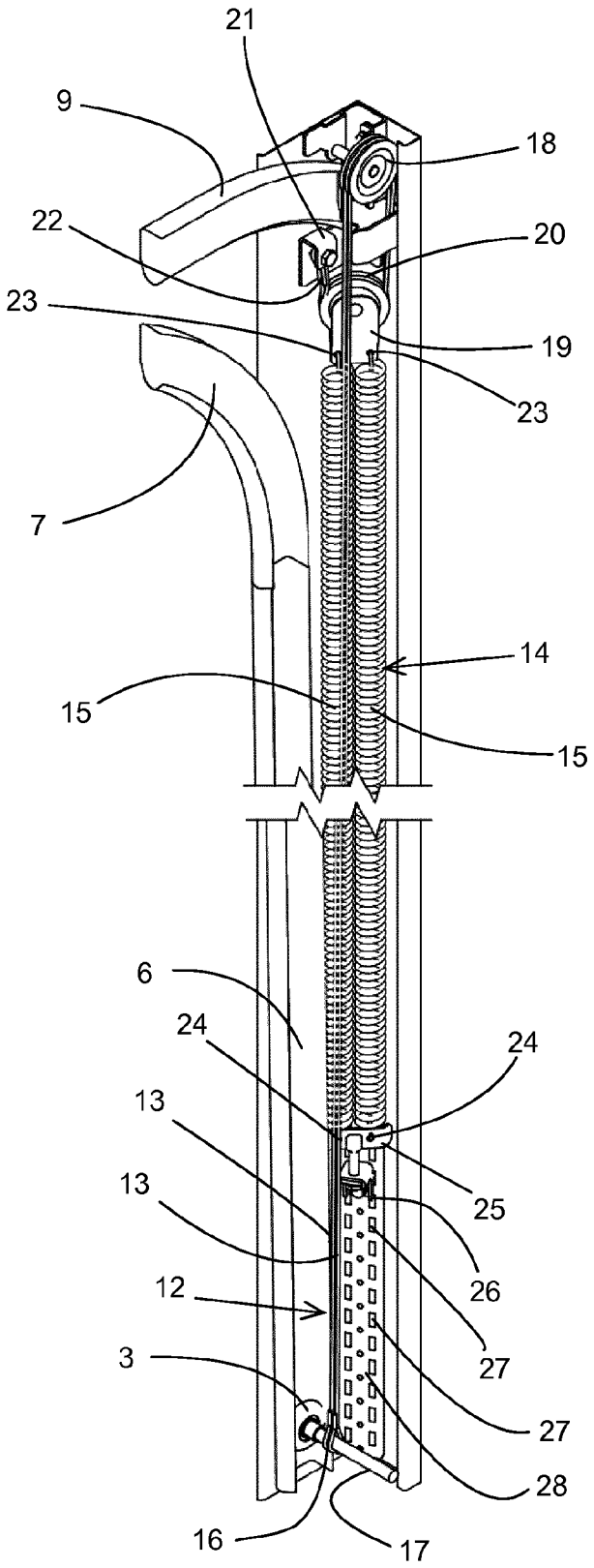

Fig. 2

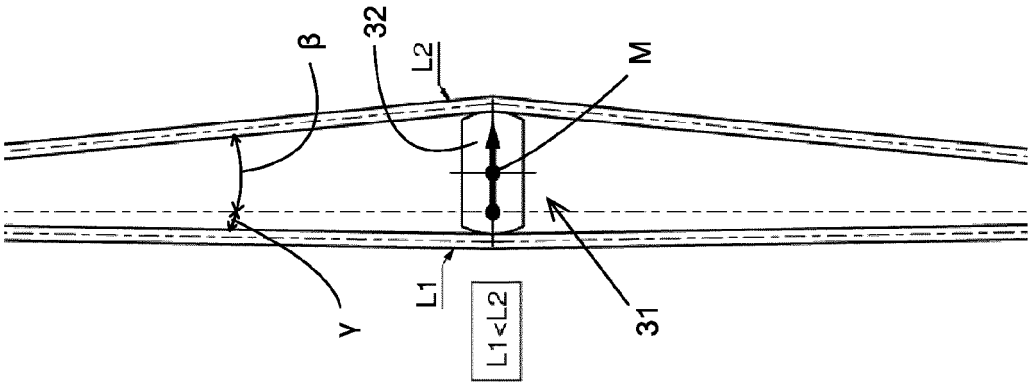

Fig. 3C

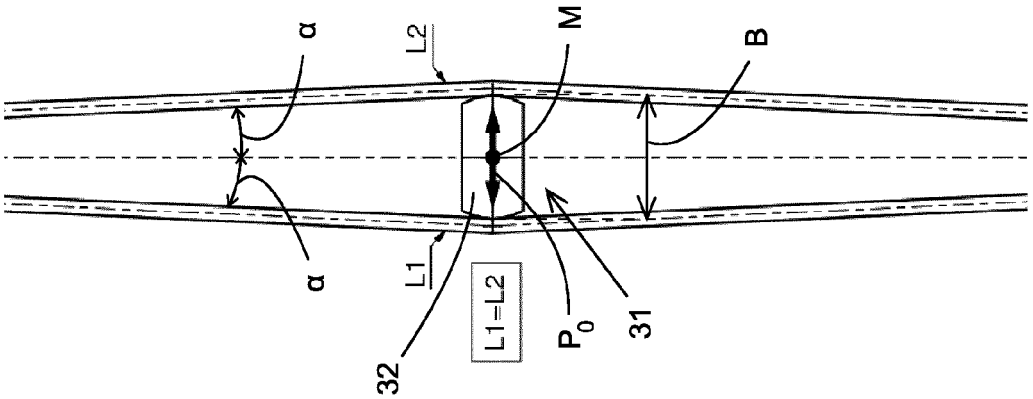

Fig. 3B

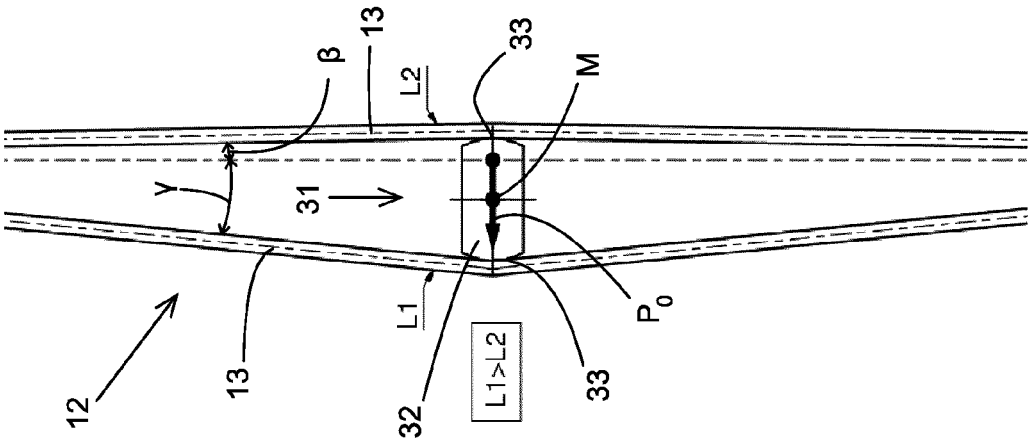

Fig. 3A

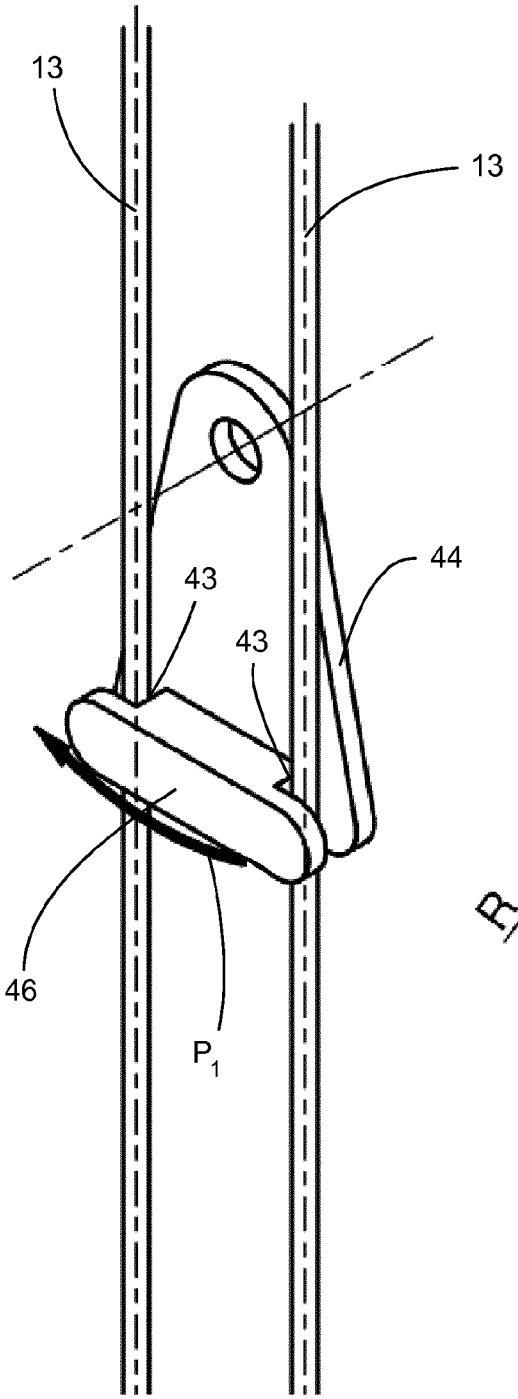

Fig. 4B

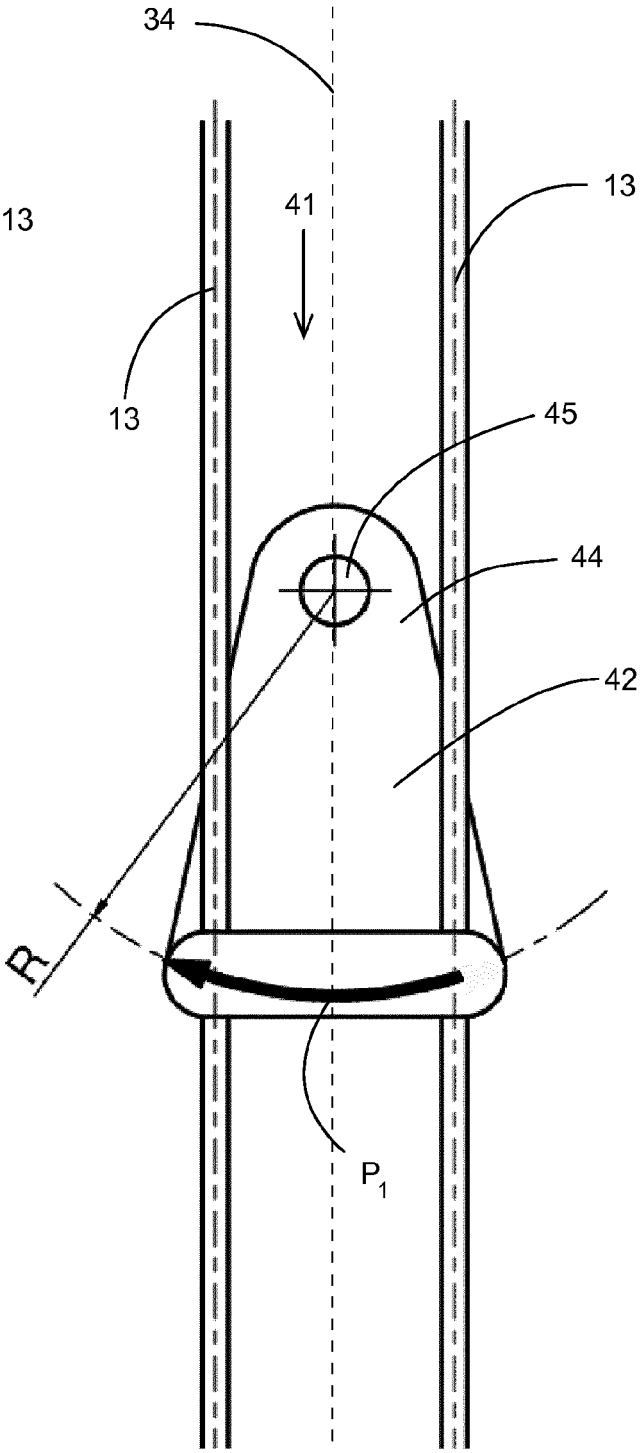

Fig. 4A

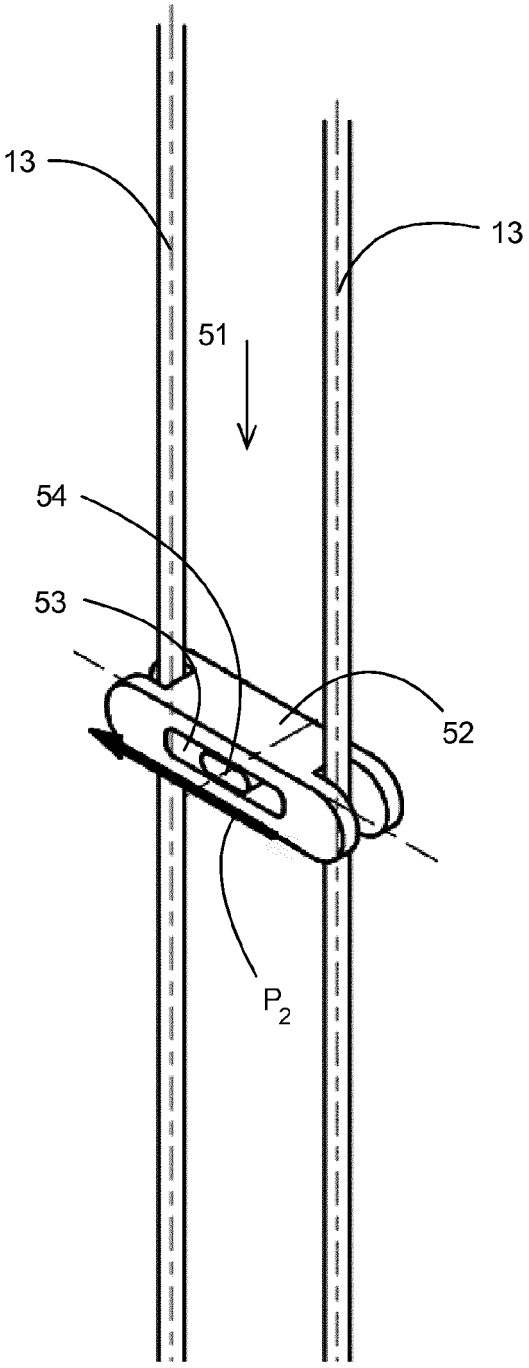

Fig. 5B

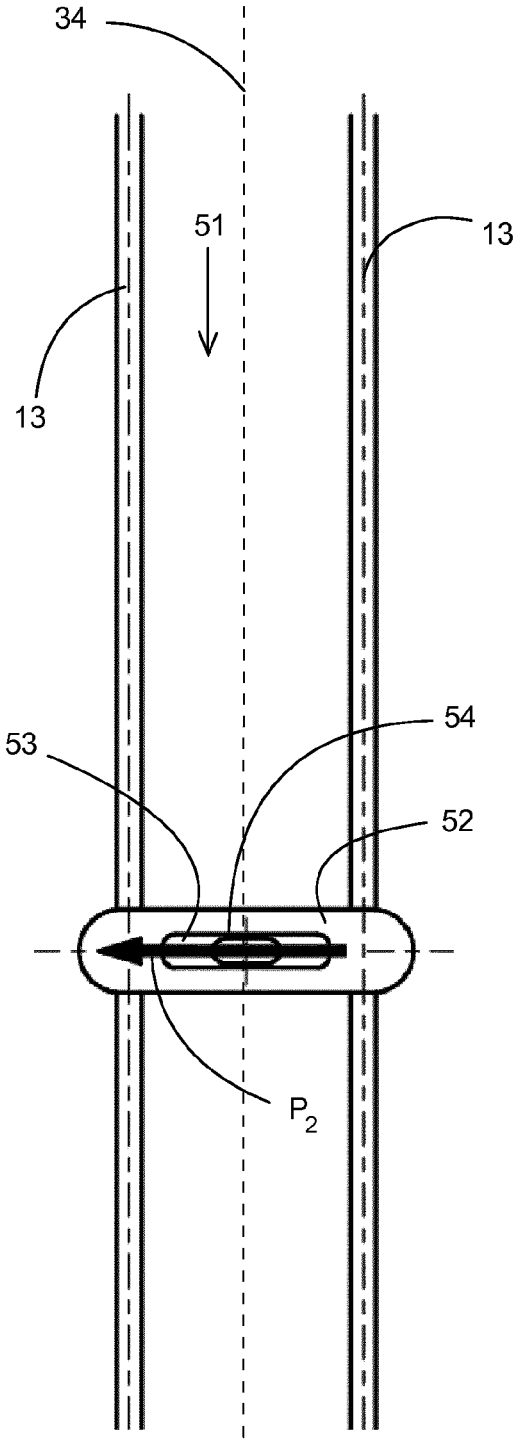

Fig. 5A

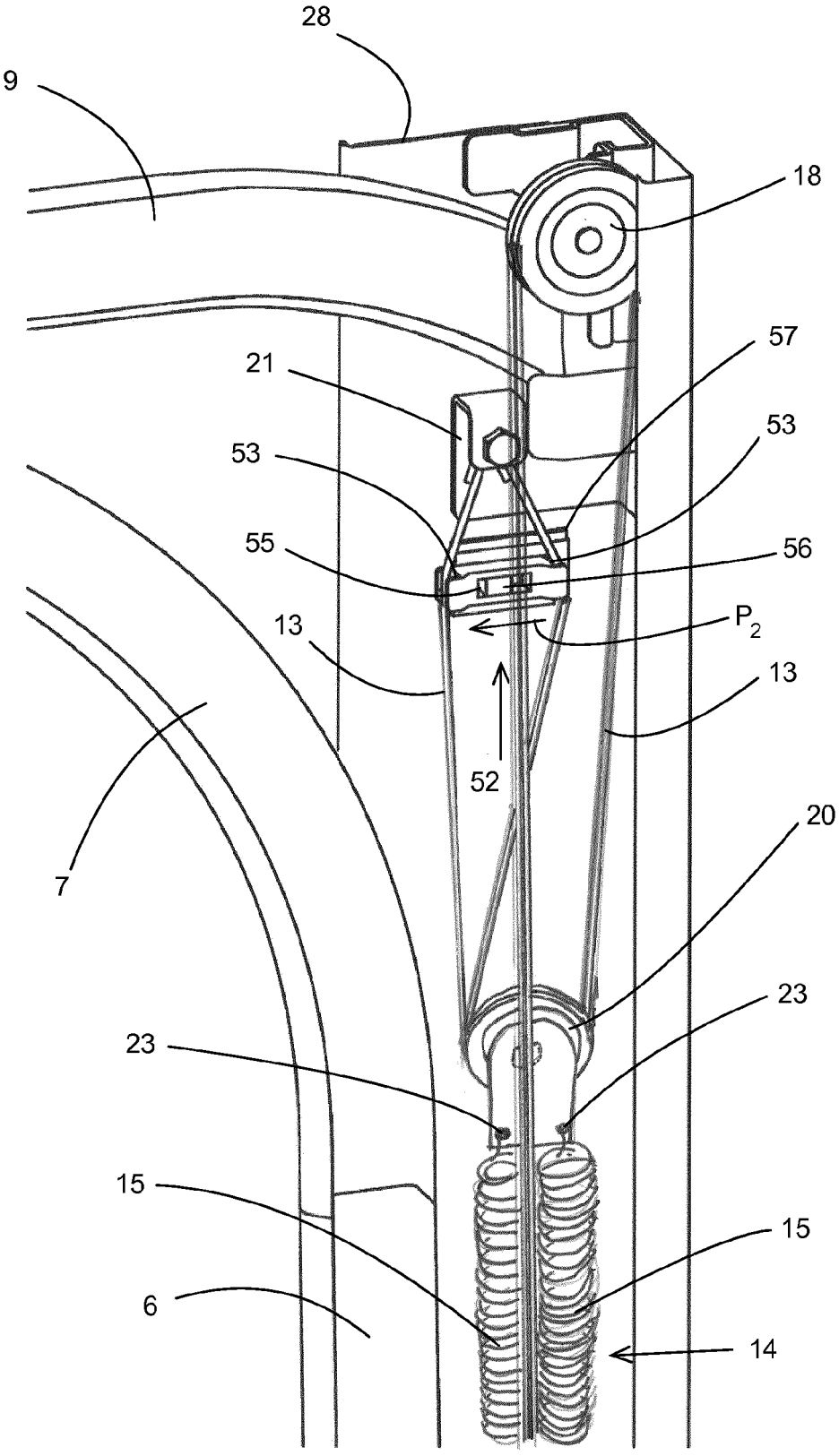

Fig. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 13 15 5456

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	WO 2011/032649 A1 (SOMMER ANTRIEBS & FUNKTECHNIK [DE]; SCHAAF GERD [DE]) 24 March 2011 (2011-03-24) * abstract * -----	1	INV. E05D13/00
A	EP 0 890 010 A1 (HOERMANN KG [DE]) 13 January 1999 (1999-01-13) * paragraphs [0024], [0026]; figures * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

E05D
E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 May 2013	Van Kessel, Jeroen

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

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 15 5456

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-05-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011032649 A1	24-03-2011	CN 102472066 A	23-05-2012
		DE 102009041871 B3	24-02-2011
		EP 2446102 A1	02-05-2012
		US 2012167474 A1	05-07-2012
		WO 2011032649 A1	24-03-2011
EP 0890010 A1	13-01-1999	AT 203085 T	15-07-2001
		AT 219206 T	15-06-2002
		CN 1215447 A	28-04-1999
		CZ 9803104 A3	17-03-1999
		DE 19713457 A1	20-11-1997
		DE 19713458 A1	20-11-1997
		DK 890009 T3	16-09-2002
		DK 890010 T3	24-09-2001
		EP 0890009 A1	13-01-1999
		EP 0890010 A1	13-01-1999
		ES 2158556 T3	01-09-2001
		ES 2174251 T3	01-11-2002
		GR 3036353 T3	30-11-2001
		HU 9901382 A2	30-08-1999
		NO 984424 A	12-11-1998
		PL 329128 A1	15-03-1999
		PT 890009 E	30-09-2002
		PT 890010 E	31-10-2001
		RU 2150562 C1	10-06-2000
		US 6122862 A	26-09-2000
		WO 9737097 A1	09-10-1997
		WO 9737098 A1	09-10-1997

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2011032649 A **[0005]**