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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Supporting and motorized actuation device of rolling shutters**

(57) A supporting and motorized actuation device (200) of rolling shutters comprises a pair of support bars (1) between which a winding assembly (10) is disposed and supported, comprising a revolving casing (70) with longitudinal axis (X) that houses a frame (T), a compen-

sating spring assembly (30) and a geared motor (20) driving into rotation a pulley (21) fixed to said revolving casing (70). The device comprises a first and a second fast-coupling connector (6) fixed to said winding assembly for coupling with said support bars (1).

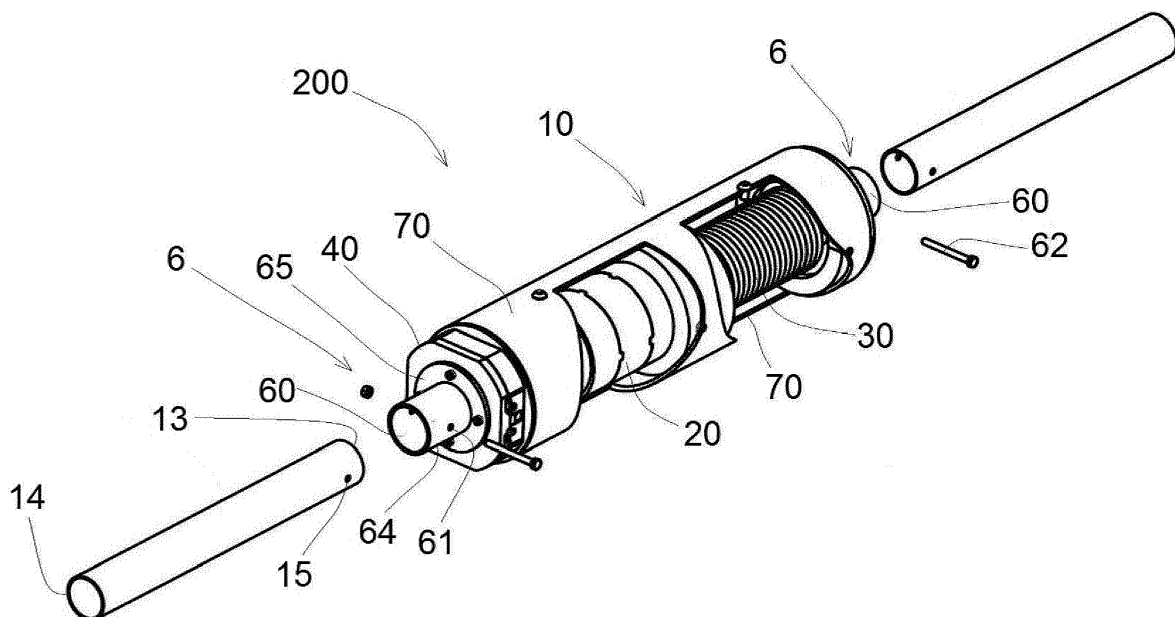


FIG. 3

Description

[0001] The present invention relates to a supporting and motorized actuation device of rolling shutters for doors of garages, shops and industrial buildings in general.

[0002] Figs. 1 and 2 respectively show a device (100) according to the prior art used to wind and unwind rolling shutters, as well as a rolling shutter (5) fixed to said device (100). The device (100) comprises a fixed (not revolving) support bar (101). Two or more spring-holding boxes (102) with circular shape are mounted on the support bar (101), revolving idly. Each spring-holding box (102) contains a compensating spring (103) that is generally obtained with steel straps wound in spiral configuration. A first end of the compensating spring (103) is fixed to the support bar (101). A second end of the compensating spring (103) is fixed to the casing of the spring-holding boxes (102).

[0003] A geared motor (104) is installed on the support bar (101). The geared motor (104) drives into rotation a pulley (140) that rotates around an axis coinciding with the longitudinal axis of the support bar (101). The pulley (140) has the same diameter as the spring-holding boxes (102). The rolling shutter (5) has an upper border (5a) fixed both to the pulley (140) and to the casing of the spring-holding boxes (102). Therefore, the spring-holding boxes (102) rotate around the support bar (101) when the geared motor (104) is actuated in order to wind or unwind the rolling shutter (5).

[0004] The compensating springs (103) are unloaded when the shutter (5) is lifted and completely wound around the support bar (101), whereas the springs (103) are loaded with the maximum load when the shutter (5) is unwound completely, as shown in Fig. 2.

[0005] During the descending travel of the shutter (5), the compensating springs (103) are progressively loaded, taking advantage of the weight of the shutter (5), whereas, during the ascending travel of the shutter, the compensating springs (103) are unloaded, significantly contributing to the shutter lifting force exerted by the geared motor (104).

[0006] These types of systems used to wind and unwind rolling shutters are impaired by some drawbacks.

[0007] The length and the diameter of the support bar (101), the number and the diameter of the spring-holding boxes (102), the length and the thickness of the steel straps used to make the spiral springs (103), the power of the geared motor (104), and the diameter of the pulley (140) vary according to the width and the weight of the shutter. Accordingly, in order to meet the diverse customer requirements, a rolling shutter manufacturer must store a large stock of different components in the warehouse.

[0008] Also the assembly of the shutter is rather complicated. The assembly provides for mounting all spring-holding boxes (102) along the support bar (101), mounting the geared motor (4) on the support bar (101), and

fixing the upper border (5a) of the shutter (5) to the pulley (140) and to the casing of all spring-holding boxes (102).

[0009] Additional drawbacks refer to the safety of the operators in charge of assembling the shutter or repairing and maintaining it after installation. As a matter of fact, the spring-holding boxes (102) need to be handled with great care and skill, especially when the compensating springs (103) are loaded with maximum or partial load. In fact, the steel straps of the compensating springs (103) become sharp blades and can be extremely dangerous if they are unwound freely and uncontrollably because of an accidental failure or if their ends are released from the fixing points. It must be noted that the spiral springs tends to come out of their box, converting themselves in extremely dangerous sharp objects.

[0010] CH688006 discloses an actuation device of rolling shutters that comprises a winding tube inside which a geared motor and a spiral spring are mounted. The shutter is fixed to the winding tube that is rotated by the electrical motor in order to wind the rolling shutter on the winding tube. Such a device is not versatile. In fact, the length of the winding tube must be the same as the width of the rolling shutter. In view of the above the operator must stock a plurality of devices in the warehouse, with winding tubes of different length according to the width of the rolling shutters.

[0011] DE4211940 discloses an actuation device for rolling shutters similar to CH688006 wherein a winding tube houses both a geared motor and a spiral spring. However, the device of DE4211940 is not provided with a system to adjust to the width of the rolling shutter or to the width of the window opening.

[0012] CH206381 discloses a traditional rolling shutter winding device and a fixing system in order to adjust the device to small dimensional variations caused by defective fabrication. Such a fixing system provides for U-shaped brackets comprising two legs that are engaged with clearance in holes obtained in the masonry wall. The brackets are fixed to a flange connected to the winding device. Such a fixing system allows for vertical and horizontal adjustment of a few millimeters and is not capable of adjusting to the width of different rolling shutters that can differ in a few meters.

[0013] The purpose of the present invention is to remedy the drawbacks of the prior art, by providing a supporting and motorized actuation device of rolling shutters, which is versatile and used for any width of the shutter or of the opening to be covered with the shutter.

[0014] The first purpose of the invention is to provide a supporting and motorized actuation device of rolling shutters that allows a rolling shutter manufacturer to meet the most diverse requirements using the same standardized component, with consequent simplification and saving in terms of warehouse stock.

[0015] An additional purpose of the invention is to provide a device that makes the installation of the shutter easier and safer.

[0016] These purposes are achieved by the device of

the invention, the characteristics of which are described in the attached claims.

[0017] The device of the invention comprises a winding assembly, which is provided and pre-assembled both with a geared motor and a compensating spring assembly used to compensate the weight of the shutter.

[0018] The winding assembly comprises a revolving casing with horizontal axis, and fast-coupling connectors disposed at the end of the winding assembly in order to couple two support bars.

[0019] The revolving casing houses a support frame used to support a geared motor adapted to drive into rotation a pulley with horizontal axis, which is fixed to said revolving casing. The upper border of the shutter is fixed to the revolving casing and the shutter is supported and driven by said revolving casing, which also acts as winding drum for the entire shutter.

[0020] The revolving casing also houses the compensating spring assembly, composed of helical torsional springs with ends joined to a fixed portion and to a revolving portion of the winding assembly, respectively.

[0021] During the rotation of the pulley in the direction that corresponds to the descending travel of the shutter, the compensating spring assembly is subject to a torsional stress and accumulates energy that, during the ascending travel of the shutter, contributes to the shutter lifting force exerted by the geared motor.

[0022] After being informed on the dimensions of the shutter to be installed, the operator in charge of preparing and assembling the shutter simply needs to cut two identical bar sections to size and insert them from opposite sides in the fast-coupling connectors fixed to the winding assembly.

[0023] Evidently, the length of the bar sections must be identical to the total length of the shutter, after subtracting the length of the winding assembly that is disposed between the two bar sections.

[0024] Then the operator must fix the upper border of the shutter on the revolving casing of the winding assembly.

[0025] In terms of accident prevention, the helical springs of the compensating spring assembly are much safer than the spiral springs contained in the spring-holding boxes used in the prior art. In fact, in case of a spring failure, the helical springs are contained and protected inside the revolving casing and are wound on the spring-holding sleeve that supports them.

[0026] For explanatory reasons, the description of the invention continues with reference to attached drawings, which only have an illustrative, not limiting value, wherein:

Fig. 1 is a perspective view of an actuation device of rolling shutters according to the prior art;

Fig. 2 is a perspective view of a rolling shutter fixed to the device of Fig. 1;

Fig. 3 is an exploded axonometric view of the invention, which illustrates one winding assembly and two

support bars;

Fig. 4 is an axonometric view of a rolling shutter fixed to the device of the invention; and

Fig. 5 is an axial view of the winding assembly of Fig. 3.

[0027] Referring to Figs. 3 to 5, the device of the invention is disclosed, being generally indicated with reference numeral (200).

[0028] The device (200) comprises a winding assembly (10). The winding assembly (10) comprises a revolving casing (70) whereon the upper border (5a) of a rolling shutter (5) is fixed, in such manner that the shutter (5) is wound onto the revolving casing (70) of the rolling assembly. The revolving casing (70) has a cylindrical shape.

[0029] The winding assembly (10) comprises a geared motor (20) and a compensating spring assembly (30) disposed inside the revolving casing (70). The geared motor (20) is used to drive the revolving casing (70) into rotation. The compensating springs (30) are used to compensate the weight of the shutter (5).

[0030] With reference to Fig. 5, the winding assembly (10) comprises a support frame (T) used to support the geared motor (20) and the compensating spring assembly (30). The support frame (T) comprises a first support (40) that supports the motor (20) and a second support (50) that supports the compensating spring assembly (30). The two supports (40, 50) are shaped as a circular plate and disposed at the ends of the winding assembly (10).

[0031] Two collars (80) are revolvingly mounted on the supports (40, 50) and fixed to the revolving casing (70). In view of the above the revolving casing (70) rotates with respect to the frame (T) that is fixed. Rolling bearings (90) are preferably interposed between the supports (40, 50) and the collars (80).

[0032] The geared motor (20) has multiple reduction stages, for example of epicycloidal type. The geared motor (20) has a drive shaft (20a) connected to a pulley (21) disposed in a central portion of the winding assembly (10). The pulley (21) is fixed to the revolving casing (70) with fixing means (22), such as bolts. In this way the geared motor (20) drives the revolving casing (70) into rotation.

[0033] The compensating spring assembly (30) comprises a first end (30b) fixed to the second support (50) of the frame and a second end (30a) connected to the pulley (21). In this way the compensating spring assembly (30) is loaded and unloaded according to the direction of rotation of the pulley (21).

[0034] According to the preferred embodiment of Fig. 5, the compensating spring assembly (30) is connected to the pulley (21) by means of a disc-like coupling (71) fixed to the pulley (21).

[0035] The compensating spring assembly (30) comprises helical torsional springs disposed coaxially one inside the other. The number of springs of the compen-

sating spring assembly (30) changes according to the weight of the shutter (5).

[0036] The concentric springs of the compensating spring assembly (30) are disposed on a spring-holding sleeve (74) fixed to the second support (50) of the frame. The second support (50) of the frame has a central hole (51) wherein the spring-holding sleeve (74) is fixed.

[0037] The coupling (71) has a through central hole (72) that is crossed by one end of the spring-holding sleeve (74). Clearance is provided between the coupling (71) and the spring-holding sleeve (51) in order for the coupling (71) to rotate with respect to the spring-holding sleeve (74).

[0038] The second support (50) and the coupling (71) have shanks (52, 73) that define housings adapted to contain the first end (30b) and the second end (30a) of the spring assembly, respectively.

[0039] During the rotation of the pulley (70), the coupling (71) drives the second end (30a) of the compensating spring assembly (30) into rotation around the axis (X), whereas the first end (30b) of the compensating spring assembly is kept fixed by the second support (50) of the frame.

[0040] With reference to Fig. 3, the device (10) of the invention comprises a pair of support bars (1) with tubular cylindrical shape. Each support bar (1) has a first ending section (13) and a second ending section (14).

[0041] A first and a second fast-coupling connector (6) are fixed to the first support (40) and to the second support (50) of the frame, in such manner to axially protrude outwards in order to be coupled with the first ending section (13) of each support bar (1). A male-female coupling is provided between the first ending section (13) of the support bar (1) and the fast-coupling connector (6).

[0042] The second ending section (14) of each support bar is adapted to be fixed to a masonry wall.

[0043] Each fast-coupling connector (6) comprises a flange (65) fixed to the support (40, 50) and a cylindrical shank (64) provided with a cylindrical housing (60) adapted to receive the ending section of the support bar (1).

[0044] The shanks (64) of the fast-coupling connectors and the ending sections of the support bars (1) comprise radial holes (61, 15) adapted to receive stop plugs (62) to prevent the free removal of said support bars (1).

[0045] The two support bars (1) are obtained from time to time by cutting two identical bar sections to size, starting from a long bar with standard length. In view of the above, a rolling shutter manufacturer can stock a suitable quantity of long bars with standard length in the warehouse. It must be noted that the length of the winding assembly (10) is considerably lower with respect to the width of the shutter (5) and consequently to the width of the opening that receives the shutter (5). The difference between the length of the winding assembly (10) and the width of the shutter (5) is compensated by the length of the support bars (1).

[0046] Therefore, the rolling shutter manufacturer can keep a stock of samples only for the two following stand-

ard components:

- the winding assembly (10);
- the standard length bar used to cut to size the support bars (1) to be associated from time to time with the winding assembly (10).

Claims

1. Supporting and motorized actuation device (200) of a rolling shutter (5) comprising a winding assembly (10) that comprises:

- a fixed frame (T),
- a revolving casing (70) revolvingly mounted on said fixed frame (T) in such manner to revolve around a longitudinal axis (X); said revolving casing (70) being adapted to be fixed to the rolling shutter (5) in order to wind and unwind the rolling shutter,
- a geared motor (20) mounted in the fixed frame (T) and adapted to drive the revolving casing (70) into rotation,
- a compensating spring assembly (30) disposed between the fixed frame (T) and the revolving casing (70) in such manner to be loaded or unloaded according to the direction of rotation of the revolving casing (70),

wherein said geared motor (20) and said compensating spring assembly (30) are housed in said revolving casing (70),

characterized in that

the length of the revolving casing (70) is lower than the width of the shutter (5) to be fixed to the revolving casing, and

said device (200) also comprises:

- a first fast-coupling connector (6) and a second fast-coupling connector (6) fixed to said fixed frame (T) in such manner to axially protrude from the ends of said winding assembly;
- a pair of support bars (1) adapted to be cut to size and having a first ending section (13) adapted to be coupled with said fast-coupling connector (6) and a second ending section (14) adapted to be coupled with a masonry wall.

2. The device (200) of claim 1, wherein said support bars (1) have a tubular shape.

3. The device (200) of claim 2, wherein said coupling between the first section (13) of the support bar and the fast-coupling connector (6) is a male-female coupling.

4. The device (200) of claim 3, wherein each fast-cou-

pling connector (6) comprises a flange (65) fixed to the fixed frame (T) and a cylindrical shank (64) that axially protrudes from the flange (65).

5. The device (200) of claim 4, also comprising at least one plug (62) that crosses radial holes (61, 15) respectively obtained in said cylindrical shank (64) of the fast-coupling connector and in said first ending section (13) of the support bar. 5
6. The device (200) of any one of the preceding claims, wherein said support bars (1) are obtained by cutting a bar. 10
7. The device (200) of any one of the preceding claims, wherein said support bars (1) have the same length. 15
8. The device (200) of any one of the preceding claims, wherein said fixed frame (T) comprises a first support (40) supporting said geared motor (20) and a second support (50) supporting said compensating spring assembly (30), wherein said first support (40) and said second support (50) of the fixed frame are disposed at the ends of said winding assembly (10) and said fast-coupling connectors (6) are fixed to the first support (40) and to the second support (50) of the fixed frame, respectively. 20 25
9. The device (200) of any one of the preceding claims, wherein said geared motor comprises a drive shaft (20a) connected to a pulley (21) fixed to said revolving casing (70) and said compensating spring assembly (30) comprises a first end (30b) fixed to the fixed frame (T) and a second end (30a) connected to the pulley (21). 30 35
10. The device (200) of claim 9, also comprising a coupling (71) fixed to the pulley (21) and to the second end (30a) of the compensating spring assembly. 40
11. The device (200) of any one of the preceding claims, wherein said compensating spring assembly (30) comprises a plurality of helical torsional springs (30) disposed coaxially one inside the other. 45
12. The device (200) of claim 11, when depending on claims 8 and 10, wherein said second support (50) comprises a shank (52) that defines a housing adapted to receive said first end (30b) of the compensating spring assembly (30) and said coupling (71) comprises a shank (73) that defines a housing adapted to receive said second end (30a) of the compensating spring assembly. 50
13. The device (200) of claim 12, comprising a spring-holding sleeve (74) whereon said compensating spring assembly (30) is disposed and fixed to the fixed frame (T) of the winding assembly. 55

Amended claims in accordance with Rule 137(2) EPC.

1. Supporting and motorized actuation device (200) of a rolling shutter (5) comprising a winding assembly (10) that comprises:

- a fixed frame (T),
- a revolving casing (70) revolvingly mounted on said fixed frame (T) in such manner to revolve around a longitudinal axis (X); said revolving casing (70) being adapted to be fixed to the rolling shutter (5) in order to wind and unwind the rolling shutter,
- a geared motor (20) mounted in the fixed frame (T) and adapted to drive the revolving casing (70) into rotation,
- a compensating spring assembly (30) disposed between the fixed frame (T) and the revolving casing (70) in such manner to be loaded or unloaded according to the direction of rotation of the revolving casing (70),

wherein said geared motor (20) and said compensating spring assembly (30) are housed in said revolving casing (70),

the length of the revolving casing (70) is lower than the width of the shutter (5) to be fixed to the revolving casing, and

said device (200) also comprises:

- a first fast-coupling connector (6) and a second fast-coupling connector (6) fixed to said fixed frame (T) in such manner to axially protrude from the ends of said winding assembly;
- a pair of support bars (1) adapted to be cut to size and having a first ending section (13) adapted to be coupled with said fast-coupling connector (6) and a second ending section (14) adapted to be coupled with a masonry wall,

characterized in that

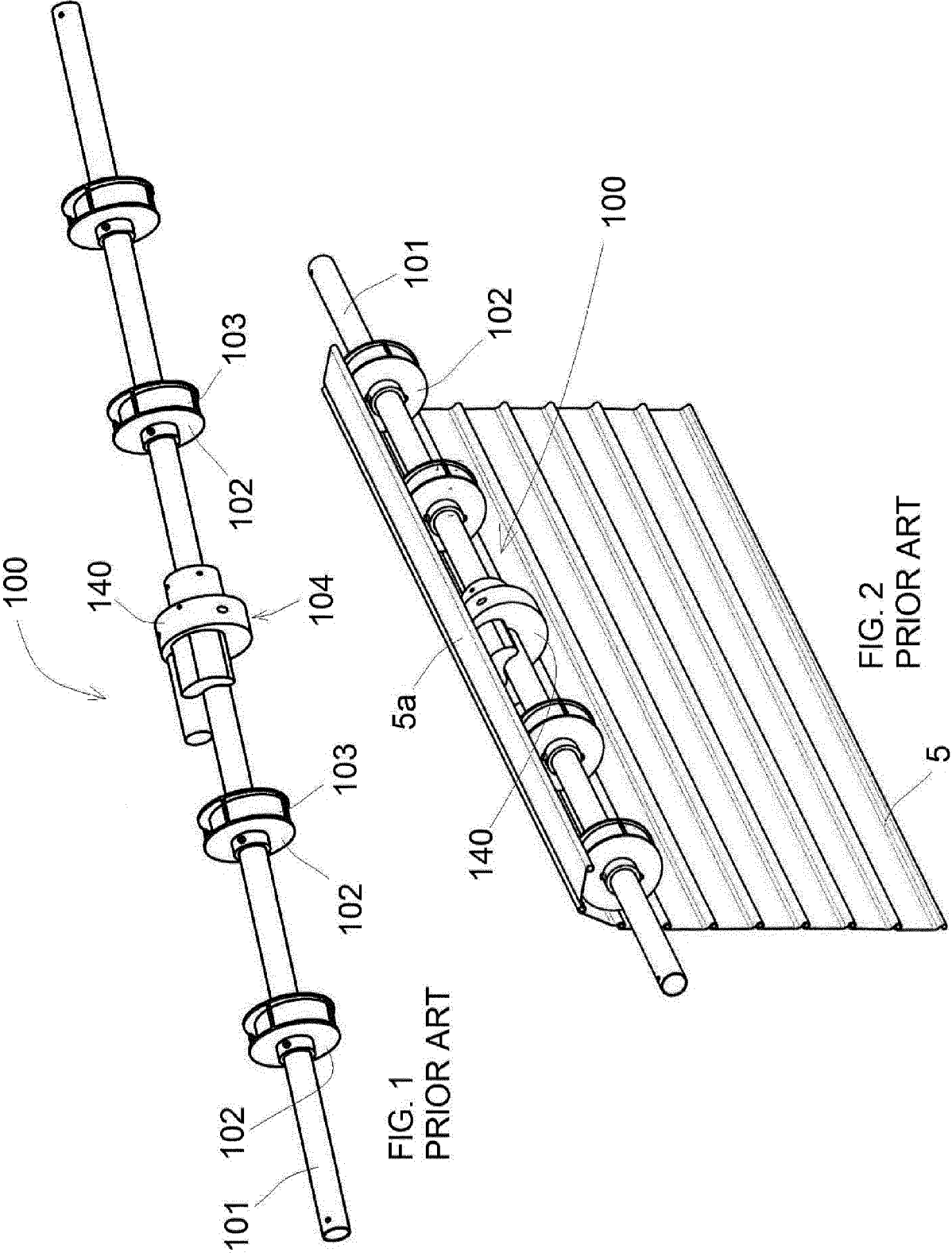
said geared motor (20) comprises a drive shaft (20a) connected to a pulley (21) fixed to said revolving casing (70) and said compensating spring assembly (30) comprises a first end (30b) fixed to the fixed frame (T) and a second end (30a) connected to the pulley (21).

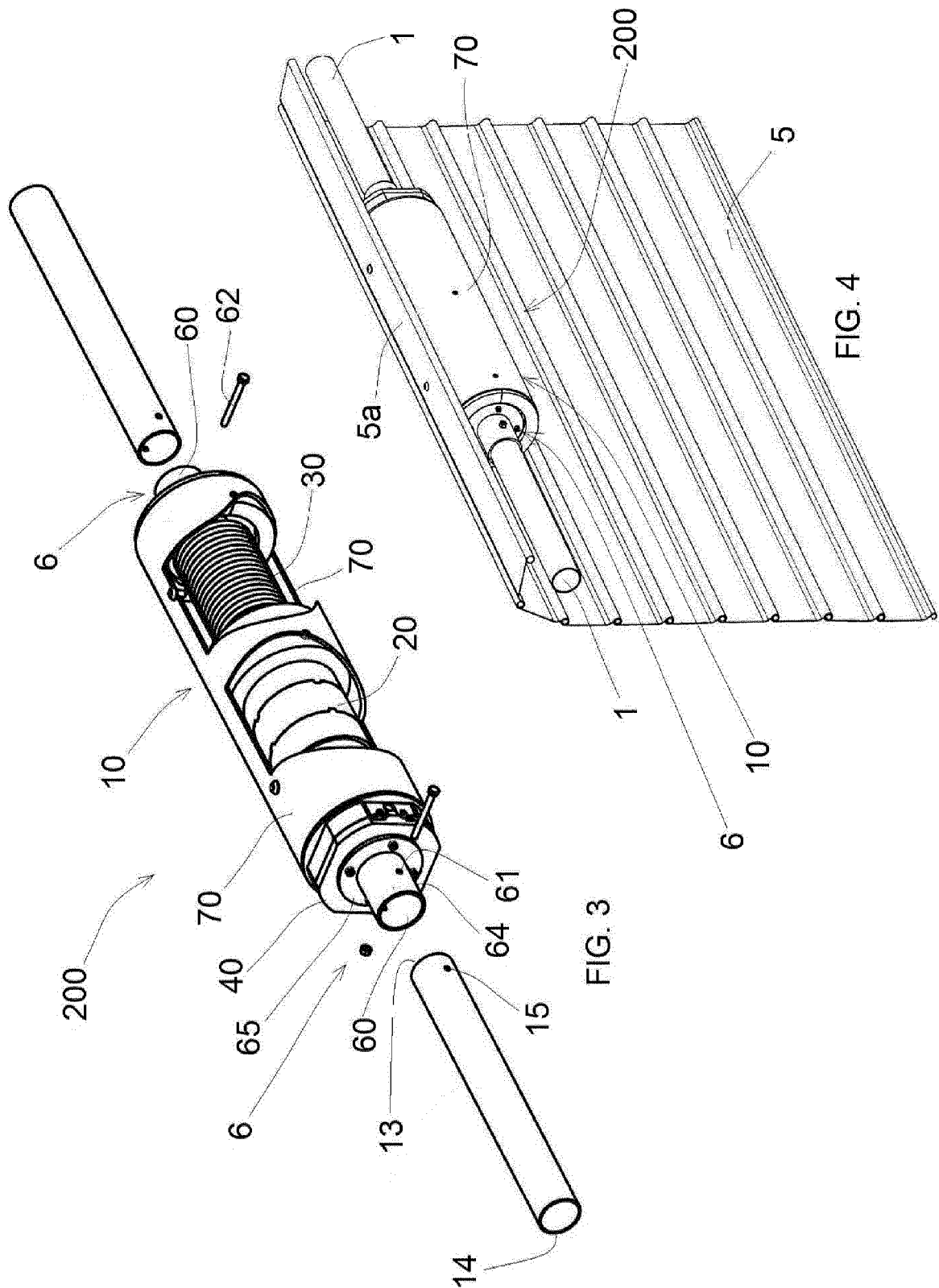
2. The device (200) of claim 1, wherein said support bars (1) have a tubular shape.
3. The device (200) of claim 2, wherein said coupling between the first section (13) of the support bar and the fast-coupling connector (6) is a male-female coupling.
4. The device (200) of claim 3, wherein each fast-cou-

pling connector (6) comprises a flange (65) fixed to the fixed frame (T) and a cylindrical shank (64) that axially protrudes from the flange (65).

5. The device (200) of claim 4, also comprising at least one plug (62) that crosses radial holes (61, 15) respectively obtained in said cylindrical shank (64) of the fast-coupling connector and in said first ending section (13) of the support bar. 5
6. The device (200) of any one of the preceding claims, wherein said support bars (1) are obtainable by cutting a bar. 10
7. The device (200) of any one of the preceding claims, wherein said support bars (1) have the same length. 15
8. The device (200) of any one of the preceding claims, wherein said fixed frame (T) comprises a first support (40) supporting said geared motor (20) and a second support (50) supporting said compensating spring assembly (30), wherein said first support (40) and said second support (50) of the fixed frame are disposed at the ends of said winding assembly (10) and said fast-coupling connectors (6) are fixed to the first support (40) and to the second support (50) of the fixed frame, respectively. 20 25
9. The device (200) of anyone of the preceding claims, also comprising a coupling (71) fixed to the pulley (21) and to the second end (30a) of the compensating spring assembly. 30
10. The device (200) of any one of the preceding claims, wherein said compensating spring assembly (30) comprises a plurality of helical torsional springs (30) disposed coaxially one inside the other. 35
11. The device (200) of claim 10, when depending on claims 8 and 9, wherein said second support (50) comprises a shank (52) that defines housing adapted to receive said first end (30b) of the compensating spring assembly (30) and said coupling (71) comprises a shank (73) that defines a housing adapted to receive said second end (30a) of the compensating spring assembly. 40 45
12. The device (200) of claim 11, comprising a spring-holding sleeve (74) whereon said compensating spring assembly (30) is disposed and fixed to the fixed frame (T) of the winding assembly. 50

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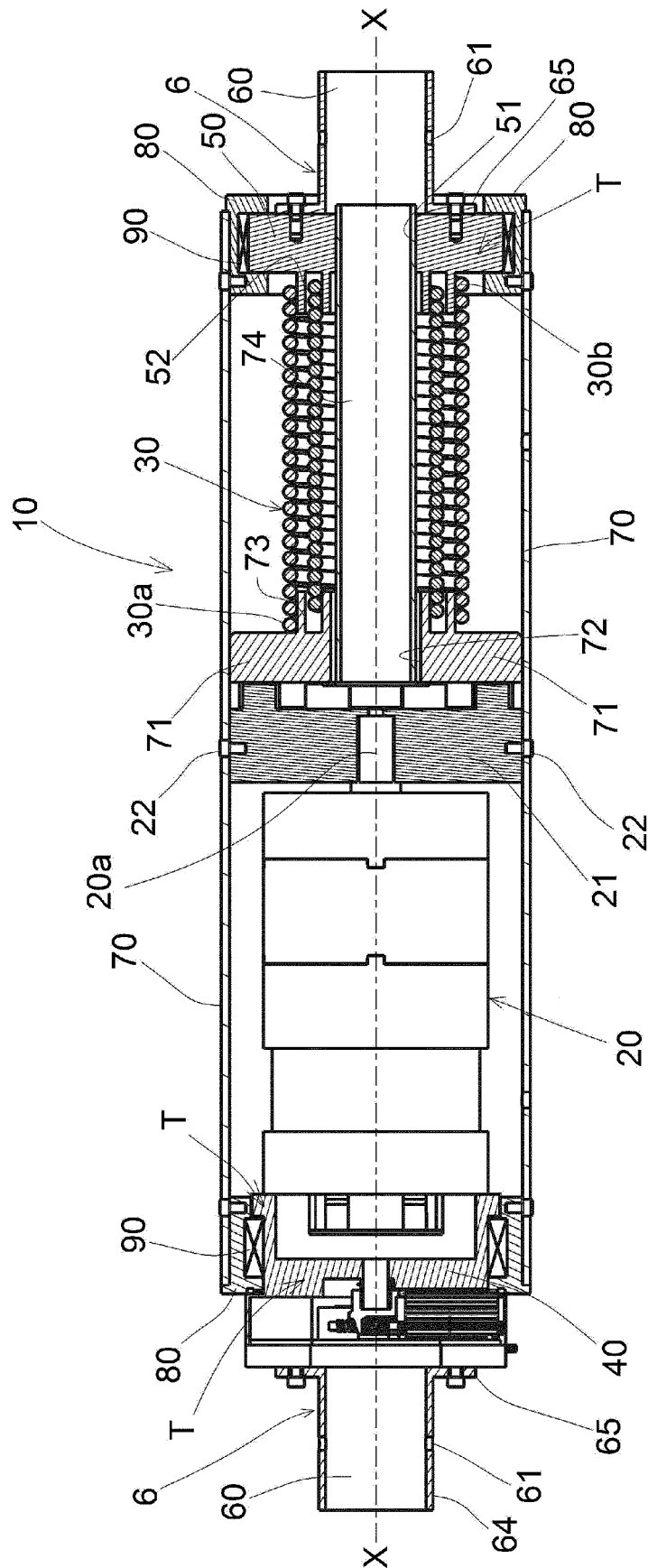


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 14 19 2522

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	* paragraphs [0039], [0045] - [0049]; figures 13-17 *	4,5	E06B9/60 E06B9/62 E06B9/72 E06B9/56 E06B9/174 E04F10/06
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A	DE 12 34 970 B (KARL PETZOLD) 23 February 1967 (1967-02-23) * claim 1; figure 1 *	1-13	
A	WO 2008/139526 A1 (NASUNO KUNIO [JP]) 20 November 2008 (2008-11-20) * abstract; figures 1, 6 *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC)
			E06B E04F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 May 2015	Examiner Weißbach, Mark
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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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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