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(54) **POWER UNIT FOR A ROLLER SHUTTER, IN PARTICULAR ROLLER SHUTTER WITH SLATS**

(57) The roller shutter power unit, which has a cassette for storing the movable curtain in its wound state on roller shaft **(3),** also equipped with drive shaft **(4),** is characterized by the fact that both shafts are driven by separate electric motors, respectively driving motor **(71)** and winding motor **(61).** At least one of the motors, in particular winding motor **(61),** has a rotational speed controlled by the controller, depending on the stage of winding of the mobile curtain on winding shaft **(3).**

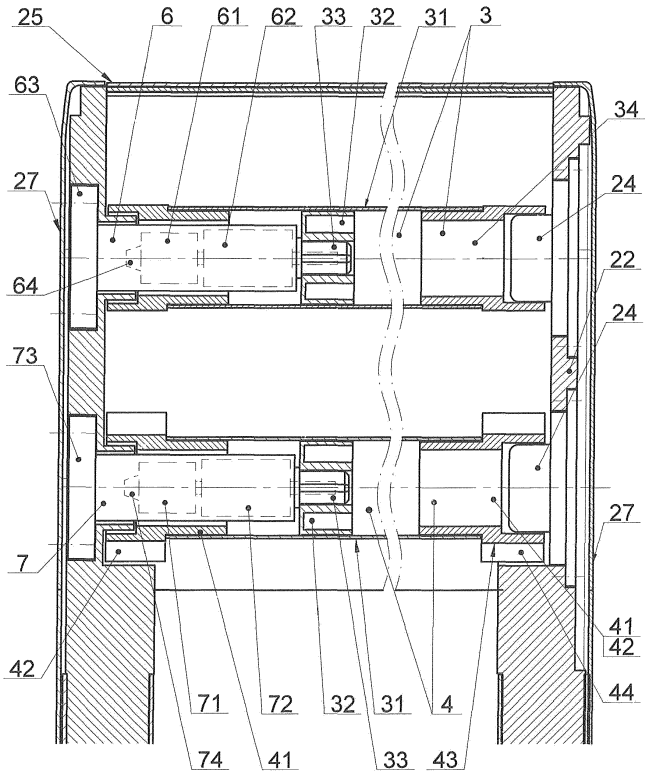

Fig. 2

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Description

[0001] The subject of the invention is a power unit for a roller shutter, in particular a slatted roller shutter installed on the outside of the window. Wherein the roller shutter curtain comprising a series of slats, articulated on their longer edges. This unit can also be used for a roller shutter comprising a movable curtain of a small thickness, for example made of fabric. The power unit according to the invention is intended in particular for use in roller shutters installed on roof windows.

[0002] **Prior art.** It is known from the patent description PL 191038 B1, derived from PCT Application Publication No. WO 00/29706, a power unit for the "Screen device", which has a shaft with drive wheels for moving the roller shutter slats during its unwinding or winding, and has a tubular bar on which such a wound roller shutter is stored. Inside the tubular bar, a drive shaft connected by a toothed or belt gear is located, with a shaft provided with drive wheels, and connected by a spring to a tubular bar. During unwinding of the roller shutter, the tubular bar is driven from the roller shutter slats pulled by a shaft provided with drive wheels, and during unwinding the winding diameter of the roller shutter decreases and the rotational speed of the tubular bar increases. The drive shaft has a constant speed, usually smaller than the tubular bar, therefore, the spring connecting these elements inhibits the movement of the tubular bar tightening the roller shutter. The disadvantage of this solution is the need to bring external driving means to the shaft with drive wheels and to the shaft inside the tubular bar (as indicated in the description), and this requires additional space next to the window for the motor or for the gear transferring hand operation. It is known from the patent description EP 1637693 B1 to provide a solution of the driving means in which the shafts: the drive shaft and the wound roller shutter storing shaft are connected by a belt transmission and a differential planetary gear unit. Roller shutter drives, in particular for thin roller shutters, for example textile roller shutters, are also known, equipped with an electric motor built in the wound roller shutter storing shaft.

[0003] **Background of the invention.** A roller shutter power unit, in particular for the slatted roller shutter, comprising a winding shaft, which is used to store a movable curtain which is composed of slats articulated to one another on their longer edges, and comprises a drive shaft used to move the movable curtain, is characterized in that the drive shaft and the winding shaft are driven by separate electric motors, referred to as the "driving motor" and the "winding motor", respectively. At least one of the two motors has a rotational speed regulated by the controller, depending on the stage of winding of the movable curtain on the winding shaft. The roller shutter comprises the power unit according to the invention, is designed in particular for a roof window in which, due to its inclination in the roof slope and the variable inclination angle of the sash in its open positions, it is difficult or impossible to unwind the movable curtain using gravity. The roller shutter, located outside of the window, has a cassette for storage of the movable curtain in its wound state, placed in particular at the top of the window, in particular on the upper frame member. The roller shutter is connected to the movable curtain guides, placed along the side frame members and the window sash frame. The ends of both shafts, i.e. the winding shaft and the drive shaft, are bearing mounted in the cassette side plates. The drive shaft is located just upstream of the inlet of the movable curtain to the guides. During the movable curtain unwinding, the drive shaft slides subsequent slats into the guides and is supported by the winding shaft that unwinds the stored slats of the movable curtain. When moving in the opposite direction, i.e. winding of the movable curtain, the drive shaft introduces its slats to the cassette, where they are wound on the winding shaft.

[0004] Preferably, the electric motor with the rotational speed controlled during the movement of the movable curtain is the winding motor. The rotational speed of the driving motor can be constant or adjustable by the user or the roller shutter manufacturer. The adjustable rotational speed of the driving motor can refer to the full range of movements of the movable curtain, for the use of different speeds of unwinding and winding. This motor can have at least two stages of adjustable rotational speed and there may also exist stageless adjustment of the driving motor rotational speed. The rotational speed of the driving motor adjustable, at least in two stages, in particular by the manufacturer, can only be used in the final sections of movement of the movable curtain to reduce this speed when the movable curtain is moved to its extreme positions. It is also possible to program a small retraction of the movable curtain after reaching the extreme position, fully unwound, in order to obtain alignment of the positions of slats.

[0005] In the first embodiment of controlling the movement of the movable curtain of the roller shutter, the power unit control system calculates the angle of rotation of the drive shaft, calculated from one of the two extreme positions of the movable curtain. The angle of rotation of the drive shaft is measured by an encoder, i.e. a transducer for measuring the rotational movement of the motor by calculating the number of pulses sent by a magnet installed on the rotating driving motor pin, read by the sensor fixed in the roller shutter cassette, in particular in the motor set housing comprising the main components: an electric motor and a toothed gear. In addition, the controller calculates the current supplied to both motors: the driving motor and the winding motor.

[0006] The readings of the number of pulses from the driving motor are calculated in the controller as the driving force from this motor is transferred by the gear which results in that the number of rotations of the motor and the shaft driven by this motor are different. The number of rotations of the drive shaft calculated in the controller indicates how many movable curtain slats are placed in-

side the cassette and should be wound on the winding shaft. From the number of slats wound on this shaft, the controller calculates the actual diameter of the movable curtain outer layer wound on the winding shaft, and according to this diameter it determines the required number of rotations of the winding shaft, necessary to maintain the peripheral speed for the actual winding diameter compatible with the linear speed of the movable curtain slats moved by the drive shaft. The control system also calculates the rotation angle of the winding shaft, similarly to the drive shaft, by calculating the number of pulses sent by the magnet installed on the rotating pin of the winding motor. The difference of angles of rotation of the shafts: the winding shaft and the drive shaft calculated by the controller, in relation to the angle of rotation of the drive shaft, is also used to control the winding motor, as this difference of rotation angles indicates whether the actual rotational speed of the winding shaft is appropriate for cooperation with the drive shaft, and in case of any discrepancy, the speed of the winding motor is increased or decreased accordingly.

[0007] Calculation of current supplied to the motors: the driving motor and the winding motor, is used to protect the roller shutter and its power unit against overloads that may occur during movement of the roller shutter movable curtain. In the case of excessive resistance to motion or blocking of the movable curtain, the current supplied to the motors increases, and if they reach the maximum admissible values, the power supply to the electric motors is switched off.

[0008] In the second control embodiment, the rotational speed of at least one of the electric motors is controlled based on the current calculation of the motor driving the shaft, which cooperates with the movable curtain in the chosen direction of movement of the movable curtain, as second in order. The controlled motor is preferably the winding motor and to control its rotational speed calculations of current are used: in the driving motor, during the unwinding of the movable curtain, and in the winding motor during its winding. During the unwinding of the movable curtain, the lower resistance to motion of the drive shaft, and thus the lower current in the driving motor, signals that the unwinding of the movable curtain from the winding shaft is too fast, which may lead to uncontrolled stacking of slats inside the cassette. In this case, the control system reduces the rotational speed of the winding motor. Increasing current in the driving motor indicates that the winding motor is working too slowly which results in that the movable curtain is tightening between the winding and drive shaft. In this case, the control system increases the rotational speed of the winding motor in order to release the movable curtain faster. During the winding of the movable curtain on the winding shaft, low current in the winding motor indicates that the motor must be accelerated to wind on the winding shaft all slats inserted into the cassette by the drive shaft and thus avoid uncontrolled stacking of these slats in the cassette. The increase of the current in the winding motor signals that its speed and thus rotational speed of the winding shaft should be reduced as the movable curtain is overtightened between the shafts: the winding shaft and the drive shaft.

[0009] The shafts placed in the roller shutter cassette: the winding shaft and the drive shaft are hollow and the electric motors: the driving motor and the winding motor driving both shafts, are located inside this shafts. Each of these two motors is part of the motor set, respectively: the driving motor or the winding motor, that has also a toothed gear to reduce the motor speed to the speed needed to drive the shafts. The motor and gear of the motor set are placed in a cylindrical housing, having at one end a collar by means of which the motor set is mounted in one of the side plates of the cassette. The gear shaft pin protrudes at the opposite end of each motor set, with the driver mounted transferring the driving force from the motor set to the shaft, respectively: the driving motor or the winding motor. The drive shaft cooperating on its periphery with the surfaces - external to the window - of the individual slats of the movable curtain, has seats for the slats moved by this shaft. The seats are concave and their shape is adapted to the convex surfaces of the movable curtain slats, located on the side - external to the window - of these slats. Preferably, between the adjacent seats for the movable curtain slats, the drive shaft comprises hooks. During the cooperation of the drive shaft with the movable curtain, these hooks enter gaps between its slats, stretching slightly flexible connectors of adjacent seats. The use of hooks increases the efficiency of transferring the driving force of the individual slats of the movable curtain. It is sufficient to locate the seats for the movable curtain only at the ends of the drive shaft. In particular, these seats are part of the drive wheels which are monolithic with the ends of the drive shaft and are used for its sliding bearing mounting in the cassette. In the second variant, the drive wheels with seats for the slats of the movable curtain are mounted on both ends of the drive shaft and they are separated elements from the shaft ends used for bearing mounting.

[0010] **Advantageous effects of the invention.** The use for the roller shutter drive, in particular the slatted roller shutter, of two electric motors located inside the shafts: the drive shaft and the winding shaft, and controlling their rotational speeds, eliminates the use of complicated and expensive mechanical gear sets. It also eliminates tightening of the roller shutter by means of springs between the drive and winding shafts, and maintaining the unnecessary spring tension while the roller shutter does not move. The motors located inside the two shafts also reduce the dimensions of the roller shutter, in particular the width, which is important when embedding of a set of windows placed next to each other on the roof. In addition, two motors instead of one big motor allow better and more flexible use of the power of both cooperating motors.

[0011] **An embodiment of the invention.** The subject of the invention is illustrated in the embodiment as a pow-

er unit for a roof window slatted roller shutter, in the drawing, of which the individual figures show:

Fig. 1 - Roof window, closed, with a roller shutter partially covering the window - in axonometric view.

Fig. 2 - The roller shutter cassette - in cross-section with the plane passing through the axes of the shafts: the drive shaft and the winding shaft.

Fig. 3 - The roller shutter cassette - in cross-section with a vertical plane.

Fig. 4 - Diagram of the control system of the power unit motors.

[0012] The roof window slatted roller shutter has movable curtain **1**, comprising slats **11**, in a number appropriate to the length of the roof window, articulated to one another on the longer edges of the slats by flexible connectors **12.** In the open position of the roller shutter, slats **11** of movable curtain **1** are stored in cassette **2,** by winding on the winding shaft **3.** Cassette **2** also includes drive shaft **4** that moves slats **11** of movable curtain **1.** Roller shutter cassette **2** is mounted on the roof window **5**, on upper frame member **51.** Roof window also comprises a sash **52** with window pane **53b,** embedded in a frame **54** of this sash. The complete sash is fixed in the frame by means of common hinges suitable for the window opening function as a tilting window, i.e. opened by turning the sash about an axis located slightly above half the height of the window, or as hinged window, i.e. opened by turning the sash around the axis at the top of the frame, or also with a double set of hinges, for opening the window in both indicated functions.

[0013] The supporting elements of cassette **2** in the roller shutter according to the invention are two side plates: motor plate **21** and bearing plate **22.** Motor winding unit **6** is attached to the motor plate **21**, in the cylindrical housing of which winding motor **61** and planetary winding gear **62** are embedded, and motor power unit **7** is also mounted, in the cylindrical housing of which driving motor **71** and planetary drive gear **72** are located. In order to unify the roller shutter units, both motor sets **6, 7** have identical construction, whereas differentiation by separate references in the drawing of the present description is due to the fact that each motor set drives a shaft that performs a different function in the roller shutter. Motor set housings **6, 7** have flanges **63, 73**, by means of which these sets are fixed to motor plate **21** of the cassette. Flanges **63, 73** are placed in the seats of the motor plate **21**, accessible from the outside of cassette **2**, and secured with screws (not shown in the drawing). The cylindrical part of winding motor set **6** passes through a port in motor plate **21,** and a distal section of the motor set protruding from the motor plate is placed inside winding shaft **3.** Similarly, the cylindrical part of motor power unit **7** passes through a port in motor plate **21**, and a distal section of the motor set is arranged in the interior of drive shaft **3.** Both motor sets **6, 7** have encoders, i.e. transducers for measuring the rotation of motors; in case of winding unit **6** it is winding encoder **64**, and in case of motor power unit **7**, it is drive encoder **74.** Each of the encoders comprises a magnet mounted on the shaft of winding motor **64** or driving motor **7**, rotating along with the motor shaft, and of a pulse reader embedded inside the casing of the winding unit: winding motor set **6** or motor power unit **7.**

[0014] Around the openings through which motor sets **6, 7** pass, the motor plate has monolithic cylindrical pins **23**, on which the sliding ends of the shafts are bearing mounted: winding shaft **3** and drive shaft **4.** Both shafts: winding shaft **3** and drive shaft **4**, in the middle part, have polygonal tube **31** (identical in order to unify parts), and the driving force of motors: winding motor **61** and driving motor **71** for these shafts is transferred by drivers **32**, mounted on gear pins protruding from motor set: winding motor set **6** and motor power unit **7.** The shape of the circumferential surface of drivers **32** is adapted to the internal contour of polygonal tube **31.** Drivers **32** are made of plastic and are mounted by means of metal inserts **33** on the gear pins.

[0015] On the opposite to motor plate **21** side of cassette **2**, there is a bearing plate **22** equipped with two bearing pins **24** detachably mounted in it, placed in the seats of bearing plate **22**, accessible from the outside of cassette **2**, and secured with screws (not shown in the drawing). Pin bearing elements **22** cooperating with shafts enter inside cassette **2**, and the ends of shafts: winding shaft **3** and driving shaft **4** are sliding bearing mounted on these pin elements.

[0016] The ends of the shafts: winding shaft **3** and drive shaft **4**, cooperating with cylindrical pins **23** of motor plate **21** and with bearing pins **24** of bearing plate **22**, are different in both shafts due to their functions, but identical at both ends of each shaft. In winding shaft **3**, there are bearing ends **34** embedded in the interior of polygonal tube **31** which on their protruding outer ends, have cylindrical openings cooperating with pins **23** of motor plate **21**, and with bearing pins **24** of bearing plate **22.** Bearing ends **34** are used for sliding bearing mounting of winding shaft **3** in roller shutter cassette **2.**

[0017] Drive ends **41** for a dual function are placed in drive shaft **4.** The first of this function is bearing mounting of drive shaft **4** in cassette **2**, in the same way as the function of bearing ends **32** in winding shaft **3.** The second function is to transfer the driving force from this shaft to individual slats **11** of movable curtain **1**, and this function at each drive end **41** is fully provided by a portion of the drive end, formed into the shape of drive wheel **42**, protruding from polygonal tube **31.** Each of the two drive wheels **42**, at its circumference, has concave seats **43**, with a shape adapted to the convex surfaces of slats **11** of movable curtain **1**, the slats being displaced by drive wheels **42** from cassette **2** to the guides **8**, or to the opposite side, from guides **8** to cassette **2.** Drive wheels **42**

between their seats **43** have protruding hooks **44** which, during the cooperation of drive wheels with slats **11** of movable curtain **1**, enter between adjacent slats **11**, slightly stretching flexible connector **12** that connects slats, which ensures better, because shaped, transfer of the drive to slats **11** of movable curtain **1.** Flexible connector **12** on both edges has profiles entering the recesses at the edges of slats **11** of the movable curtain. Slat **11** located in the movable curtain of in the highest position of all, is connected to winding shaft **3** via limit switch **13**, which has a profile on one of its edges entering the recess at the edge of slat **11**, identical to that in flexible connector **12.** On the other edge, limit switch **13** has a profile entering recess **35** in polygonal tube **31** of winding shaft **3.**

[0018] Roller shutter slats **11,** covering roof window **5**, are fixed with their ends in guides **8:** right guide and left guide and are displaced in these guides during covering or uncovering the window. The upper ends of guides **8** are connected by the side plates of cassette **2**, one with motor plate **21** and the second with bearing plate **22.** The lower ends of both guides **8** are connected to frame **54** of sash **52** in the lower corners of this frame. Cassette **2** with the upper frame member **51** of window frame **5** is articulated via axis **28**, the connections of guides **8** to the bottom corners of frame **54** of sash **52** are also articulated. This makes it possible to adjust the position of guides **8** to the position of sash **54** in a closed or open window at various stages of opening. In the closed window position (drawing, Fig. 1), guides **8** are arranged parallel to side frame members **54** of sash frame **52.** In the open window as tilting window, guides **8**, the upper part of the frame, i.e. above the hinges, and the lower part of sash **52** (below the hinges) form a triangle, however due to the variability of the position of the window sash and the roller shutter guides, these guides are compensated for their length.

[0019] Roller shutter cassette **2**, in addition to the previously discussed parts and subassemblies has also central cover **25**, comprising an upper and a lower part located between its side plates: motor plate **21** and bearing plate **22**, connected to these plates by means of screws. In the upper part of central cover **25**, photovoltaic panel **26** is installed, which generates electric current for motors **61** and **71**, while constituting an independent source of electricity, or auxiliary power supply for another source, for example for home electricity network. The side plates of cassette **2**, i.e. motor plate **21** and bearing plate **22** have side covers **27** on the outside of the cassette.

[0020] The drive unit control system calculates the angle of rotation of drive shaft **4**, calculated from one of the two extreme positions of movable curtain **1.**

[0021] The angle of rotation of this shaft is measured with drive encoder **74**, by calculating the number of pulses sent by a magnet installed on the rotating pin of driving motor **71**, read by a sensor installed in the housing of motor power unit **7.** The control system also calculates the rotation angle of winding shaft **3,** similarly to drive shaft **4**, by calculating the number of pulses sent by the magnet of winding encoder **64**, installed on the rotating pin of winding motor **71.** The readings of the number of pulses from the encoders: drive encoder **74** and winding encoder **64** are transmitted to controller **9**, where in speed control modules **91**, separate for driving motor **71** and winding motor **61**, the rotational speeds of the motors: driving motor **71** and winding motor **61** as well as the shafts: drive shaft **4** and winding shaft **3** are calculated. In addition, controller **9** in current control modules **93**, separate for driving motor **71** and winding motor **61**, calculates the current supplied by controller **9** to both of these motors.

[0022] On the basis of information on the rotational speed of drive shaft **4**, processor **9** calculates how many slats **11** of movable curtain **1** are inside cassette **2** and should be wound on winding shaft **3**, on the basis of which it calculates the current diameter of the outer mobile layer of curtain **1** wound on winding shaft **3,** according to this diameter it determines the required number of rotations of winding shaft **3** and winding motor **61** necessary to maintain the circumferential speed, for the current winding diameter, according to the linear speed of movement, of drive shaft **4**, slat **11** of movable curtain **1.** The difference between the angles of rotation of the shafts: drive shaft **3** and the winding shaft **4**, in relation to the angle of rotation of drive shaft **4**, is also used to control winding motor **61**, as this difference in rotation angles indicates whether the actual rotational speed of winding shaft **3** is appropriate for cooperation with drive shaft **4**, for the current stage of winding of the movable curtain on winding shaft **3.** In case of a discrepancy processor **93** calculates the respectively increased or decreased rotational speed of winding motor **61.** Information on the calculated rotational speed of motors: driving motor **71** and winding motor **61** is transferred to control systems **94**, separate for both motors, which regulate the current of motors **61, 71,** according to the required rotational speed.

[0023] The current supplied to motors: driving motor **71** and winding motor **61**, measured in current control modules **93**, is used to protect the roller shutter and its power unit against overloads that may occur when moving movable curtain **1**. In the case of excessive resistance to motion or blocking of the movable curtain, the current absorbed by motors **61, 71** increases, and if they reach the maximum admissible values, the power supply to the electric motors is switched off.

Claims

1. A roller shutter power unit, where said roller shutter is arranged to be installed on the outside of a window, and the roller shutter comprising

- a cassette for storing a movable curtain in its wounded state, said cassette is arranged to be connected to guides for said movable cover, and the power unit comprising

- a winding shaft for storing the movable curtain on it, and a drive shaft for moving the movable curtain before it enters the guides, and moving in the opposite direction when the movable curtain is inserted into the cassette, wherein the ends of both shafts are bearing mounted in a cassette side plates,

characterized in that the drive shaft **(4)** and the winding shaft **(3)** are arranged to be driven by separate electric motors, referred to as "driving motor" **(71)** and "winding motor" **(61)** respectively, of which at least one, comnprises a rotational speed controlled by controller **(9)**, dependent on the stage of winding of the movable curtain **(1)** on the winding shaft **(3).**

2. The roller shutter power unit according to claim 1, **characterized in that** the speed of the driving motor **(71)** is constant and the speed of the winding motor **(61)** is adjustable.

3. The roller shutter power unit according to claim 1, **characterized in that** the speed of driving motor **(71)** is set and the speed of winding motor **(61)** is adjustable.

4. The roller shutter power unit according to claim 3, **characterized in that** the driving motor comprises at least two stages of rotational speed.

5. The roller shutter power unit according to claim 1 or 2 or 3 or 4, **characterized in that** its control system calculates the angle of rotation of the drive shaft **(4)** calculated from one of the two extreme positions of the movable curtain **(1)**, and also calculates the current in both winding and driving motors **(61, 71).**

6. The roller shutter power unit according to claim 5, **characterized in that** its control system calculates the angle of rotation of the winding shaft **(3)**, and the calculated difference in the angles of rotation of both winding and driving shafts **(3, 4)**, in relation to the angle of rotation of the drive shaft **(4)** is used to control the speed of the winding motor **(61).**

7. The roller shutter power unit according to one of claims from 1 to 6, **characterized in that** the rotational speed of at least one of the winding and driving motors **(61, 71)** is controlled on the basis of the current calculation in the motor driving the shaft **(3, 4)** which, in the chosen direction of movement of the movable curtain **(1)**, cooperates with it as second in order.

8. The roller shutter power unit according to one of claims from 1 to 7, **characterized in that** the drive shaft **(3)** and winding shaft **(4)** are hollow and the motors: driving motor **(4)** and winding motor **(3)**, driving these shafts, are located inside said shafts **(3, 4).**

9. The roller shutter power unit according to one of the claims from 1 to 8, **characterized in that** the drive shaft **(4),** on its periphery comprises a seats **(43)** for slats **(11)** of the movable curtain **(1)** and the shape of the seats is adapted to the convex surfaces of the slats, located on the side of these slats external to window **(5)**.

10. The roller shutter power unit according to claim 9, **characterized in that** between adjacent seats **(43)** for slats **(11)** of the movable curtain **(1)** a hooks **(44)** are located which, in cooperation with this curtain, enter the gaps between its slats.

11. The roller shutter power unit according to claim 9 or 10, **characterized in that** seats **(43)** for slats **(11)** of movable cover **(1)** are located at the ends of the drive shaft **(4).**

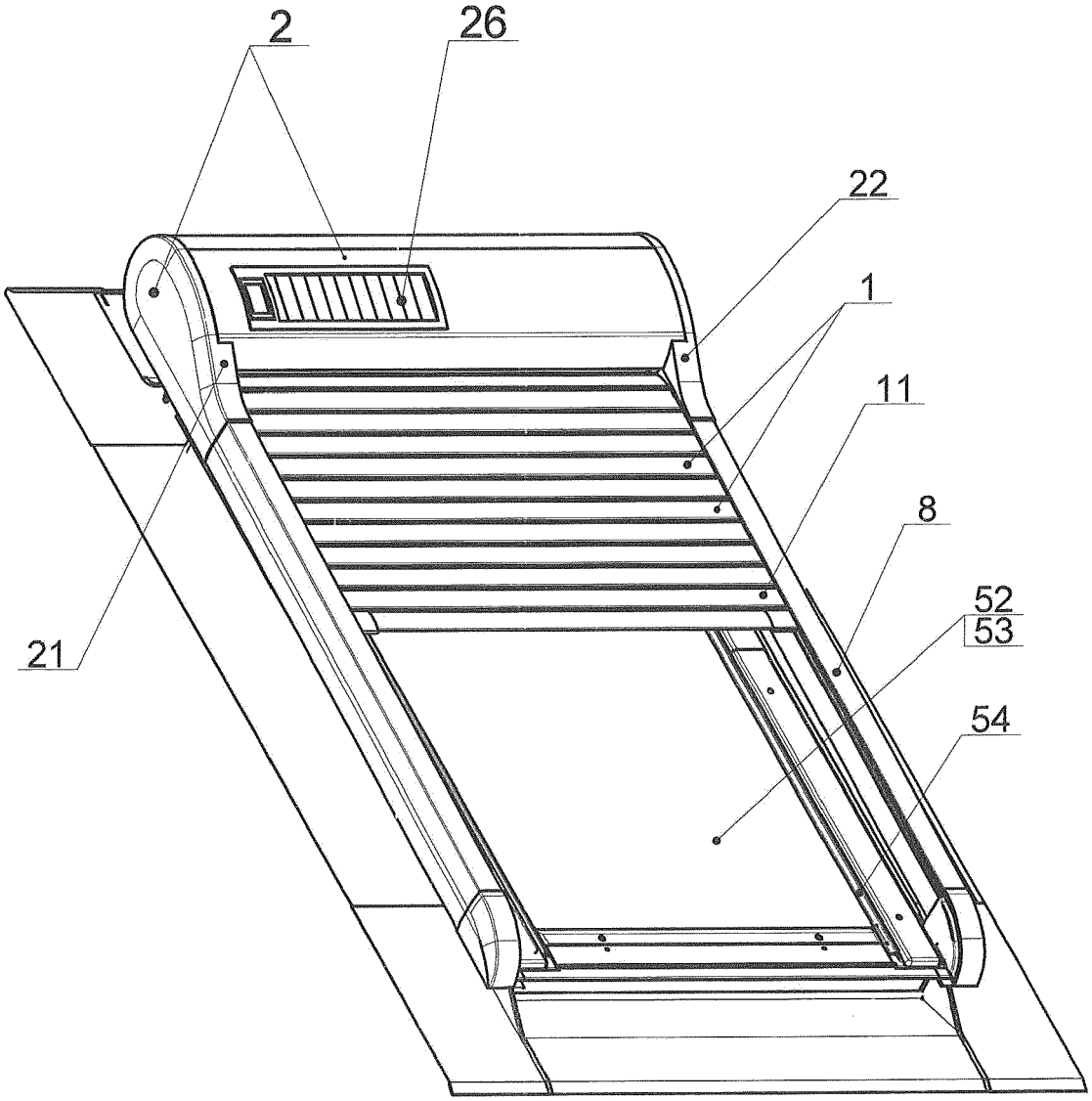

Fig.1

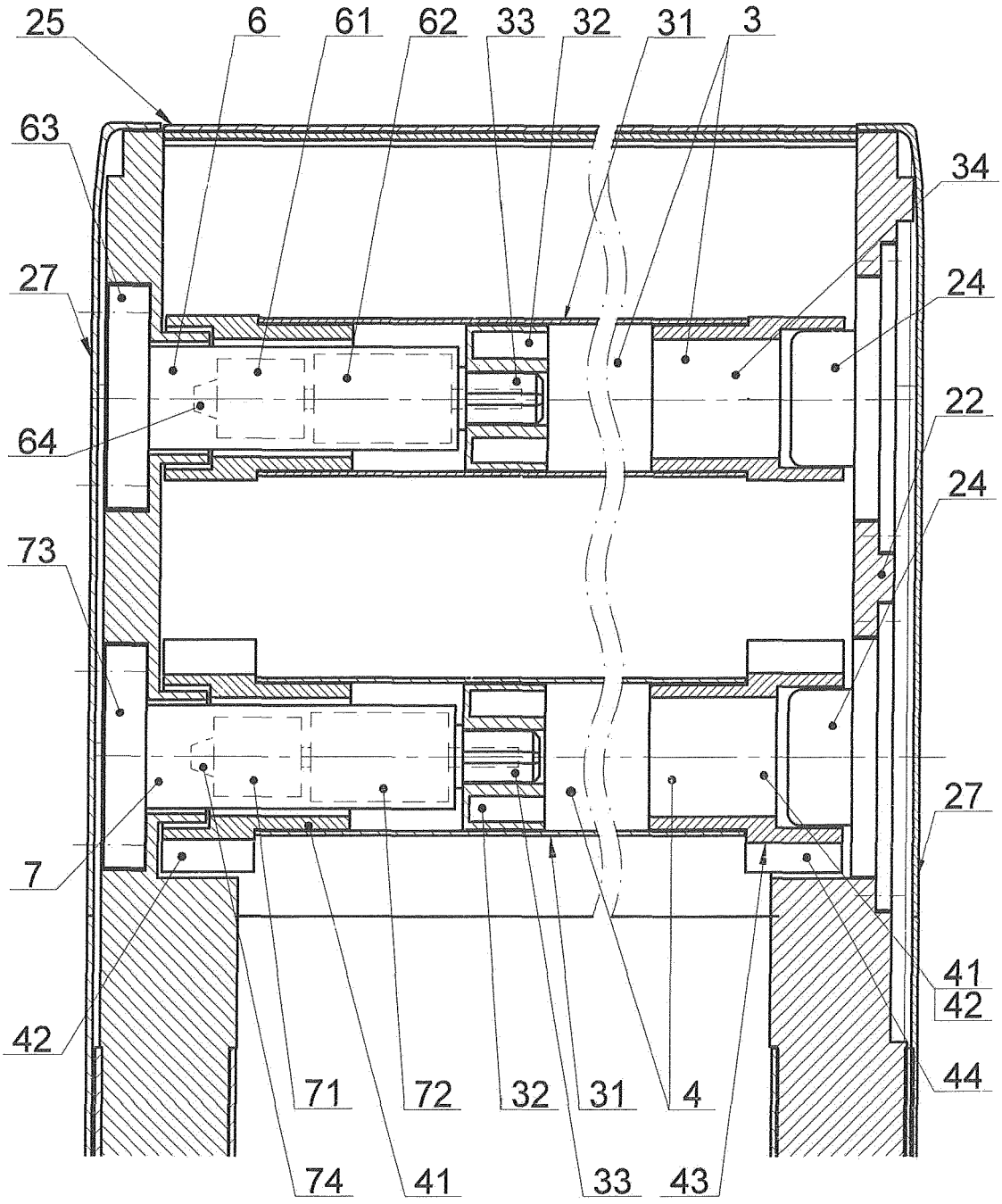
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Fig. 2

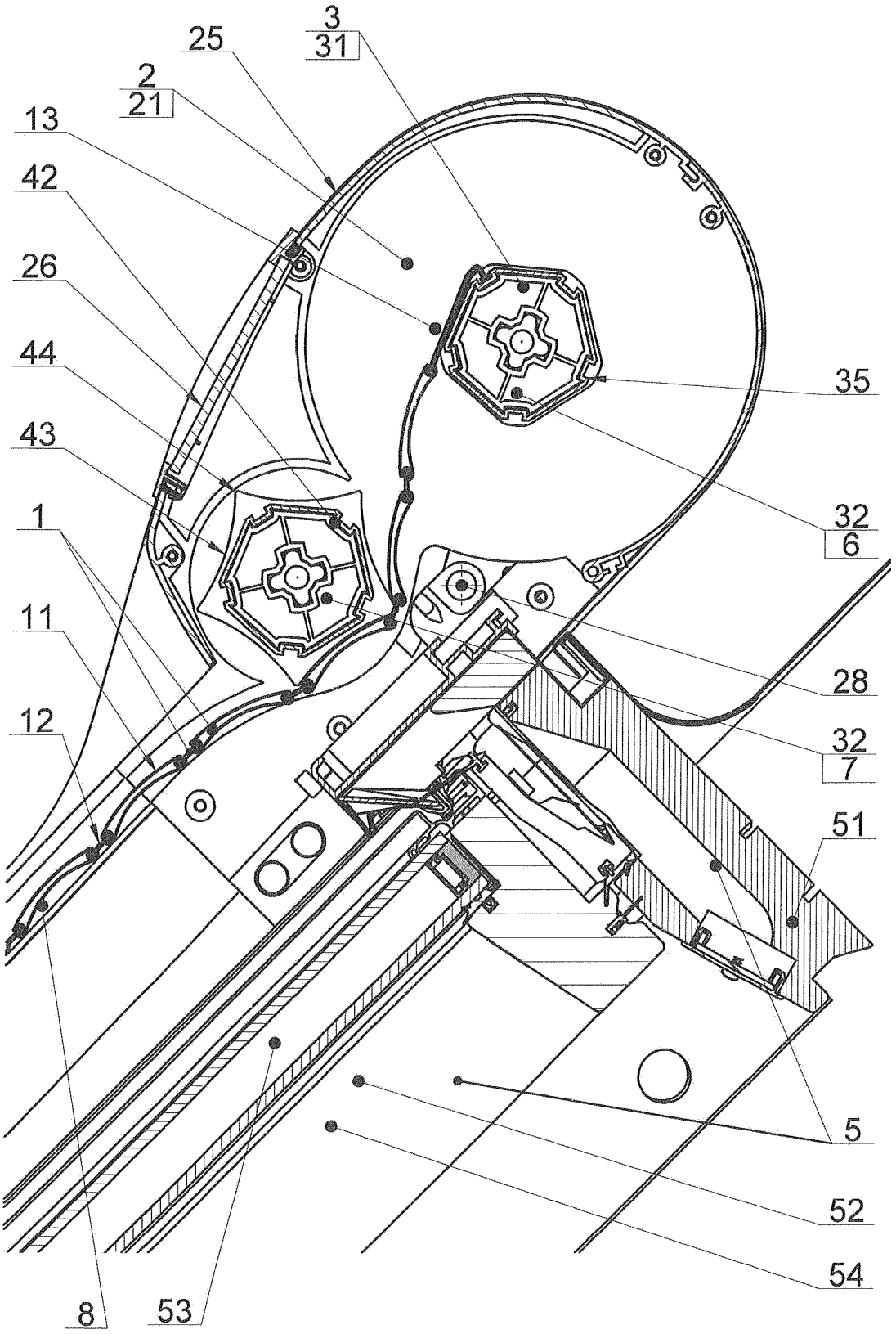

Fig. 3

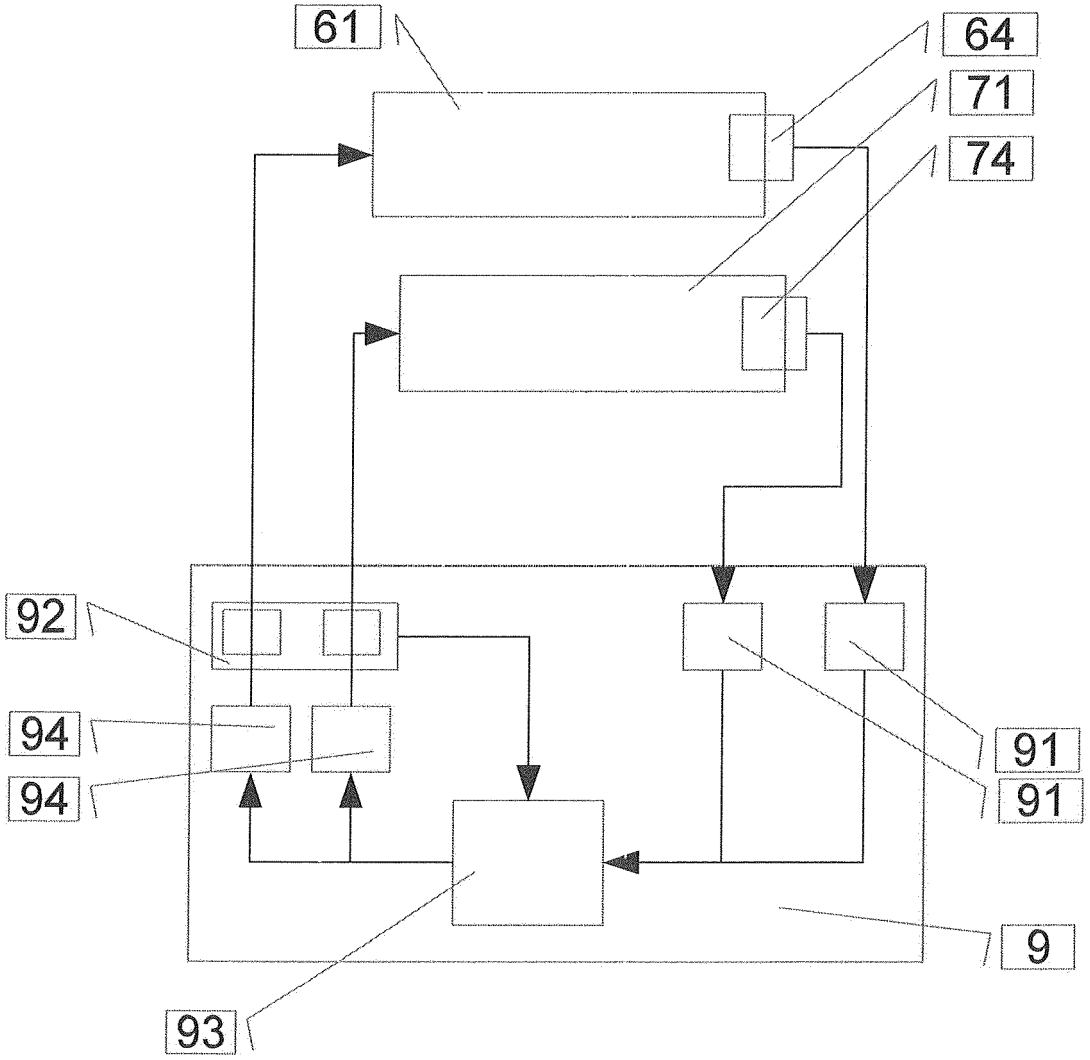

FIG.4

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EUROPEAN SEARCH REPORT

Application Number
EP 18 18 2563

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	US 5 547 009 A (PLUMER LOUIS [FR]) 20 August 1996 (1996-08-20) * column 5, line 30 - column 9, line 7; claims 3,6-8; figure 2 *	1-11	INV. E06B9/171 E06B9/174 E06B9/58 E06B9/72
A	WO 00/29706 A1 (VELUX IND AS [DK]; RITZ ANDERS [DK]; ULRIKSEN ULRIK [DK]) 25 May 2000 (2000-05-25) * page 4, line 20 - page 8, line 16; figures 1-5 *	1-11	E06B9/68
A	EP 2 703 595 A2 (FAKRO PP SP Z O O [PL]) 5 March 2014 (2014-03-05) * paragraphs [0022] - [0024]; figure 6 *	1-11	
A	US 2012/053731 A1 (FELDSTEIN GEORGE [US] ET AL) 1 March 2012 (2012-03-01) * abstract *	1-11	
			TECHNICAL FIELDS SEARCHED (IPC) E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 November 2018	Kofoed, Peter

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 18 2563

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