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(54) **BATTERY POWERED WINDING SHAFT FOR A ROLLER BLIND**

(57) Disclosed is a screening device (1) for screening an architectural opening (2) such as a window. The screening device (1) comprises screening means (10) for screening at least a part of the architectural opening (2) and reel means (7) arranged to be rotated around a longitudinal rotational axis by means of an electrical motor (6) powered by an electrical energy storage (24) and controlled by control means (15) including a printed circuit board (14). A first end (11) of the screening means (10) is connected to the reel means (7) so that the screening means (10) can be rolled of or rolled up around the reel means (7) dependent on a rotational direction of the reel means (7). The screening device (1) further comprises bracket means (5) for connecting the reel means (7) to the architectural opening (2). The electrical motor (6), the electrical energy storage (24) and the printed circuit board (14) are all arranged substantially inside the reel means (7), wherein an operation interface (4) mounted at a first end (3) of the printed circuit board (14) is arranged at a first end (18) of the screening device (1) and wherein a rotary encoder part (8) mounted at a second end (19) of the printed circuit board (14) engages an output shaft (20) of the electrical motor (6).

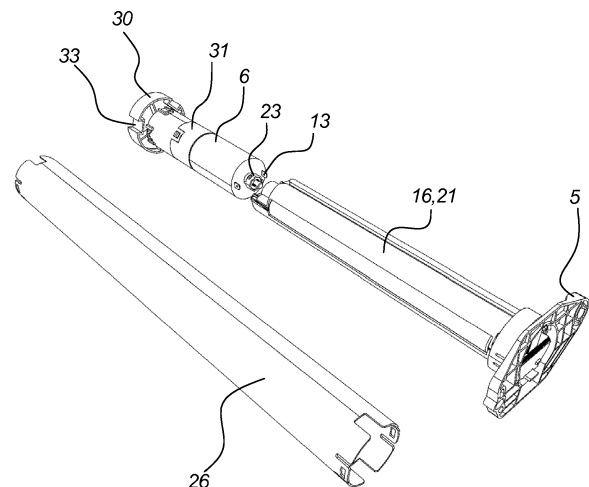


Fig. 7

Description

Background of the invention

[0001] The invention relates to a screening device for screening an architectural opening such as a window. The screening device comprises reel means arranged to be rotated around a longitudinal rotational axis by means of an electrical motor.

[0002] Use of a screening device is also disclosed.

Description of the Related Art

[0003] Motorised screening devices for windows are known in the art e.g. to quickly black out a room or just to simplify the operation of curtains, blinds or the like. Typically in relation with some sort of wired or wireless remote control. And particularly in relation with roof windows and skylights the demand for motorized screening devices is pronounced because these types of window usually are mounted in a relatively remote part of a building and therefore often is difficult to reach or access.

[0004] Awning or roller shutter systems are typically placed on the outside of the windows to also provide efficient heat protection and such systems are particularly hard to power continuously and from European patent application EP 1 710 389 A1 it is therefore known to provide a reel device for a motorised screening device with a battery incorporated in one of the end support brackets - to supplying the motor with power. The battery is arranged to receive power from a photovoltaic solar cell.

[0005] However, given the harsh environment such screening devices are often mounted in, the battery and the printed control board is often the "weakest link" and it is therefore feasible that one or both of these components will have to be exchanged or at least serviced during the life of the screening device. However this is quite difficult when these parts are mounted in an end bracket.

[0006] An object of the invention is therefore to provide for a shading device having a more advantageous design.

The invention

[0007] The invention provides for a screening device for screening an architectural opening such as a window. The screening device comprises screening means for screening at least a part of the architectural opening and reel means arranged to be rotated around a longitudinal rotational axis by means of an electrical motor powered by an electrical energy storage and controlled by control means including a printed circuit board. A first end of the screening means is connected to the reel means so that the screening means can be rolled of or rolled up around the reel means dependent on a rotational direction of the reel means. The screening device further comprises bracket means for connecting the reel means to the architectural opening. The electrical motor, the electrical

energy storage and the printed circuit board are all arranged substantially inside the reel means, wherein an operation interface mounted at a first end of the printed circuit board is arranged at a first end of the screening device and wherein a rotary encoder part mounted at a second end of the printed circuit board engages an output shaft of the electrical motor.

[0008] Providing the screening device with an operation interface - e.g. enabling a manual on-off function, paring with a particular remote control or other - is advantageous in that it increases the functionality of the screening device e.g. by enabling that several screening device can be controlled by the same remote control - even if they are not originally set up for this. However, such an operation interface - e.g. in the form of a manually operated button or buttons - typically requires internal wiring which can be woundable and increase manufacturing costs. It is therefore advantageous to mount the operation interface directly on the printed circuit board. And for the same reasons it is advantageous to mount the rotary encoder part directly on the printed circuit board.

[0009] Since the motor is located in the reel means it would be difficult to power the motor by means of the power grid. It is therefore advantageous to power the motor by means of e.g. a battery, accumulator or capacitor located in the transversal profile to reduce wiring and cost.

[0010] Providing the screening device with a rotary encoder part is advantageous in that the operation of the electrical motor hereby can be controlled on the basis of input from the rotary encoder part, that the rotary encoder part enables that the screening means may be directed to any position in automated operation - not just fully open or fully closed. Since the rotary encoder part continually detect the position of the screening means it is possible for an operator to order the screening device - e.g. by means of a remote control - to go to and stop when e.g. 30% of the window is covered.

[0011] Furthermore, the rotary encoder part enables that the traveling speed of the screening means may be controlled according to its position - e.g. faster at the middle and slowing down when approaching an extreme position.

[0012] It should also be noted that the term "*rotary encoder part*" in this context should be interpreted as any kind of position tracker suited for substantially continuous - direct or indirect - detection of a change of the position of an output shaft of the electrical motor i.e. any kind of encoder, tachometer, revolution-counter or other or any combination thereof.

[0013] It should also be understood that a rotatory encoder is an electro-mechanical device that converts the angular position or motion of a shaft or axle to an analog or digital code and a linear encoder is a sensor, transducer or readhead paired with a scale that encodes position. The sensor reads the scale in order to convert the encoded position into an analog or digital signal, which

can then be decoded into position by a digital readout or motion controller.

[0014] Furthermore, it should be noted that the term "screening means" in this context should be interpreted as any kind of screen suited for screening a window i.e. any kind of curtain, drape, blind, shade, shutter, awning or other or any combination thereof.

[0015] Further, it should be noted that the term "control means" in this context should be interpreted as any kind of controller suited for controlling the operation of the electrical motor i.e. any kind of Programmable Logic Controller (PLC), Personal Computer (PC), circuit, regulation or other or any combination thereof.

[0016] In an aspect the electrical energy storage and the printed circuit board are formed elongated.

[0017] Since the operational device is arranged at one end of the screening device - to enable external manual operation from - the electrical motor will have to drive the reel means at the other end of the screening device, and the rotary encoder part will therefore have to be arranged at least in the other half of the screening device. So to enable that the same printed circuit board can comprise the operational device at one end and the rotary encoder part inside the elongated reel means it is advantageous to form the printed circuit board elongated.

[0018] In an aspect the first end of the printed circuit board is arranged opposite the second end of the printed circuit board.

[0019] The space is cramped inside the reel means and it is therefore advantageous to arrange the operational device and the rotary encoder part at opposite ends of the printed circuit board.

[0020] In an aspect the electrical energy storage and the printed circuit board are overlapping inside the reel means as seen in a direction perpendicular to the longitudinal rotational axis and/or in an aspect the electrical energy storage and the printed circuit board are arranged on top of each other as seen in the direction of the longitudinal rotational axis.

[0021] Since the operational device and the rotary encoder part advantageously are arranged at opposite ends of the printed circuit board inside the reel means it is advantageous to stack the electrical energy storage and the printed circuit board on top of each other to efficiently use the space inside the reel means and to reduce the need for or completely avoid wiring between the electrical energy storage and the printed circuit board.

[0022] In an aspect the electrical energy storage and the printed circuit board are arranged to form a single power module arranged to be placed and removed as a single unit.

[0023] Forming the electrical energy storage and the printed circuit board so that these two components together form a single power module is advantageous in that this enables a simpler reel means design where the electrical energy storage and the printed circuit board easily can be exchanged or removed for inspection and/or repair.

[0024] In an aspect the single power module comprises a casing substantially enclosing the electrical energy storage and the printed circuit board inside the reel means.

[0025] Arranging the electrical energy storage and the printed circuit board inside a dedicated casing or housing inside the reel means is advantageous in that the electrical energy storage and the printed circuit board hereby is better protected, the electrical energy storage and the printed circuit board is easier to handle and the power module can easier be formed as a standardized part enabling that the same power module can be used across different types of screening devices.

[0026] In an aspect the single power module is connected directly to the electrical motor through a plug-and-socket connection.

[0027] Connecting the power module directly to the electrical motor through a plug-and-socket connection is advantageous in that it ensures easy assembly and disassembly and it eliminates wiring between the power module and the electrical motor.

[0028] In an aspect the operation interface comprises one or more buttons for turning the operation of the screening device on or off, for resetting remote control information and/or for pairing the screening device with a specific remote control.

[0029] Forming the operation interface so that it comprises one or more buttons for manual operation or setup of the screening means is advantageous in that it increases the functionality of the screening device.

[0030] In an aspect the rotary encoder part is arranged to detect rotation of the output shaft.

[0031] Hereby is achieved an advantageous embodiment of the invention.

[0032] In an aspect the rotary encoder part comprises a Hall Effect sensor arranged to detect a magnet of the output shaft.

[0033] Mounting one or more magnets on a drive shaft enables that a Hall Effect sensor comprised by the rotary encoder part, in a simple and inexpensive manner can generate an electrical pulse in accordance with the rotation of the output shaft. By feeding these pulses to control means of the printed circuit board e.g. the number of impulses generated from the passing magnet or magnets can be converted into a measurement of distance.

[0034] It should be noted that a Hall Effect sensor is some kind of transducer that generates and/or varies its output voltage in response to a magnetic field.

[0035] In an aspect the control means are arranged for controlling the operation of the electrical motor in accordance with input from the rotary encoder part.

[0036] In an aspect the screening device further comprises at least one end position sensor arranged to detect when the screening means has reached an extreme position.

[0037] Over time minor inaccuracies can build up and entail that the control means and rotary encoder part can lose track of position of the screening means. Or if the

motor is disengages - to enable manual operation - the rotary encoder part will lose track of the exact position of the screening means. It is therefore advantageous to also control the operation of the electrical motor in accordance with input from an end position sensor in that this enables that the travel of the transversal profile may be stopped when an end position has been reached - even if the position means detect a different position - and because the end position sensor enable fast and simple re-calibration of the position means after manual operation.

[0038] In an aspect of the invention, the end position sensor comprises a limit switch.

[0039] Using a limit switch is a relatively accurate and inexpensive way of detecting an end position.

[0040] In this context a limit switch is a switch operated by the motion of a part or presence of an object. A limit switch typically requires physical contact to switch.

[0041] In an aspect the end position sensor comprises proximity sensor.

[0042] Using a proximity sensor for detecting the end positions is advantageous in that a proximity sensor enables touch-free detection - thus reducing wear and prolonging life.

[0043] In this context a proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact, in that proximity sensor typically operates by the disturbance of an electromagnetic field, by capacitance, or by sensing a magnetic field.

[0044] In an aspect the control means is arranged to reset input from the rotary encoder part in response to an input from the end position sensor.

[0045] Resetting input from the rotary encoder part when the end position sensor detects that an extreme position has been reached is advantageous in that it hereby is possible to easily calibrate the rotary encoded system.

[0046] In an aspect, the position sensing encoder is an incremental position sensing encoder which is advantageous in that the output of an incremental encoder provides information about the motion of a part - to which the encoder is attached - in relation to another part - i.e. the position output is relative.

[0047] Thus, it is advantageous to use an incremental encoder in relation to a screening device according to the present invention in that the relative position detection provides more accurate information regarding the position and in that a screening device with the same incremental encoder can be used with guide means of different length.

[0048] In an aspect of the invention, the screening device comprises speed control means for controlling the traveling speed of the transversal profile in response to input from the rotary encoder part.

[0049] Controlling the travelling speed of the transversal profile in response to its actual position is advantageous in that it hereby is possible to reduce traveling time and reduce power consumption in relation to braking.

[0050] In an aspect of the invention, the electrical motor

is a brushless motor, a stepper motor or a piezoelectric motor with rotation signal used as position means.

[0051] With these types of motors it is possible to detect how much the magnetic field in the motor is rotated. I.e. using these types of motors in relation to the present invention is advantageous in that this rotation of the internal magnetic field can be used as position means - thereby reducing weight, cost and/or power consumption.

[0052] In an aspect of the invention, the control means comprises current level means for detecting a current level of the electrical motor, in particular a direct current motor and in an aspect of the invention, the control means comprises comparing means for detecting if the input from the current level means exceeds a predefined level.

[0053] Providing current level means is advantageous in that it hereby is possible to stop the travel of the transversal profile if a current peak is detected - e.g. in case of collision with an unexpected object. Also the detection of current peaks enables redundancy of the end position sensors in that the current of the motor will be increased if the end of the guide means has been reached without the travel being stopped.

[0054] The invention further relates to use of a screening device according to any of the previously mentioned screening devices for external screening of an architectural opening mounted in an inclined surface of a building.

[0055] External screening devices such as awnings or roller shutters are very difficult to access and it is therefore particularly to use a screening device according to the present invention in relation with external screening in that the present invention enables simpler and easier exchange of the most woundable parts of the screening device.

Figures

[0056] The invention will be described in the following with reference to the figures in which

- fig. 1 illustrates a screening device mounted on a roof window, as seen in perspective,
- fig. 2 illustrates a screening device in a rolled up state, as seen in perspective,
- fig. 3 illustrates a cross section through a screening device, as seen from the bottom,
- fig. 4 illustrates a cross section through a screening device, as seen from the front,
- fig. 5 illustrates a reel means mounted in bracket means, as seen in perspective,
- fig. 6 illustrates a power module being removed through the bracket means, as seen in perspective,

- fig. 7 illustrates the motor tube removed from the rest of the reel means, as seen in perspective,
- fig. 8 illustrates a power module with the casing in an open state, as seen in perspective,
- fig. 9 illustrates an open power module with the energy storage removed, as seen in perspective,
- fig. 10 illustrates an open power module with the energy storage and the PCB removed, as seen in perspective,
- fig. 11 illustrates a PCB, as seen in perspective,
- fig. 12 illustrates an energy storage, as seen in perspective,

Detailed description of the invention

[0057] Fig. 1 illustrates a screening device 1 mounted on a roof window 2, as seen in perspective and fig. 2 illustrates a screening device 1 in a rolled up state, as seen in perspective.

[0058] In this embodiment the screening device 1 is mounted on an architectural opening 2 in the form of a roof window, however in another embodiment the architectural opening 2 could be a wall window, a door, a hole in a wall or roof surface, an emergency exit or other and/or the architectural opening 2 could be arranged in a wall, a floor or another part of a building.

[0059] In this embodiment the screening means 10 are roller shutters but in another embodiment the screening means 10 could be roller blinds, folding blinds, venetian blinds, awnings or other.

[0060] In this embodiment the screening device 1 is provided with a photovoltaic solar cell 17 arranged to be the sole power source regarding the operation of the screening device 1. However in another embodiment the screening device 1 could also or instead be powered by a utility grid, by means of batteries or another electrical power source.

[0061] As best seen in fig. 2; in this embodiment the screening device 1 comprises a reel unit 28 arranged at the top of the screening device 1 and two guide means 27 in the form of racks extending transversally at the longitudinal ends of the reel unit 28. In this embodiment the guide means 27 is arranged to guide the screening means 10 - as seen in fig. 1 - but in another embodiment the guide means 27 could be arranged or formed differently or the screening device 1 would be formed without guide means 27.

[0062] In fig. 2 the reel unit 28 of the screening device 1 is shown without an end cap to reveal the bracket means 5 inside the reel unit 28.

[0063] Fig. 3 illustrates a cross section through a screening device 1, as seen from the bottom and fig. 4 illustrates a cross section through a screening device 1,

as seen from the front.

[0064] In this embodiment screening device 1 comprises reel means 7 arranged inside the reel unit 28 and arranged to be rotated around a longitudinal rotational axis in that an outer reel tube 32 is rotationally fixed to the reel unit 28 by means of some sort of bearing arrangement 34 - such as ball bearings, roller bearings, plain bearing or other similar arrangements suspending the reel tube 32 on the stationary parts of the reel unit 28 while at the same time allowing the reel tube 32 to rotate in relation to the stationary parts of the reel unit 28.

[0065] In this embodiment the outer reel tube 32 is connected to a first end 11 of the screening means 10 (not shown in fig. 3 and 4) so that when the outer reel tube 32 is rotated the screening means 10 is rolled of or rolled up around the reel means 7 dependent on the rotational direction of outer reel tube 32.

[0066] In this embodiment the outer reel tube 32 of the reel means 7 is arranged to be rotated by means of an electrical motor 6 connected to the outer reel tube 32 through a transmission 31 and a coupling part 30. However, in another embodiment the electrical motor 6 could obviously rotate the outer reel tube 32 by other means e.g. without a transmission 31, through coupling parts 30 of a different type or other.

[0067] In this embodiment the reel means 7 is formed so that the electrical motor, the electrical energy storage 24, a printed circuit board 14 comprising control means 15, and the transmission 31 is arranged stationary inside a stationary motor tube 26 - which can be seen more clearly e.g. in fig. 7. At one end of the motor tube 26 the coupling part 30 is arranged and as e.g. seen in fig. 7 the coupling part 30 is provided with engaging means 33 formed to mesh with corresponding means of the outer reel tube 32. In this embodiment the indentations 33 of the coupling part 30 are shaped to tightly fit a corresponding track (not shown) protruding inwards from the outer reel tube 32 but in another embodiment the transmission drive shaft 35 or even the electrical motor drive shaft 36 could be connected to the outer reel tube 32 through different means.

[0068] In this embodiment the printed circuit board 14 is formed elongated so that it can extend all the way from an operation interface 4 arranged at the first end 18 of the screening device 1 to a rotary encoder part 8 engaging an output shaft 20 of the electrical motor 6. The enables that both rotary encoder part 8 and the operation interface 4 can be mounted on the same printed circuit board 14 which reduced wiring and simplifies cost.

[0069] In this embodiment the electrical energy storage 24 is also formed elongated so that it may be arranged on top of the printed circuit board 14 inside the motor tube 26. The battery's 24 capacity is among other dependent on its size and it is therefore advantageous to efficiently utilize the cramped space inside the reel means 7.

[0070] A further advantage of arranging the electrical energy storage 24 and printed circuit board 14 overlap-

ping is that this enables that these two parts can be fitted inside a common casing 21 to form a single power module 16 which enables that the two parts may be handled and exchanged as a single unit.

[0071] In this embodiment the rotary encoder part 8 is arranged to detect motion of the output shaft 20 of the motor 6. I.e. in this embodiment the rotary encoder part 8 is the sensor part of an encoder and an encoder magnet 23 is mounted on the output shaft 20 so that the encoder sensor 8 detects when the encoder magnet 23 passes the sensor 8. Thus, in an embodiment the control means 15 would comprise counting means arranged to count the input from the rotary encoder part 8 which then can be translated to a measure of distance when multiplied with a pre-defined measure of the distance traveled by the screening means 10 between two signals from the rotary encoder part 8. And since the magnet 23 is mounted on a output shaft 20 extending directly from the electrical motor 6 - i.e. not on an transmission drive shaft 31 - the accuracy of the rotary encoder part 8 is greatly improved in that one revolution of the outer reel tube 32 would require several revolution of the motor output shaft 20.

[0072] In this embodiment the screening device 1 is also provided with a single end position sensors 9 in the form of a limit switch arranged so that when the second end 12 of the screening means 10 reaches an upper end position inside the reel unit 28 the limit switch 9 will be physically activated and thereby send a signal to the control means 15 which in turn will stop the electrical motor 6 and thereby the travel of the transversal profile 4.

[0073] However in another embodiment the end position sensor 9 could comprise a Hall Effect sensor, a piezo element, reed switch, a photoelectric sensor or other and/or in another embodiment end position sensors 9 would be arranged at both ends of the guide means 27, on the screening means 10 or elsewhere.

[0074] As previously explained in this embodiment the control means 15 comprises counting means arranged to count the impulses from the rotary encoder part 8 so that the control means 15 may calculate the traveled distance and the current position of the second end 12 of the screening means 10. Thus, when the control means 15 receives an input from an end position sensor 9, the control means 15 could also initiate that the rotary encoder part 8 is updated or reset - e.g. to ensure that the counting means always started counting from zero from the top position.

[0075] This updating or resetting could be done every time an end position is detected, it could be done only when the upper or only when the lower end position is detected, it could be done only when an end position is unexpectedly reached, it could be done after a predefined operation time or at other times or any combination thereof.

[0076] In this embodiment the control means 15 are arranged for controlling the operation of the electrical motor 6 in accordance with input from the rotary encoder

part 8 and the end position sensor 9 as described above.

[0077] Once the control means 15 detects that an end position has been reached it will also ensure, that once the screening device 1 continues operation, it will ensure that the screening means 10 travels in the opposite direction - i.e. away from the just detected end position.

[0078] In this embodiment the control means 15 also comprise speed control means enabling that the traveling speed of the screening means 10 can be controlled - particularly in response to input from the rotary encoder part 8. I.e. if the control means - based on input from the rotary encoder part 8 - detects that the traveling screening means 10 is within e.g. 3 cm from a target position or an end position, the speed control means could enable deceleration of the travel speed so that the screening means 10 is stopped more smoothly. However, in another embodiment the traveling speed of the screening means 10 could be controlled in another way or the speed control means would be absent.

[0079] Furthermore, in this embodiment the control means 15 also comprise current level means for detecting the current through the electrical motor 6 and comparing means arranged to compare the detected current with a predefined threshold. I.e. if the traveling screening means 10 collides with a foreign object, if an end position sensor 9 malfunctions or other the comparing means will detect that the output from the current level means is above the predefined level and the control means 15 will stop the electrical motor 6. However, in another embodiment collision or malfunction could be detected in another way or current level means 25 and comparing means 26 would not be present.

[0080] In a preferred embodiment the current level means would at least in function act as end position sensors 9.

[0081] Fig. 5 illustrates reel means 7 mounted in bracket means 5, as seen in perspective.

[0082] To prevent the motor tube 26 - containing the power module 16 and the electrical motor 6 - from rotating, one end of the motor tube 26 is in this embodiment rigidly connected to bracket means 5. In turn the bracket means 5 is rigidly connected to the reel unit 28 as best seen in fig. 2. However in another embodiment the bracket means 5 could be formed differently e.g. as some sort of fitting, mounting, support or other or the bracket means 5 could be formed integrally with the motor tube 26 or another stationary part of the reel means 7.

[0083] In this embodiment the reel means 7 is connected to the bracket means 5 by means of a snap lock 38 but in another embodiment the reel means 7 and the bracket means 5 could be mutually connected by means of screws, bolts, friction fitting, meshing parts or other.

[0084] Fig. 6 illustrates a power module 16 being removed through the bracket means 5, as seen in perspective.

[0085] In this embodiment the bracket means 5 are provided with an access opening 37 through which the power module may be removed.

[0086] In this embodiment an end lid is arranged at the free end of the power module 16. This end lid 29 can be opened - even when the power module 16 is mounted in the motor tube 26 - to enable access to the operation interface 4 on the printed circuit board 14 inside the casing 21 of the power module 16. However, in another embodiment the end lid 29 would not be present, the operation interface 4 would extend out through an end surface of the power module 16, the operation interface 4 would at least partly be integrated in an end surface of the power module 16 or other.

[0087] Fig. 7 illustrates the motor tube 26 removed from the rest of the reel means 7, as seen in perspective.

[0088] In this embodiment the motor 6, the transmission 31 and the power module 16 are arranged to substantially extend the entire length of the motor tube 26. I.e. in this embodiment the far end of the motor tube 26 is formed to engage the far end of the transmission 31 and the closest end is arranged to engage the bracket means 5, so that the motor tube 26, the motor 6, the transmission 31, the bracket means 5 and the power module 16 are all stationary while the coupling part 30 is free to rotate.

[0089] In this embodiment the electrical motor 6 is provided with a plug part of a plug-and-socket connection 13 while the power module 16 is provided with the socket part. However, in another embodiment the plug part could be formed on the power module 16 etc. or the electrical connection between electrical motor 6 and the power module 16 could be formed differently e.g. by means of wiring, spring loaded touching parts, wireless power transmission or other.

[0090] Fig. 8 illustrates a power module 16 with the casing 21 in an open state, as seen in perspective, fig. 9 illustrates an open power module 16 with the energy storage 24 removed, as seen in perspective and fig. 10 illustrates an open power module 16 with the energy storage 24 and the PCB 14 removed, as seen in perspective.

[0091] In this embodiment the printed circuit board 14 and the electrical energy storage 24 is arranged inside a common casing 21 which can easily be opened when removed from the motor tube 26 to enable access to the printed circuit board 14 and the electrical energy storage 24.

[0092] The battery 16 can be removed from the power module 16 to enable full access to the printed circuit board 14 or the control means on the printed circuit board 14.

[0093] Fig. 11 illustrates a PCB 14, as seen in perspective and fig. 12 illustrates an energy storage 24, as seen in perspective.

[0094] In this embodiment both the energy storage 24 and the PCB 14 are formed long and slender to more efficiently utilize the space inside the casing 21.

[0095] In fig. 11 the printed circuit board 14 is shown with operational interface 4 in the form of a single push button mounted directly on the printed circuit board 14. However in another embodiment the operational inter-

face 4 could comprise more than one button and/or the operational interface 4 could instead or also comprise a touchscreen, touch buttons or other means capable of detecting manual human input.

[0096] The invention has been exemplified above with reference to specific examples of designs and embodiments of screening devices 1, screening means 10, power modules 16 etc. However, it should be understood that the invention is not limited to the particular examples described above but may be designed and altered in a multitude of varieties within the scope of the invention as specified in the claims.

[0097] List

1. Screening device
2. Architectural opening
3. First end of printed circuit board
4. Operation interface
5. Bracket means
6. Electrical motor
7. Reel means
8. Rotary encoder part
9. End position sensor
10. Screening means
11. First end of screening means
12. Second end of screening means
13. Plug-and-socket connection
14. Printed circuit board
15. Control means
16. Power module
17. Solar cell
18. First end of screening device
19. Second end of printed circuit board
20. Output shaft
21. Casing
22. Button
23. Magnet
24. Electrical energy storage
25. Current level means
26. Motor tube
27. Guide means
28. Reel unit
29. End lid
30. Coupling part
31. Transmission
32. Reel tube
33. Engaging means
34. Bearing arrangement
35. Drive shaft of transmission
36. Drive shaft of electrical motor
37. Access opening
38. Snap lock

55 Claims

1. A screening device (1) for screening an architectural opening (2) such as a window, said screening device

- (1) comprising screening means (10) for screening at least a part of said architectural opening (2), reel means (7) arranged to be rotated around an longitudinal rotational axis by means of an electrical motor (6) powered by an electrical energy storage (24) and controlled by control means (15) including a printed circuit board (14), wherein a first end (11) of said screening means (10) is connected to said reel means (7) so that said screening means (10) can be rolled of or rolled up around said reel means (7) dependent on a rotational direction of said reel means (7), and bracket means (5) for rotationally fixating a part of said reel means (7) in relation to said architectural opening (2), wherein said electrical motor (6), said electrical energy storage (24) and said printed circuit board (14) are all arranged substantially inside said reel means (7), wherein an operation interface (4) mounted at a first end (3) of said printed circuit board (14) is arranged at a first end (18) of said screening device (1) and wherein a rotary encoder part (8) mounted at a second end (19) of said printed circuit board (14) engages an output shaft (20) of said electrical motor (6).
2. A screening device (1) according to claim 1, wherein said electrical energy storage (24) and said printed circuit board (14) are formed elongated.
 3. A screening device (1) according to claim 1 or 2, wherein said first end (3) of said printed circuit board (14) is arranged opposite said second end (19) of said printed circuit board (14).
 4. A screening device (1) according to any of the preceding claims, wherein said electrical energy storage (24) and said printed circuit board (14) are overlapping inside said reel means (7) as seen in a direction perpendicular to said longitudinal rotational axis.
 5. A screening device (1) according to any of the preceding claims, wherein said electrical energy storage (24) and said printed circuit board (14) are arranged on top of each other as seen in the direction of said longitudinal rotational axis.
 6. A screening device (1) according to any of the preceding claims, wherein said electrical energy storage (24) and said printed circuit board (14) are arranged to form a single power module (16) arranged to be placed and removed as a single unit.
 7. A screening device (1) according to claim 6, wherein said single power module (16) comprises a casing (21) substantially enclosing said electrical energy storage (24) and said printed circuit board (14) inside said reel means (7).
 8. A screening device (1) according to claim 6 or 7, wherein said single power module (16) is connected directly to said electrical motor (6) through a plug-and-socket connection (13).
 9. A screening device (1) according to any of the preceding claims, wherein said operation interface (4) comprises one or more buttons (22) for turning the operation of said screening device (1) on or off, for resetting remote control information and/or for pairing said screening device (1) with a specific remote control.
 10. A screening device (1) according to any of the preceding claims, wherein said rotary encoder part (8) is arranged to detect rotation of said output shaft (20).
 11. A screening device (1) according to any of the preceding claims, wherein said rotary encoder part (8) comprises a Hall Effect sensor arranged to detect a magnet (23) of said output shaft (20).
 12. A screening device (1) according to any of the preceding claims, wherein said control means (15) are arranged for controlling the operation of said electrical motor (6) in accordance with input from said rotary encoder part (8).
 13. A screening device (1) according to any of the preceding claims, wherein said screening device (1) further comprises at least one end position sensor (9) arranged to detect when said screening means (10) has reached an extreme position.
 14. A screening device (1) according to claim 13, wherein said control means (15) is arranged to reset input from said rotary encoder part (8) in response to an input from said end position sensor (9).
 15. Use of a screening device (1) according to any of the preceding claims for external screening of an architectural opening (2) mounted in an inclined surface (28) of a building (29).

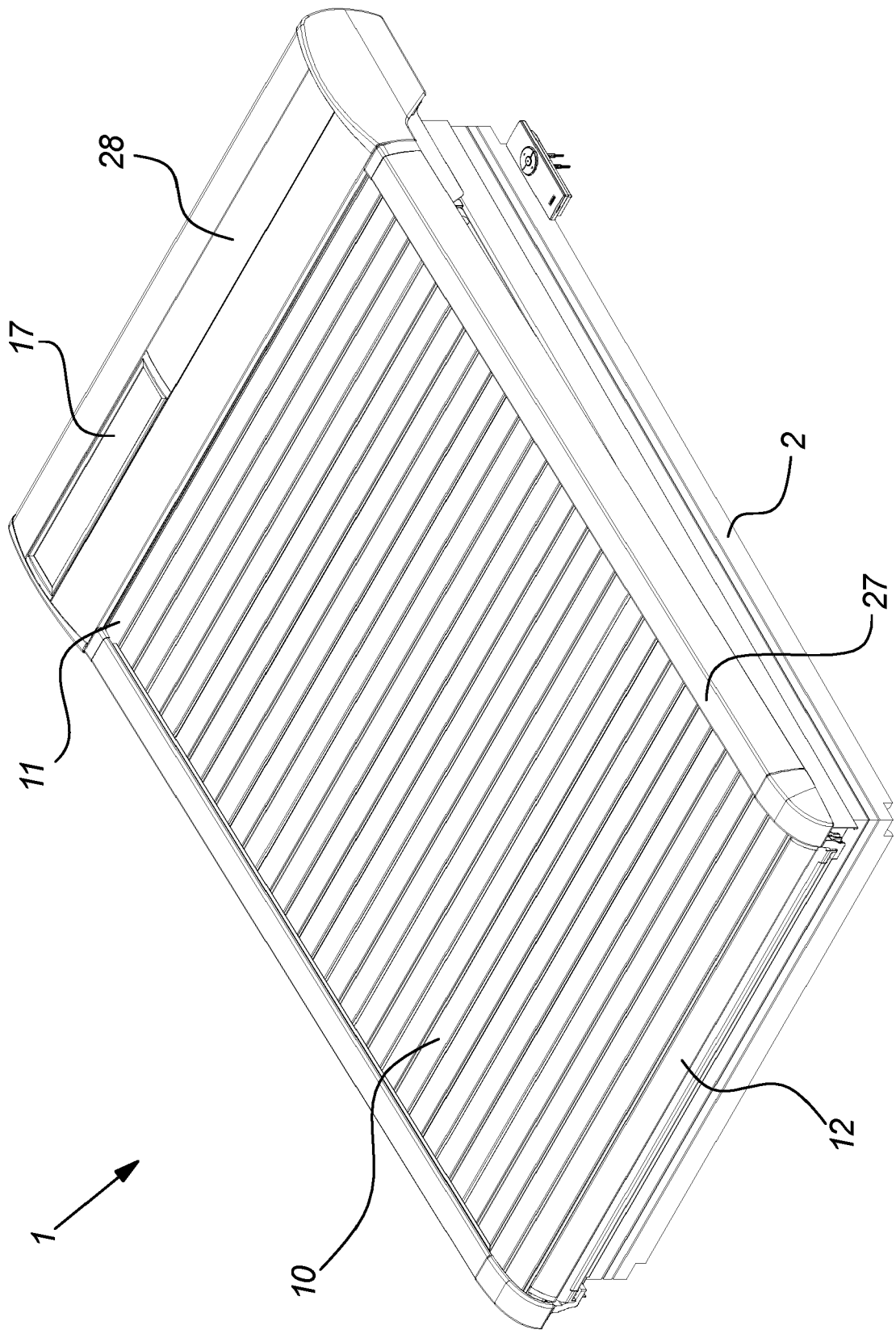
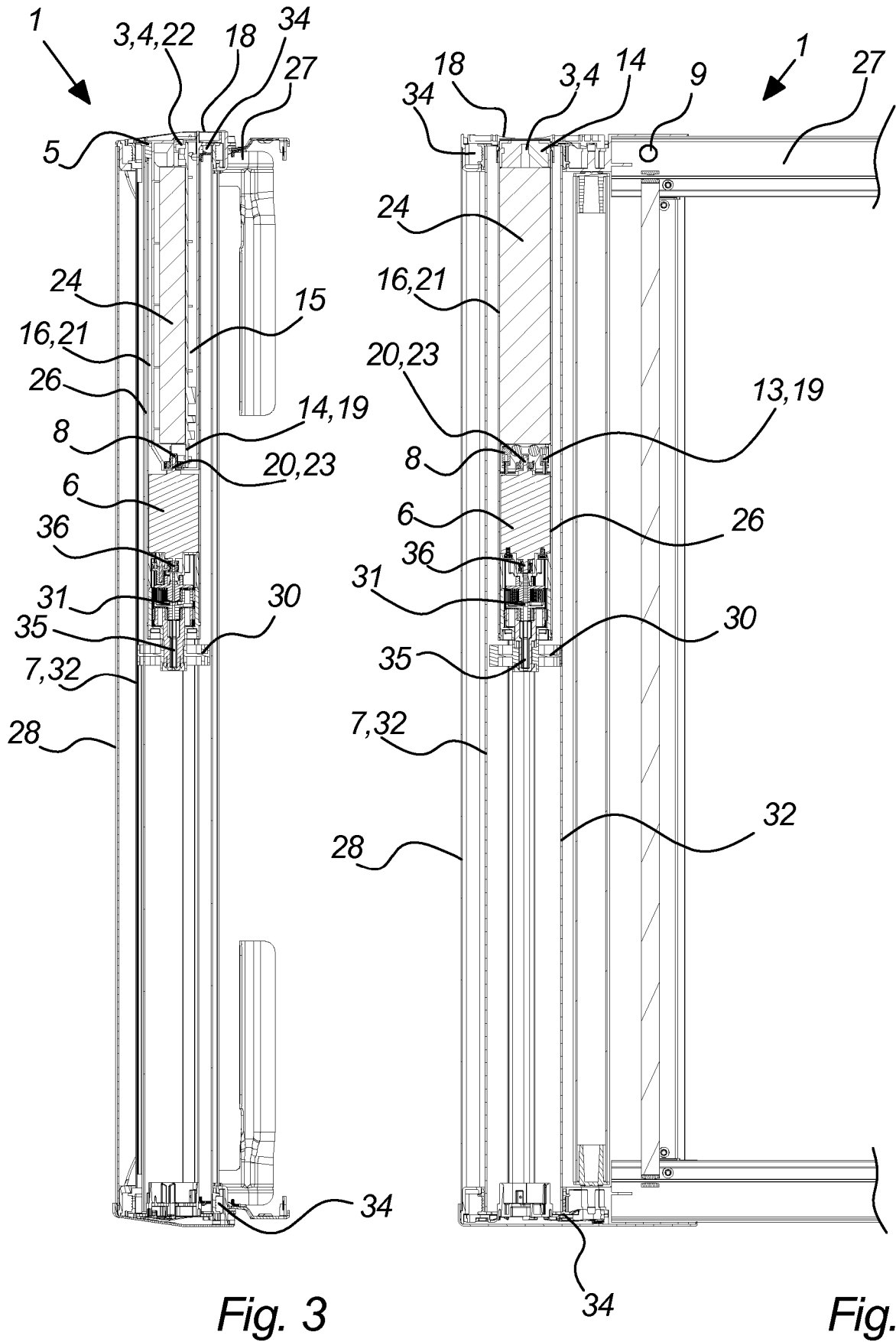
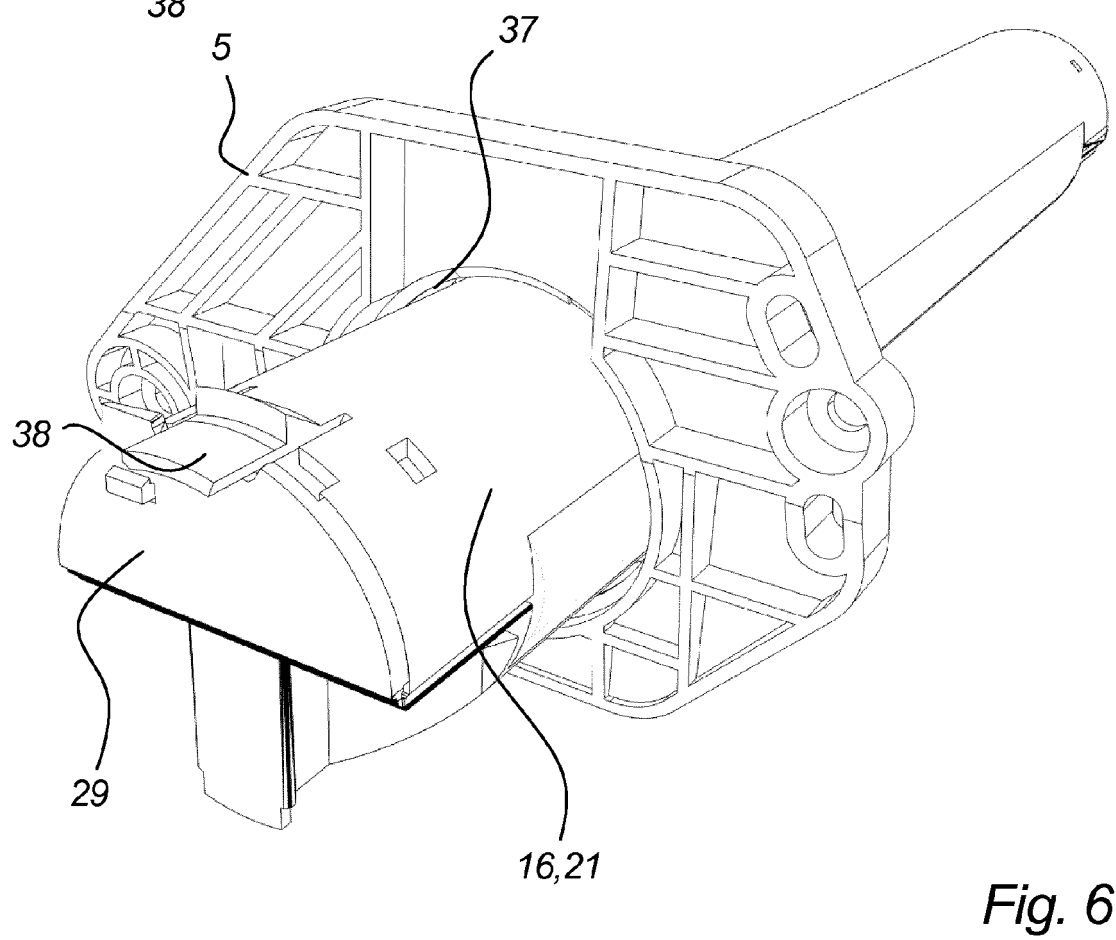
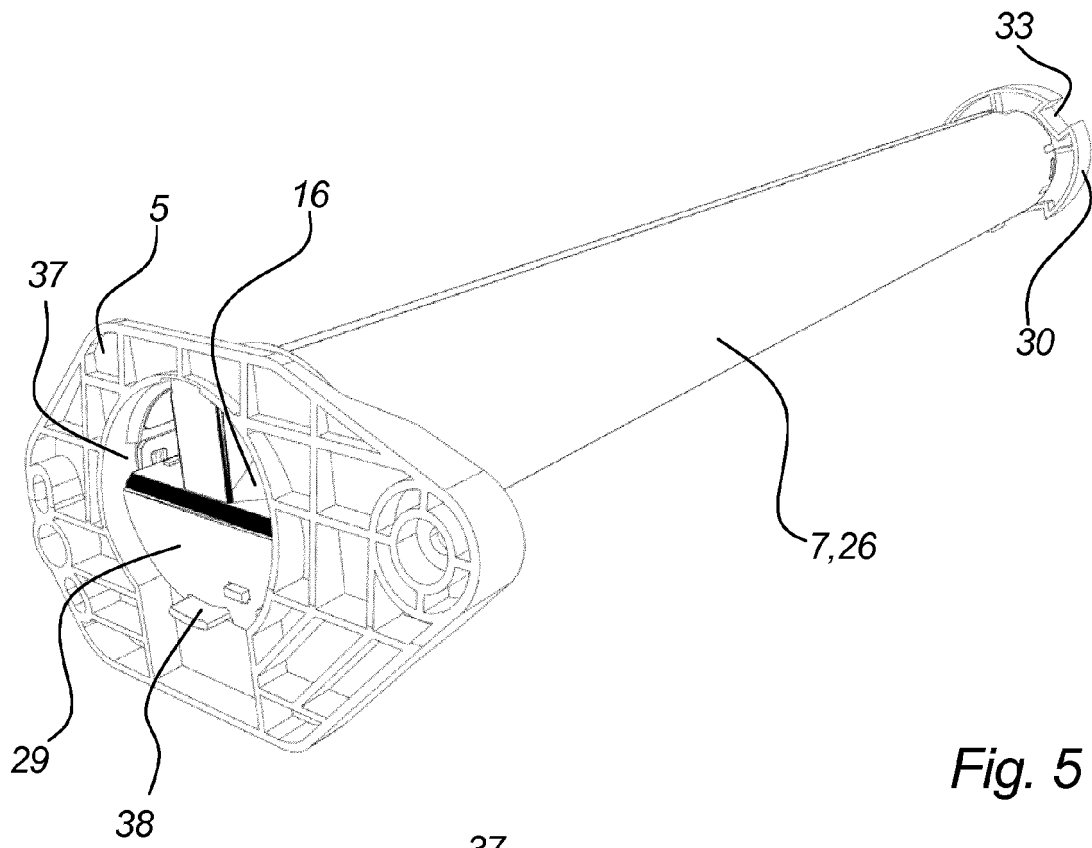


Fig. 1



Fig. 2





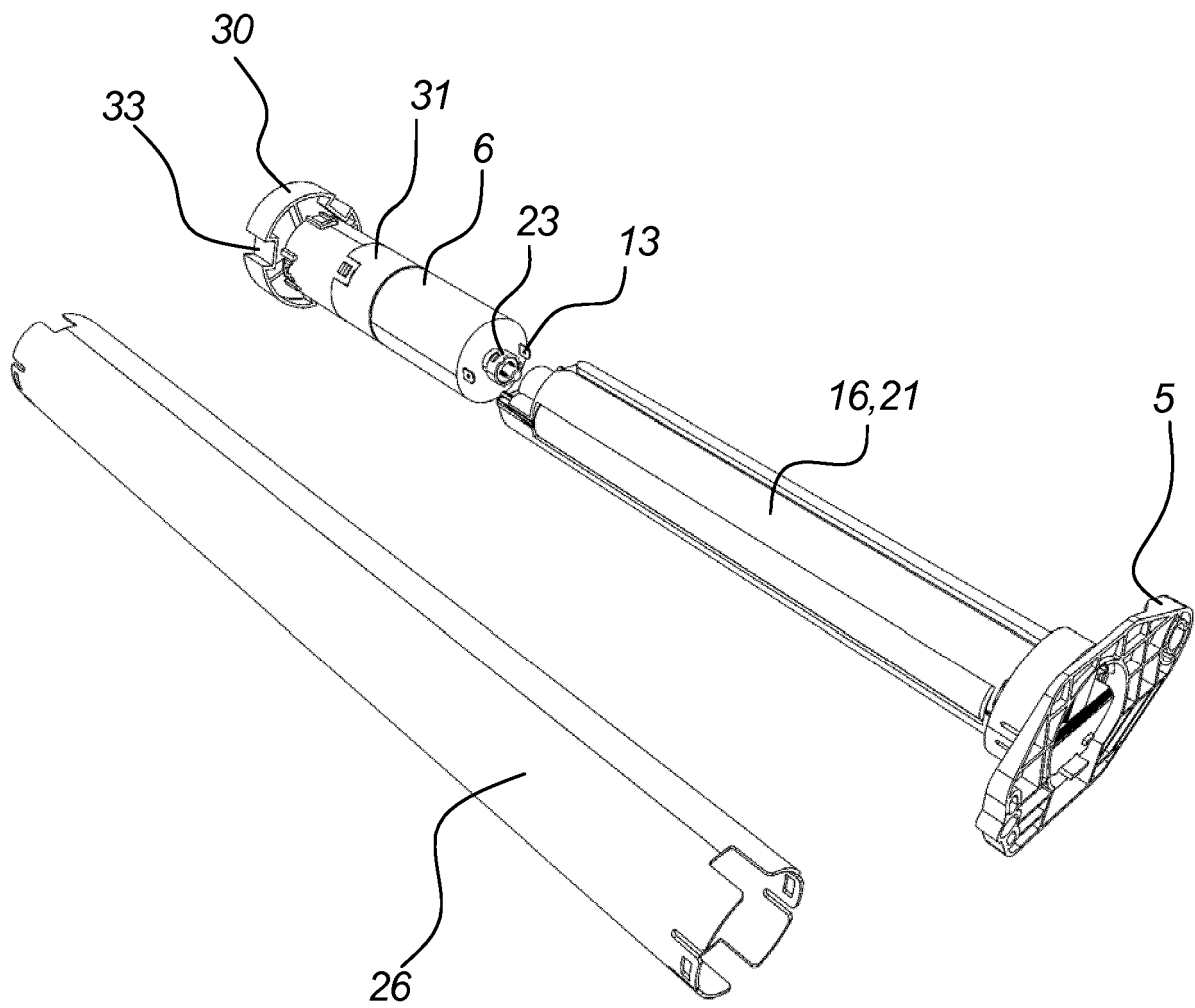


Fig. 7

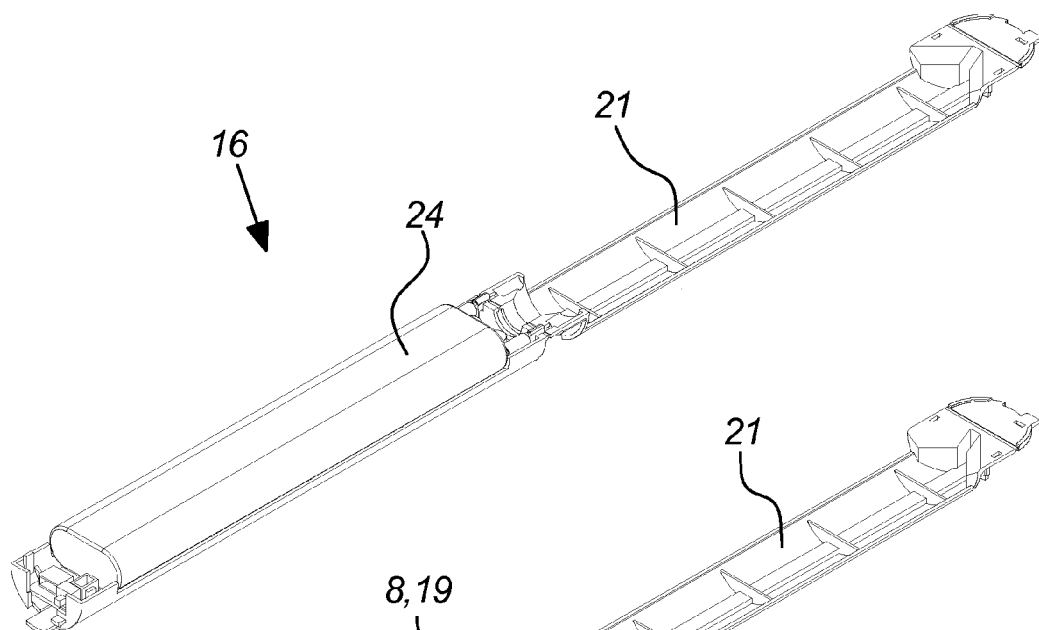


Fig. 8

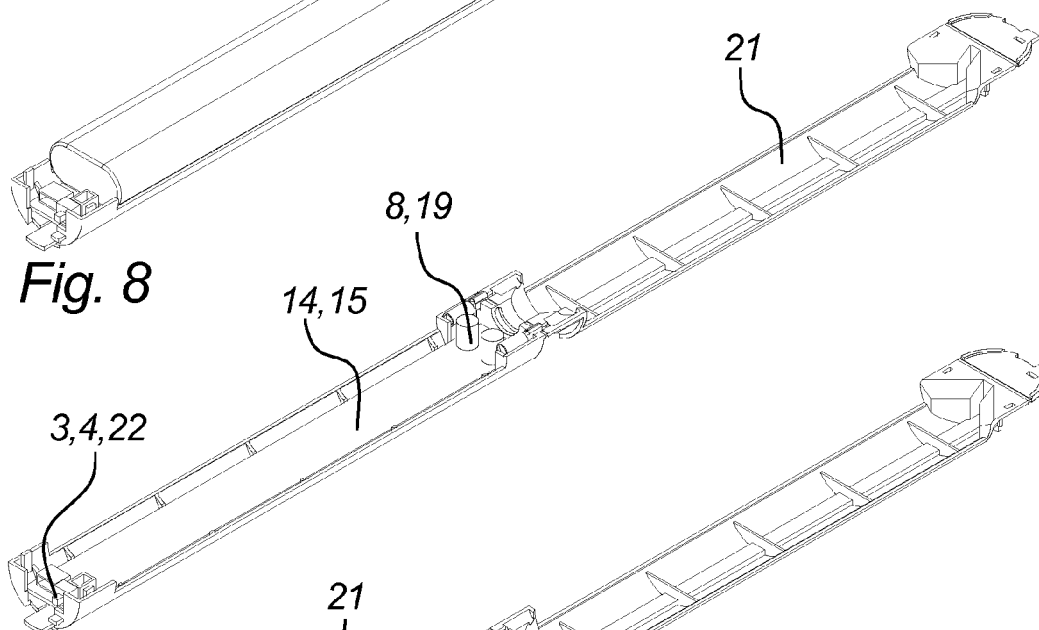


Fig. 9

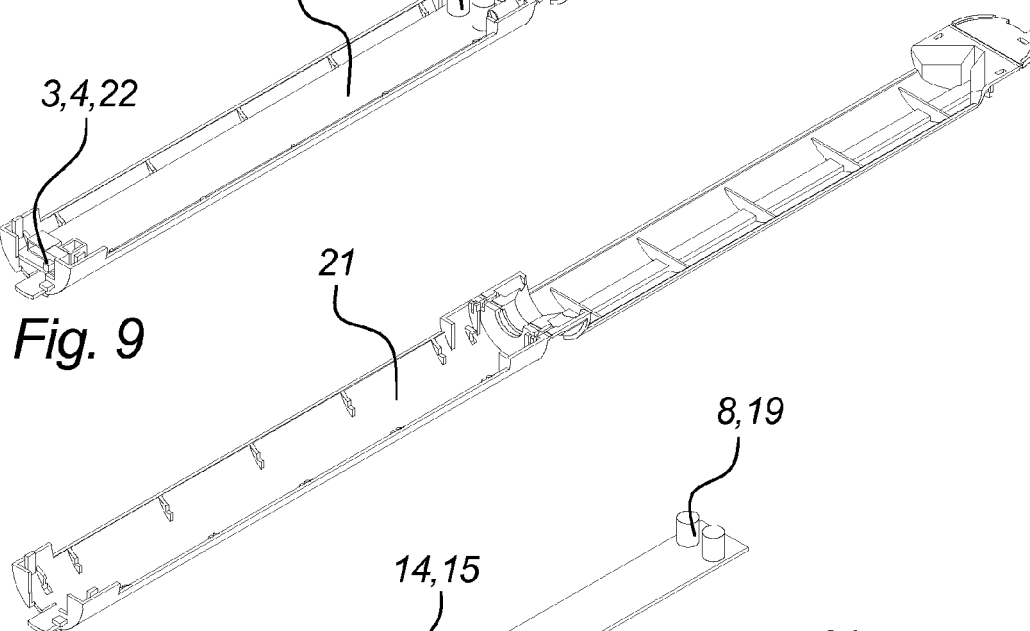


Fig. 10

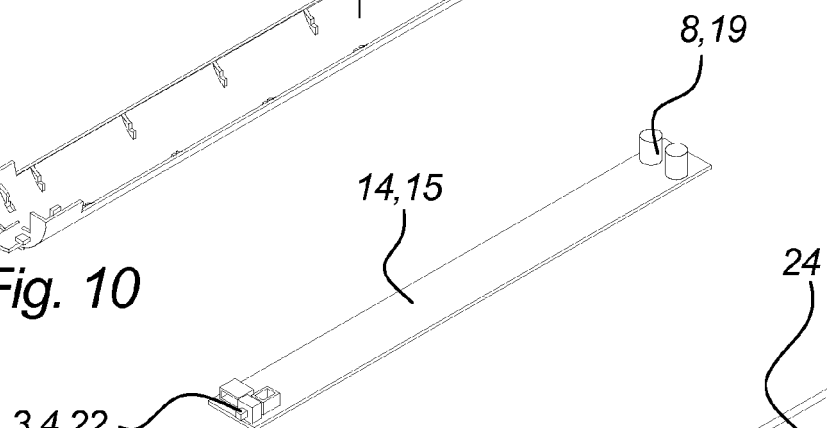


Fig. 11

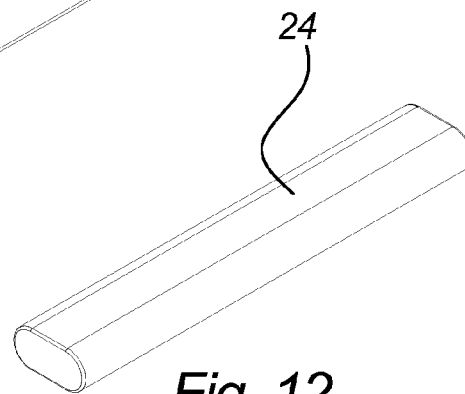


Fig. 12



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Application Number
EP 16 16 0128

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			E06B E04D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 September 2016	Examiner Schwertfeger, C
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