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(54) **Electric power window device, particularly but not exclusively for motor vehicles of the armored type**

(57) An electric power window device for motor vehicles, particularly but not exclusively for motor vehicles of the armored type, of the type which comprises a guide (11) to be arranged substantially vertically within the body of the vehicle and a slider (12, 112) which is arranged so that it can slide on the guide (11) and to which the window pane to be moved can be fixed. The slider (12, 112) is connected to a rotary actuation element (13) by means of an upper portion (15, 115) and a lower portion (16, 116) of a flexible transmission element (14, 114). The upper portion (15) of the flexible element (14, 114) comprises a first upper part (22), which extends from the rotary actuation element (13) toward an upper guiding element (23) arranged above the slider (12, 112), and a second upper part (30), which extends from the first guiding element (23) toward the slider (12, 112). Likewise, the lower portion (16, 116) of the flexible element (14, 114) comprises a first lower part (26) which extends from the rotary actuation element (13) toward a lower guiding element (27) arranged below the slider (12, 112) and a second lower part (31) which extends from the second guiding element (27) toward the slider (12, 112). The device comprises, on the slider (12, 112), at least one pulley (32, 132) for guiding respectively the second upper part (30) and the second lower part (31) respectively toward a first region (33), which is arranged substantially above the position occupied by the at least one pulley (32, 132) when the slider (12, 112) is at the upper stroke limit of the guide (11), and a second region (34), which is arranged substantially below the position occupied by the at least one pulley (32, 132) when the slider (12, 112) is at the lower stroke limit (11b) of the guide (11).

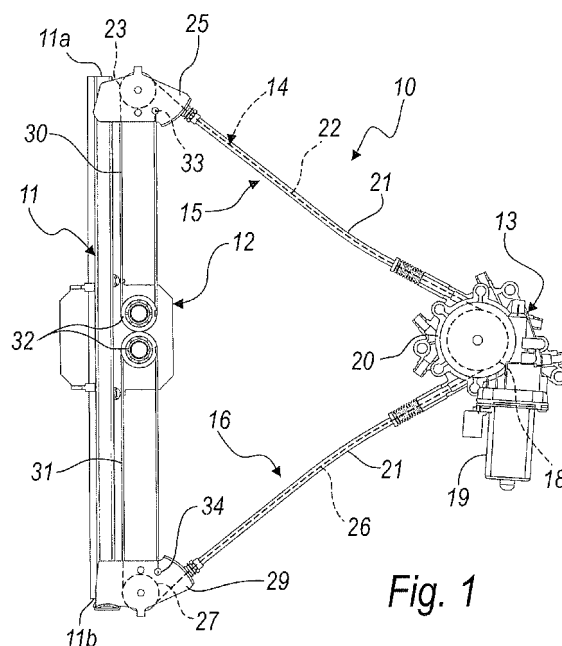


Fig. 1

Description

[0001] The present invention relates to an electric power window device, particularly but not exclusively for motor vehicles of the armored type.

[0002] As is known, one of the electrical devices most widely used to operate the windows of an ordinary motor vehicle is the cable device.

[0003] This device is composed of a simple frame, which comprises a vertical guide on which a slider is arranged which is rigidly coupled to the window pane to be moved.

[0004] Two guiding wheels for a cable for moving the slider are provided at the two ends of the guide.

[0005] In particular, one portion of such cable is fixed to the slider, while the ends of the cable are fixed to a spool which is connected to a gearmotor.

[0006] The actuation of the gearmotor in one direction or the other turns directly the spool in the corresponding direction, consequently winding the cable in one direction and unwinding it in the opposite direction, moving the slider and therefore the window pane.

[0007] This type of power window device cannot be used conveniently in vehicles of the armored type, since the window panes used in such vehicles are extremely heavy.

[0008] The excessive weight of the window panes in fact leads to slippage of the cable on the spool and requires more powerful gearmotors.

[0009] Accordingly, devices of a different type, such as for example devices based on rack or rail mechanisms, are used in such motor vehicles.

[0010] However, these devices are structurally much more complex and have uneven operation.

[0011] Due to the large mass of the window panes to be moved, the descent stroke of such panes is in fact very fast, while the lifting stroke is very slow and further uses a lot of power.

[0012] The aim of the present invention is to provide an electric power window device, particularly but not exclusively for motor vehicles of the armored type, which solves the drawbacks observed in known types.

[0013] Within this aim, an object of the present invention is to provide an electric power window device, particularly but not exclusively for motor vehicles of the armored type, which leads to a reduction in difference in the lifting and descent times of the window pane associated therewith with respect to known devices.

[0014] Another object of the present invention is to provide an electric power window device, particularly but not exclusively for motor vehicles of the armored type, which is structurally simple.

[0015] Another object of the present invention is to provide an electric power window device, particularly but not exclusively for motor vehicles of the armored type, which can be produced with known components and technologies.

[0016] This aim and these and other objects, which will

become better apparent hereinafter, are achieved by an electric power window device for motor vehicles, particularly but not exclusively for motor vehicles of the armored type, of the type which comprises a guide to be arranged substantially vertically within the body of the vehicle and a slider which is arranged so that it can slide on said guide and to which the window pane to be moved can be fixed, said slider being connected to a rotary actuation element by means of an upper portion and a lower portion of a flexible transmission element, said upper portion of the flexible element comprising a first upper part, which extends from said rotary actuation element toward an upper guiding element arranged above said slider, and a second upper part, which extends from said first guiding element toward said slider, said lower portion of the flexible element comprising a first lower part which extends from said rotary actuation element toward a lower guiding element arranged below said slider and a second lower part which extends from said second guiding element toward said slider, characterized in that it comprises, on said slider, at least one pulley for guiding respectively said second upper part and said second lower part respectively toward a first region, which is arranged substantially above the position occupied by said at least one pulley when said slider is at the upper stroke limit of said guide, and a second region, which is arranged substantially below the position occupied by said at least one pulley when said slider is at the lower stroke limit of said guide.

[0017] Further characteristics and advantages of the invention will become better apparent from the following detailed description of two preferred but not exclusive embodiments thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a front view of a power window device according to the invention in a first embodiment;
Figure 2 is a perspective view of a portion of a second embodiment of the device according to the invention.

[0018] It is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0019] With reference to the figures, an electric power window device for motor vehicles, according to the invention, particularly for motor vehicles of the armored type, is generally designated by the reference numeral 10.

[0020] The power window device 10 is to be inserted within the body of a motor vehicle, for example inside a door of the motor vehicle (not shown in the figures).

[0021] The device 10 is constituted by a guide 11 to be arranged substantially vertically inside the door of the motor vehicle and on which a slider 12 is arranged slidably; the window pane to be moved (not shown in the figures) can be fixed to the slider.

[0022] The slider 12 is connected to a rotary actuation element 13 by means of a flexible transmission element

14; as shown in the figures, the extension of the flexible transmission element 14 has an upper portion 15 and a lower portion 16 for connecting the rotary actuation element 13 to the slider 12.

[0023] The flexible transmission element 14 and the rotary actuation element 13, according to a per se known configuration, are constituted, in this embodiment, by a cable which is wound in a plurality of winding turns on a spool 18 which is connected directly to an electric gearmotor 19.

[0024] In particular, the spool 18 is contained within a housing 20 to which the gearmotor 19 is coupled by means of a flange.

[0025] Two tubular ducts 21 for guiding the flexible element 14 toward the ends of the guide 11 protrude from the housing 20.

[0026] In particular, the upper portion 15 of the flexible element 14 comprises a first upper part 22, which extends from the spool 18 toward an upper guiding element 23 which is arranged above the slider 12.

[0027] The upper guiding element 23 is constituted for example, according to a per se known configuration, by a first wheel which is pivoted to a first plate 25, which is rigidly coupled to the upper end of the frame of the guide 11, substantially proximate to the upper stroke limit 11a of the guide 11.

[0028] Likewise, the lower portion 16 of the flexible element 14 comprises a first lower part 26, which extends from the spool 18 toward a lower guiding element 27 arranged below the slider 12.

[0029] The lower guiding element 27 is also constituted by a wheel, termed second wheel, which is pivoted to a corresponding second plate 29 which is rigidly coupled to the lower end of the frame of the guide 11, substantially proximate to the lower stroke limit 11b of the guide 11.

[0030] The upper portion 15 of the extension of the flexible element 14 comprises, in series to the first upper part 22, a second upper part 30 which extends from the upper guiding element 23 toward the slider 12.

[0031] Likewise, the lower portion 16 of the extension of the flexible element 14 comprises, in series to the first lower part 27, a second lower part 31, which extends from the lower guiding element 27 toward the slider 12.

[0032] Advantageously, on the slider 12, in this embodiment, there are two guiding pulleys 32, respectively for guiding the second upper part 30 and the second lower part 31 of the flexible element 14 respectively toward a first region 33, which is located substantially above the position occupied by the respective pulley 32 when the slider 12 is on the upper stroke limit 11a of the guide 11, and a second region 34, which is located substantially below the position occupied by the respective pulley 32 when the slider 12 is on the lower stroke limit 11b of the guide 11.

[0033] The first and second regions 33 and 34 are formed respectively on the first and second plates 25 and 29.

[0034] The respective ends of the flexible element 14

are fixed to the first and second regions 33 and 34.

[0035] In particular, the second upper part 30 and lower part 31 of the flexible element 14 are substantially aligned with each other and parallel to the guide 11, and likewise the parts of the upper portion 15 and lower portion 16 of the flexible element 14 that lie between the respective guiding pulleys 32 and the respective ends of the flexible element 14 are mutually aligned and substantially parallel to the guide 11.

[0036] The operation of the invention is as follows.

[0037] The gearmotor moves the flexible transmission element, i.e., the cable, for example for a lifting stroke; the upper portion of the cable is thus wound onto the spool while the lower portion is simultaneously unwound.

[0038] The second upper part of the cable tends to shorten, while the second lower part tends to become longer.

[0039] The end of the cable related to the upper cable portion is fixed on the first plate, in a position above the slider, like the upper guiding element; in this configuration, the pulley is arranged between said end and the upper guiding element and is therefore forced to rise toward them, moving the entire slider with it.

[0040] The same occurs for the descent stroke; in this case, the lower cable portion is wound onto the spool while the upper portion is simultaneously unwound, consequently increasing the length of the second upper part of the cable and shortening the second lower part.

[0041] As can be seen, with this device the load that affects the gearmotor has been substantially halved with respect to known types of power window device (in such devices, the weight of the slider plus the window pane bears directly and entirely on the second upper part of the cable).

[0042] With the present invention, the weight of the slider with the window pane is in fact substantially divided between the coupling reaction of the fixing coupling of the upper end of the cable and the second upper part of the cable.

[0043] This solution allows in practice to use a type of power window device which is typical of "normal" motor vehicle windows with very heavy window panes, typical of armored vehicles, thus leading to a simplification of the devices in such applications and allowing the lifting and descent speeds of the window panes to be closer.

[0044] Figure 2 illustrates a second embodiment of an electric power window device according to the invention.

[0045] In this embodiment, on the slider, now designated by the reference numeral 112, there is a single guiding pulley 132, on substantially mutually opposite parts of which the upper portion 115 and the lower portion 116 of the cable 117 are partially wound.

[0046] In particular, the guiding pulley 132 has two separate annular cables 132a and 132b, which are mutually coaxial and on which the upper portion 115 and the lower portion 116 of the flexible element 114 are partially wound.

[0047] This embodiment is particularly useful when

one intends to reduce the dimensions of the slider in order to increase the overall stroke of the window pane for an equal guide length.

[0048] It is evident that in another embodiment, not shown in the Figures, there can be two independent pulleys arranged coaxially with respect to each other.

[0049] In practice it has been found that the invention thus described solves the problems noted above in known types of electric power window device.

[0050] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0051] In practice, the materials employed, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

[0052] The disclosures in Italian Patent Application No. PD2006A000181 from which this application claims priority are incorporated herein by reference.

[0053] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An electric power window device for motor vehicles, particularly but not exclusively for motor vehicles of the armored type, of the type which comprises a guide (11) to be arranged substantially vertically within the body of the vehicle and a slider (12, 112) which is arranged so that it can slide on said guide (11) and to which the window pane to be moved can be fixed, said slider (12, 112) being connected to a rotary actuation element (13) by means of an upper portion (15, 115) and a lower portion (16, 116) of a flexible transmission element (14, 114), said upper portion (15) of the flexible element (14, 114) comprising a first upper part (22), which extends from said rotary actuation element (13) toward an upper guiding element (23) arranged above said slider (12, 112), and a second upper part (30), which extends from said first guiding element (23) toward said slider (12, 112), said lower portion (16, 116) of the flexible element (14, 114) comprising a first lower part (26) which extends from said rotary actuation element (13) toward a lower guiding element (27) arranged below said slider (12, 112) and a second lower part (31) which extends from said second guiding element (27) toward said slider (12, 112), **characterized in that** it comprises, on said slider (12, 112), at least one pulley (32, 132) for guiding respectively

said second upper part (30) and said second lower part (31) respectively toward a first region (33), which is arranged substantially above the position occupied by said at least one pulley (32, 132) when said slider (12, 112) is at the upper stroke limit of said guide (11), and a second region (34), which is arranged substantially below the position occupied by said at least one pulley (32, 132) when said slider (12, 112) is at the lower stroke limit (11b) of said guide (11).

2. The power window device according to claim 1, **characterized in that** the ends of said flexible transmission element (14, 114) are fixed respectively on said first region (33) and on said second region (34).
3. The power window device according to claim 2, **characterized in that** said second upper part (30) and lower part (31) are substantially aligned and parallel with respect to said guide (11).
4. The power window device according to the preceding claims, **characterized in that** the parts respectively of said upper portion (15, 115) and lower portion (16, 116) of said flexible transmission element (14, 114) provided between said at least one pulley (32, 132) and the respective ends are mutually aligned and substantially parallel to said guide (11).
5. The power window device according to one or more of the preceding claims, **characterized in that** it comprises, on said slider (12), two separate said guiding pulleys (32), a first one on which said upper portion (15) of said flexible guiding element (14) is partially wound and a second one (16) on which said lower portion (16) of said flexible guiding element (14) is partially wound.
6. The power window device according to one of claims 1 to 4, **characterized in that** it comprises, on said slider (112), a single said guiding pulley (132), on substantially mutually opposite parts of which said upper portion (115) and said lower portion (116) of said flexible guiding element (114) are partially wound.
7. The power window device according to claim 6, **characterized in that** said single guiding pulley (132) has two separate annular slots (132a, 132b), which are mutually coaxial and on which said upper portion (115) and said lower portion (116) of said flexible guiding element (114) are partially wound respectively.
8. The power window device according to one or more of the preceding claims, **characterized in that** said flexible transmission element (14, 114) is a cable and said rotary actuation element (13) comprises a

spool (18), on which said cable is wound, said spool being connected directly to an electric gearmotor (19).

9. The power window device according to one or more of the preceding claims, **characterized in that** said guiding elements (23, 27) are constituted by wheels which are pivoted on plates (25, 29) which are rigidly coupled to the ends of the frame of said guide (11), the ends of said flexible transmission element (14) being fixed respectively on said plates (25, 29).

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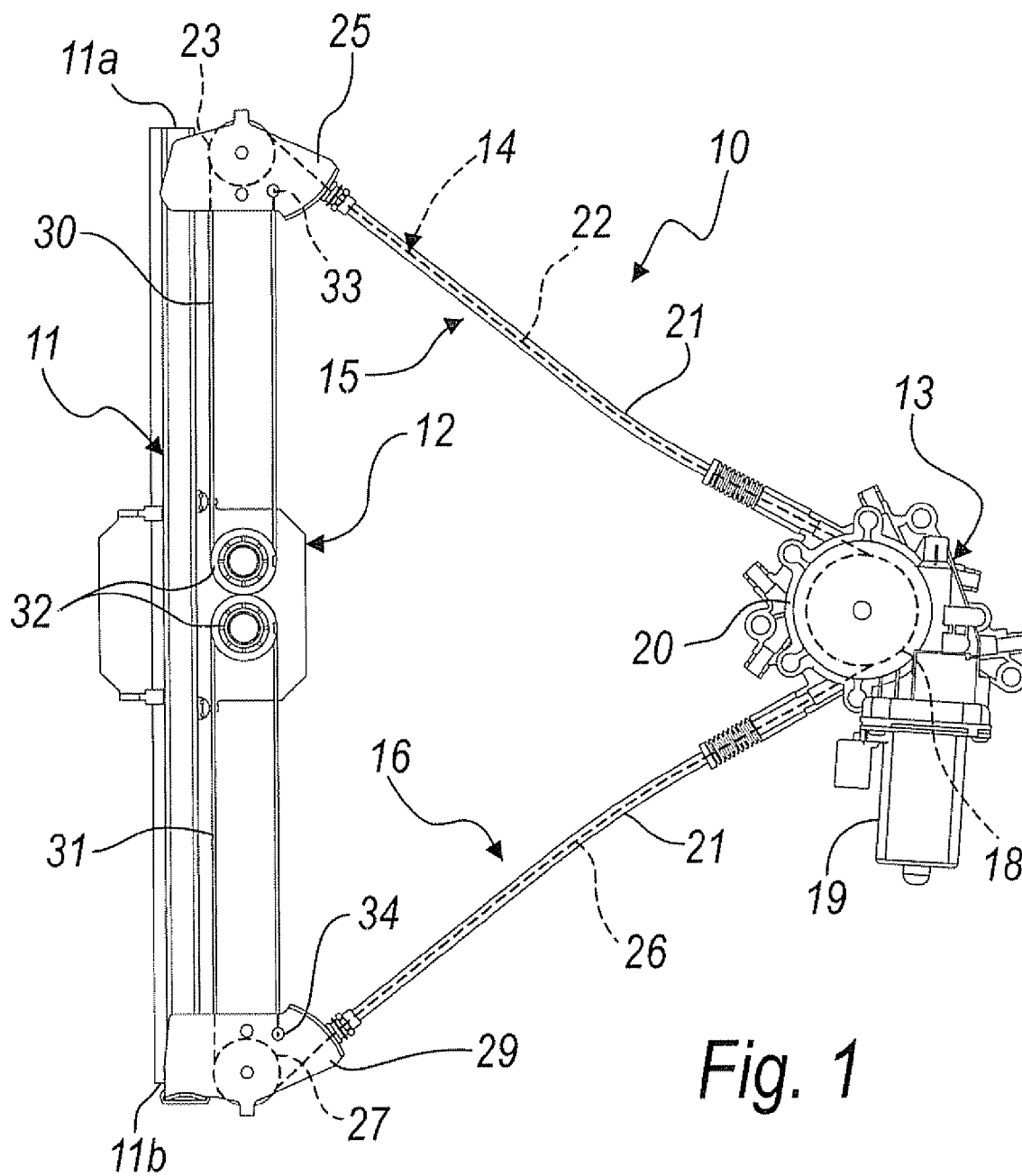


Fig. 1

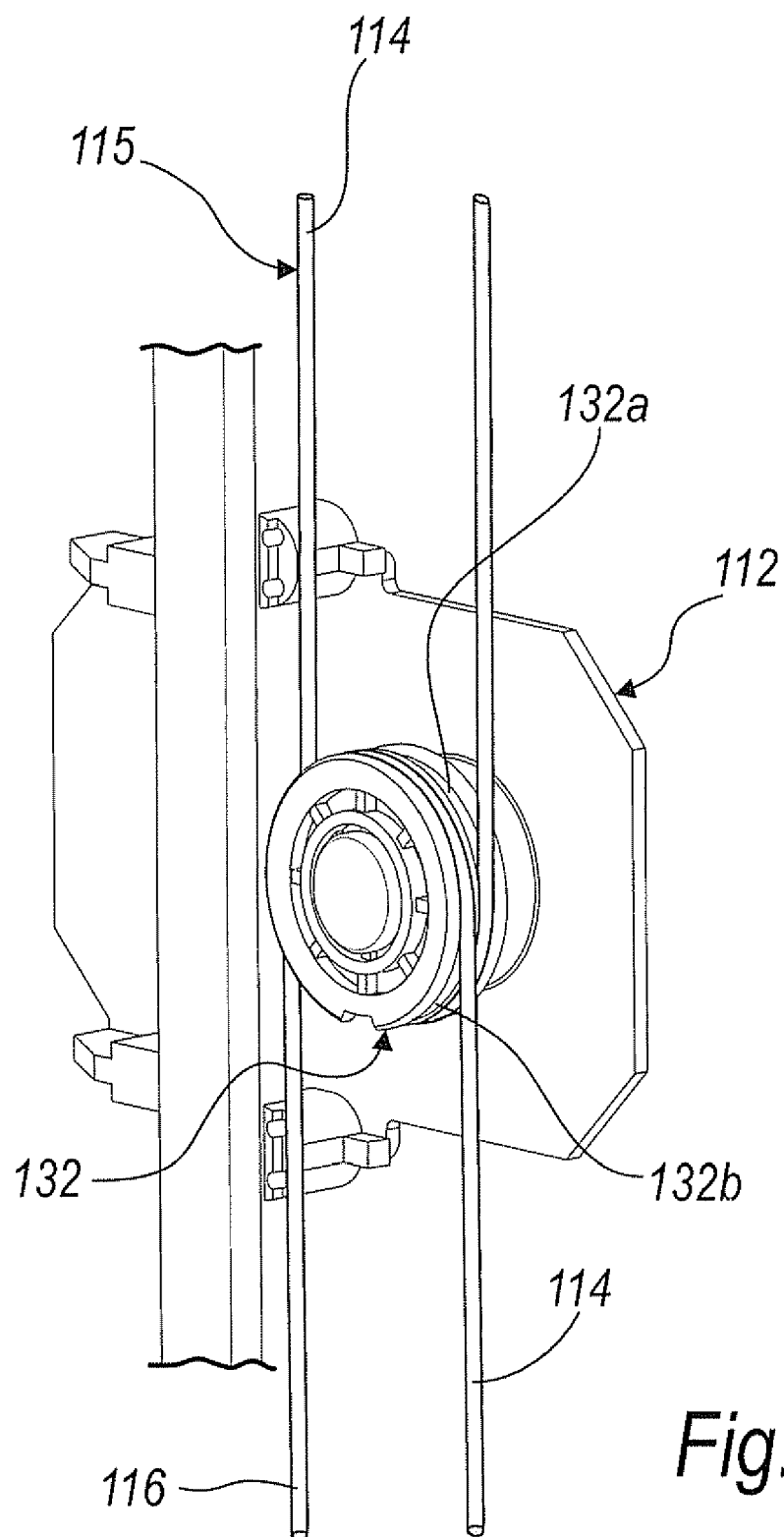


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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