

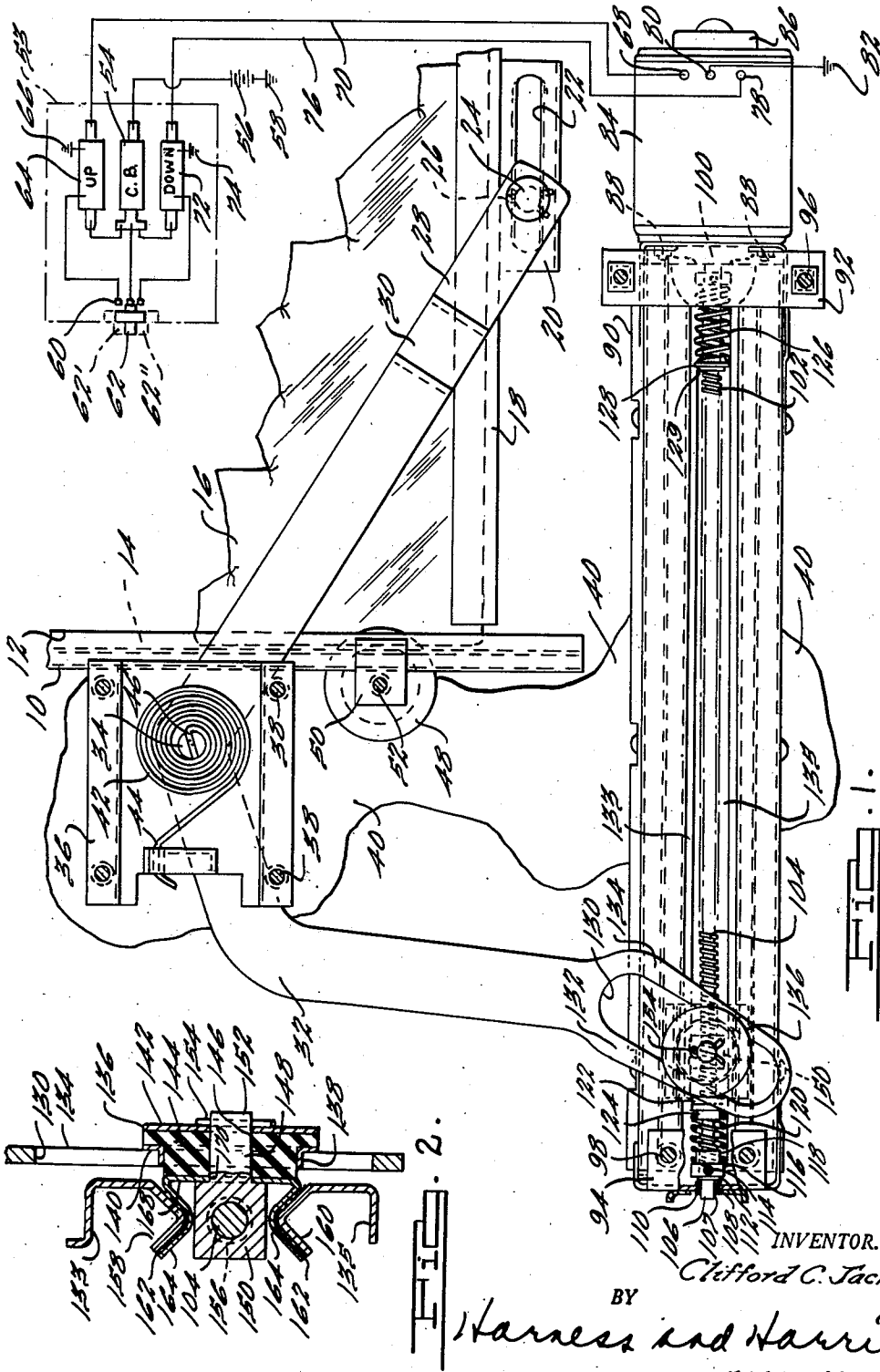
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WINDOW REGULATOR

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WINDOW REGULATOR

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This invention relates to window regulators, particularly to electrically operated regulators of the jack screw type.

It is an object of the invention to provide a power operated window regulator which will easily and noiselessly raise and lower a window such as the window of an automobile body. According to one feature, provision is made to cushion the regulator mechanism from shock as the window frame is caused to accelerate and decelerate at intermediately open positions thereof.

According to another feature, an electric window regulator is provided in which no limit switches are found necessary but rather resilient elements are employed to stop movement of the parts gradually and without need for opening the power circuit by limit switches.

According to still another feature of the invention, a fixed track is provided adjacent the screw shaft on which the nut travels, the track taking up any side thrust on the nut and thus serving to unload the screw shaft of lateral loads and bowing stresses to which it would otherwise be subjected.

According to yet another feature, a resiliently expansible element is provided for supporting the traveling nut of the mechanism in the V-ways of a fixed horizontal track whereby all slack and play will be automatically taken up as and when it may tend to develop between the nut and the track on which the nut travels.

According to a further feature, the element which supports the traveling nut resiliently on fixed horizontal ways, is provided with sliding shoes formed of lubricant impregnated fabric; the shoes, to a partial or complete degree self-lubricating as desired, furnish a cloth-to-metal sliding action which has been found highly satisfactory particularly as concerns a shoe-carrying element of a biased character.

According to yet a further feature of the invention, provision is made to open circuit the electric power means for the regulator after a sustained attempt has been unsuccessfully made to drive the traveling nut against a spring bumper past the normal compressed position; thus the safety effect of limit switches is attained without actual expense involved to provide limit switches.

According to still a further feature, provision is made between the traveling nut and power arm, for an elastic member which can take the shock out of impact of the window frame with an obstruction in the window opening during window closing; such obstruction may be caused

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by a foreign object in the glass run, or by inanimate or animate objects such as an occupant's hat, arm, or hand being in the window opening.

Power operated window regulators are not new but a jack screw type of regulator operated in the cushioned manner hereinafter described and shown in the drawings, is submitted as being new and as offering distinct advantages over other types of power operated window regulators heretofore proposed.

In the drawings:

Figure 1 is a layout in elevation of the improved window regulator; and

Figure 2 is a transverse section of the driving connection at the traveling nut.

As respects Figure 1 particularly, a glass channel 10 is provided with an inner margin defining a window opening 12. Channel 10 has a glass run indicated at 14, for reception of the edge of a glass 16 suitably supported in a channel 18. A bracket 20 on channel 18 is provided with ways defining a slot 22 in which cooperates a sliding pin 24. Pin 24, held in slot 22, by a retainer 26, is carried by the end of a lever or arm 28. Arm 28 is formed with an offset portion 30 which suitably clears the glass 16 and window frame and together with a power arm 32 constitutes a bellcrank pivoted to rotate with a pivot 34. Driving of the bellcrank in a counterclockwise direction will, as follows from the showing of Figure 1, cause window panel 16 to open, whereas window closing movement corresponds to the clockwise direction for the bellcrank. Pivot 34 is journaled in a bracket 36 suitably held by fasteners to a panel 40 which supports the entire mechanism. About pivot 34 is disposed a counterbalance spring 42, one end of which is secured at 44 to bracket 36 and the opposite end of which is secured for rotation with pivot 34 and the bellcrank just described. Spring 42 is arranged such as to urge the bellcrank in a counterclockwise direction about pivot 34 and thus tend to counteract the weight of window panel 16.

Panel 40 may be formed with an embossment 48 wherein is held by a fastener 52 a glass run support bracket 50 disposed in adjacency to window channel 10. Mounted to a relay panel 53 there may be a circuit breaker 54 connected in the circuit with a power source such as a battery 56 suitably grounded at 58. A lead from circuit breaker 64 forms a connection with a two-contact switch 60 selectively operated by a movable switch member 62. Member 62 is movable into an up position, indicated at 62', the character-

istic of which being that the up relay 64 is caused to complete a circuit to a motor terminal 68 through a conductor 70. Up relay 64 is suitably grounded at 66. Member 62 is movable into a down position 62'' wherein is caused down relay 72, suitably grounded at 74, to close a circuit through a conductor 76 to a motor terminal 78. In adjacency to terminals 68 and 78 is provided a ground terminal 80 grounded at 82. Terminals 68, 78 and 80 extend through the case of a power operated device or motor 84. Motor 84 is provided with an appropriate rotor such as of the double-wound type, which will rotate in different directions one or the other depending upon which of the respective terminals 68 or 78 happens to be energized through the relays of panel 53. The rotor, not shown, for motor 84, is suitably journaled for rotation in a rear bearing 86. By appropriate fasteners as at 88, motor 84 is mounted to a power assembly generally indicated at 90. At one end assembly 90 has a support bracket 92 mounted by fasteners 96, and at the other end a support bracket 94 fixedly mounted by fasteners 98. A front bearing 100 for motor 84 serves to support the rotor for motor 84 as well as to journal the end 102 of a threaded screw shaft 104. The opposite end 106 of screw shaft 104 has a reduced section 107 suitably received in a bearing opening formed by flanged parts 108. A fabric sleeve 110, which may be impregnated with a suitable lubricant, lines the bearing opening and serves to journal the reduced portion 107 for rotation therein. A threaded portion 112 of screw shaft end 106 receives an internally threaded collar 116 suitably held in place at an appropriate axial station along the screw threads by a set screw 114. Collar 116 has a reduced portion 118 around which is secured the end of a resilient windup part 120 which may be a coil spring. The opposite end of part 120 is connected to a smooth bored flanged collar 124, which is free to slide along the screw threads without rotating and against which rests a thrust washer 122. A similar windup part 126 is provided at the opposite end 102 of the screw shaft 104 and has a smooth bored flanged collar 128 and a washer 129, the washer 129 serving likewise as a thrust washer. Power arm 32 has a slot 130 formed by swinging guides 132 and 134. A pair of fixed guides for a nut assembly 136 is provided at 133 and 135 on the power assembly 90. Guides 132 and 134 also provide a track for reception of the nut assembly 136 which then serves to coordinate movement of the power arm 32 relative to guides 133 and 135 as the nut assembly 136 travels along the latter.

As particularly regards Figure 2, in the slot 130 inward of guide 134 is received a tire or collar 138 having a retaining flange 140 for retention in the track constituted by slot 130. Between flanged collar 138 and a retaining washer 142 of assembly 136 there is provided an elastic part 144 of generally annular shape. Part 144 may be of a resilient rubber or rubber-like composition or else formed of a suitably resilient plastic or resin. Centrally of elastic part 144 is formed an opening 146 in which may be received a pin 148 carried by a nut 150. Pin 148 has its outer end 152 formed to receive a suitable fastener 154 for washer 142. Nut 150 receives the screw shaft 104 by suitable internal threads such as at 156 engaged for appropriate movement therealong. Guides 133 and 135 for the nut provide V-ways 158 and 160 against

which are adapted to bear fabric shoes 162. Fabric shoes 162 are preferably impregnated by some such lubricant as tallow, resins, and/or grease and is firmly bonded as by cement to resiliently biased portions 164 of a resilient element 168. Resilient portions 164 are urged laterally outwardly of nut 150 and press resiliently against V-ways 158 and 160 to prevent any slack or play from developing between the V-ways and the nut 150 suitably supported therein by resilient element 168. Additional lubricant may also be provided on V-ways 158 and 160 to supplement the self-lubricating character of the shoes 162. A central opening 170 is provided in resilient element 168 for reception of the pin 148 carried by nut 150, the nut engaging element 168 adjacent opening 170.

The overall operation of the device of Figures 1 and 2 will now be set forth. From the neutral position shown at 62, the switch member may be moved upwardly or downwardly to actuate either the up relay 64 or the down relay 72, and cause the motor 84 to be energized for rotation in one direction or the other. Screw shaft 104 rotates with the rotor of motor 84 to cause the nut 150 and the nut assembly 136 to travel rectilinearly along the guides 133 and 135. As the nut 150 approaches either end of travel, it begins to engage one or the other of thrust washers 122 and 129 and to compress the appropriate windup spring 120 or 126. The windup spring tends to absorb the energy of movement of the moving parts of the mechanism and to bring screw shaft 104 and power arm 32 to a gradual though positively imposed stop. Continued operation of switch member 62 will, after all movement of the arm is overcome by windup part 120 or 126, eventually cause the circuit breaker 54 to act and open-circuit the power connection to motor 84. Inasmuch as the parts 120 and 126 are resilient, nut 150 will not tend to jam up on the threads of screw shaft 104 due to shock but rather will progressively be brought to a positive stop. When the direction of rotation of motor 84 is reversed, the energy stored in parts 120 or 126, as the case may be, will tend to start the nut 150 in the opposite direction of motion.

As particularly respects Figure 2, the elastic part 144 and tire 138 constitute a member adapting pin 148 for slidable and rotatable movement in the track provided by slot 130. The elastic connection permitted by part 144 makes provision for abrupt stopping of movement of window glass 16 in intermediate positions and takes the shock out of the impact of a window 16 with foreign bodies in the window opening. Nut 150 is resiliently supported in V-ways 158 and 160 in a manner that side thrusts on nut 150 are transmitted to guides 133 and 135 thereby unloading screw shaft 104 of stresses besides tension and compression. Since portions 164 on element 168 are resiliently biased against the V-ways, the nut 150 will tend to be self-centering as respects the plane of the angled portions of the V-ways 158 and 160, the slack which may result in such mechanisms being automatically compensated for by the resiliently held portions 164.

Variations within the spirit and scope of the described invention are equally comprehended by the foregoing description.

I claim:

1. In a window regulator, the combination of a window lifting mechanism having a power arm,

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a first track on the power arm of the lifting mechanism and formed with near edges in opposed spaced relationship, a fixed track fixedly supported adjacent the arc of swing of the power arm and formed with angled near edges in opposed spaced relationship, a spring metal element having portions retained between the angled near edges of said fixed track and pressing resiliently outwardly thereagainst, said portions of the spring metal element being provided with shoe means bearing directly on said angled near edges and comprising an impregnated fabric bearing material, a tire slidable along the near edges of said first track having a centrally apertured elastic core, a nut supported by said resilient element and having a pin journaled in the central aperture of said elastic core, and a power operated screw shaft fixedly supported in the plane of said angled near edges and drivingly engaging the nut to cause the nut to travel therealong for resiliently coordinating relative motion of the tracks to one another.

2. In a window regulator, the combination of a window lifting mechanism having a power arm, a first track on the power arm of the lifting mechanism and formed with near edges in opposed spaced relationship, a fixed track fixedly supported adjacent the arc of swing of the power arm and formed with angled near edges in opposed spaced relationship, a spring metal element having V-notched portions retained between the angled near edges of said fixed track and pressing resiliently outwardly thereagainst,

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said portions of the spring metal element being provided with shoe means bearing directly on said angled near edges and comprising an impregnated fabric bearing material, a tire slidable along the near edges of said first track having a protruding rim preventing lateral displacement therefrom and provided with a centrally apertured elastic core, a nut supported by said resilient element and having a pin journaled in the central aperture of said elastic core, and a power operated screw shaft fixedly supported in the plane of said angled near edges and drivingly engaging the nut to cause the nut to travel therealong for resiliently coordinating relative motion of the tracks to one another.

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