

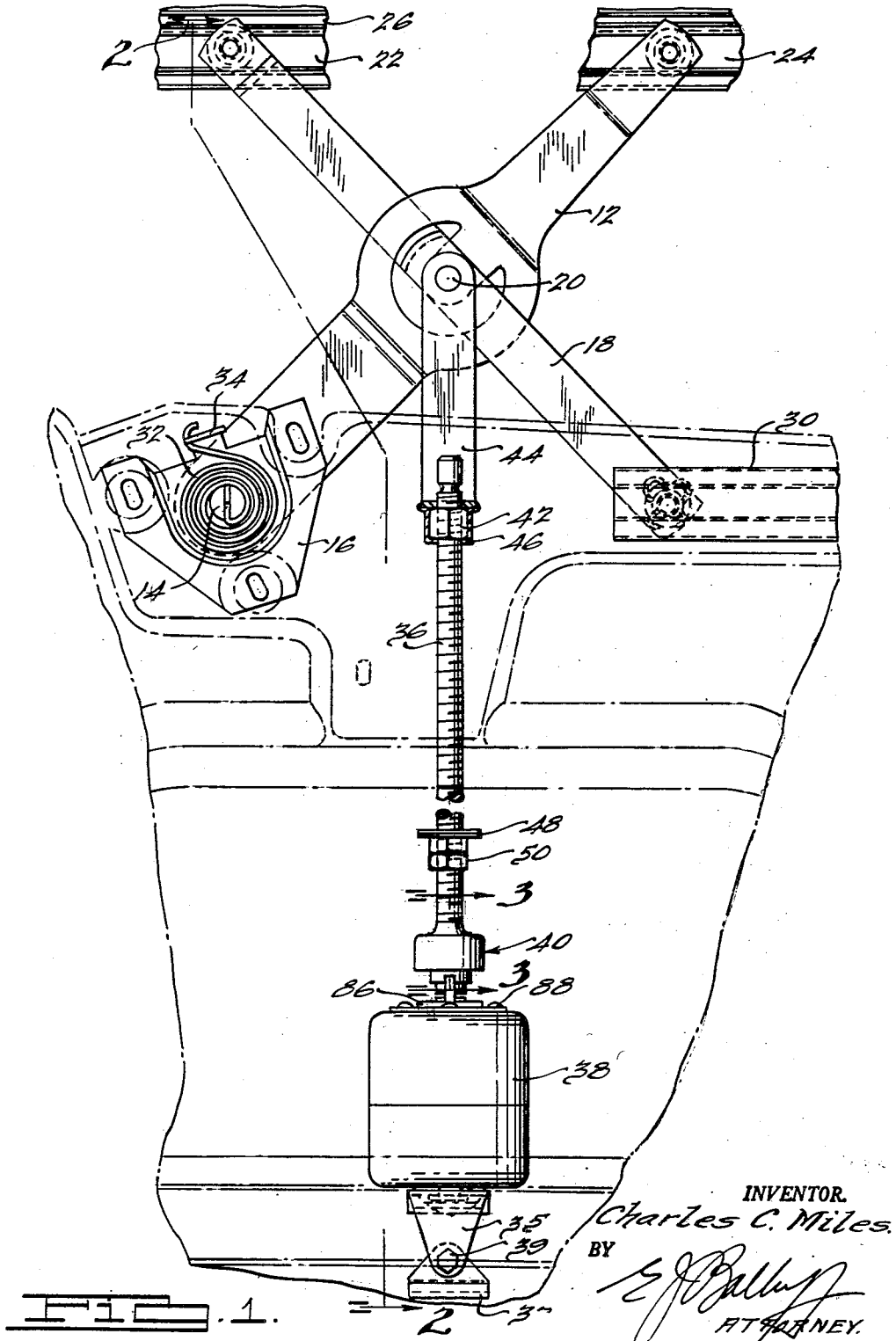
Sept 17, 1957

C. C. MILES  
WINDOW REGULATOR

2,806,690

Filed Dec. 21, 1953

2 Sheets-Sheet 1



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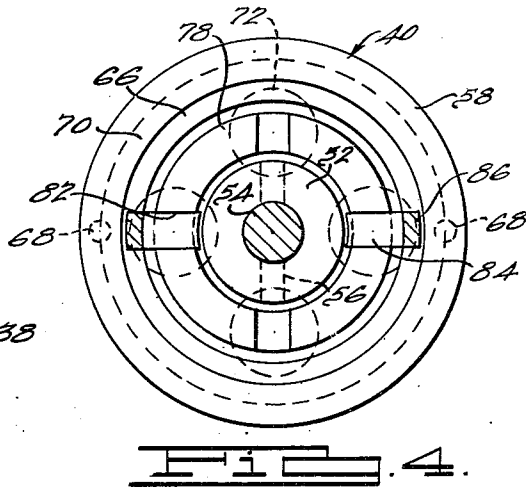
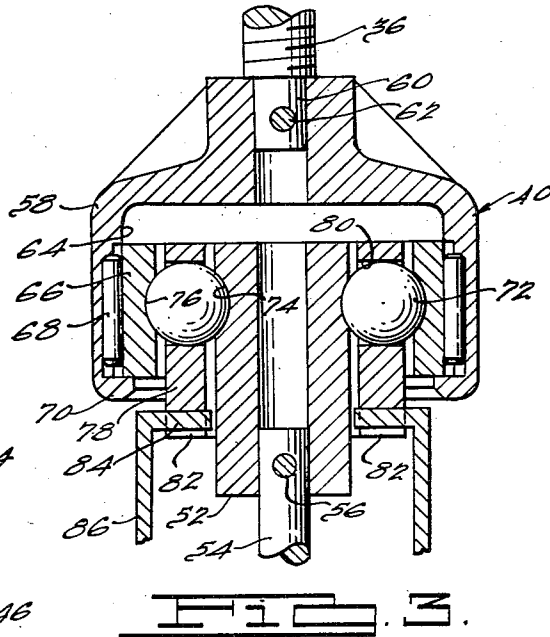
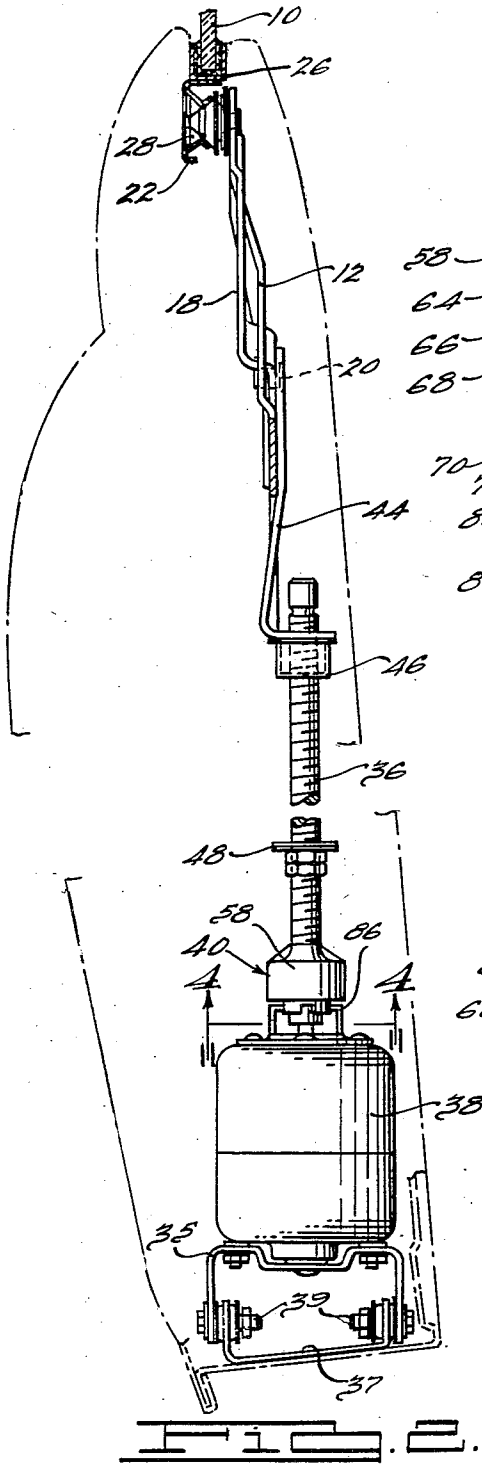
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2 Sheets-Sheet 2



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2,806,690

## WINDOW REGULATOR

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Application December 21, 1953, Serial No. 399,397

3 Claims. (Cl. 268—124)

This invention relates to power-operated regulating mechanisms for vehicle windows or the like and has particular reference to a regulator of the type comprising a motor driven jack screw and a traveling nut device connected to the supporting linkage for the window and mounted on the shaft for axial movement to raise and lower the window upon rotation of the shaft. The present invention is directed to a new and improved speed-reducing and motion-transmitting mechanism for connecting the rotatable jack screw to the electric motor.

A principal object of the invention is to provide a new and improved power-operated vehicle window regulator.

Another object of the invention is to provide a new and improved speed-reducing and motion-transmitting unit for a power-operated window regulator.

Other and further objects of the invention will be apparent from the following description and claims and may be understood by reference to the accompanying drawings, of which there are two sheets, which by way of illustration show a preferred embodiment of the invention and what I now consider to be the best mode in which I have contemplated applying the principles of my invention. Other embodiments of the invention may be used without departing from the scope of the present invention as set forth in the appended claims.

In the drawings:

Fig. 1 is an elevational view of the improved power-transmitting means and showing the same connected to one type of supporting linkage for a vehicle window;

Fig. 2 is an end elevational view of the regulator and taken on line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2.

The supporting linkage for the vehicle window 10 may be of any suitable type, and as shown in the drawings consists of an arm 12 pivoted at 14 to a bracket 16 secured to a suitable framework located between the inner and outer door panels, an arm 18 pivotally connected to arm 12 by a pin 20, and channel members 22 and 24 secured to the lower edge of the window frame 26 and adapted to receive rollers 28 provided on one end of arm 18 and the free end of arm 12. The other end of arm 18 has a similar roller 28 secured thereto and slidable in a channel member 30 mounted on the framework on one of the door panels. Pivoting arm 12 about pin 14 will effect scissoring movement of the arms 12 and 18 to raise or lower the vehicle window. A counter-balance spring 32 has one end thereof disposed in a slot in pin 14 and the other end reacting against a lug 34 provided on bracket 16. Supporting linkages of the type thus far described are conventional in the art and form no part of the present invention.

A threaded shaft or jack screw 36 is driven by an electric motor 38 through a speed-reducing and motion-transmitting unit 40, and a traveling nut 42 is mounted on shaft 36 and cooperable with the threads on the shaft

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to effect axial movement of the nut upon rotation of the shaft in either direction. The nut 42 is secured to a bracket 44 which is pivotally connected to pin 20 so that axial movement of the nut 42 in response to rotation of the shaft 36 will result in pivoting of arm 12 and raising or lowering of the window, depending on the direction of rotation of the shaft. The nut 42 is retained within a housing 46 carried by the bracket 44. The electric motor 38 is mounted on a bracket 35 which is mounted on a bracket 37 for pivotal movement of the bracket 35 and motor 38 about the horizontal axis of pins 39. The bracket 37 is mounted on the framework of the door, and resilient pads may be disposed between the brackets 35 and 37 and the bracket 35 and motor 38 to reduce vibration and eliminate noise of operation of the unit.

An adjustable stop member 48 is mounted on shaft 36, and the position thereof may be adjusted by means of lock nuts 50, the traveling nut 42 being adapted to engage the stop 48 when the window reaches its lowered position.

The speed-reduction and motion-transmitting unit 40 includes a driving member 52 secured to the upper end of motor shaft 54 by means of a pin 56. A housing 58 is secured to the lower end 60 of the threaded shaft 36 by means of a pin 62, and the housing has a downwardly opening annular recess 64 formed therein. An annular ring 66 is disposed in the housing 58 and keyed to the housing to prevent relative rotation between the ring and housing by means of pins 68 disposed in axial complementary grooves formed on the inner wall of the housing and the outer periphery of the ring. The housing 58 has an inwardly turned lip or flange 70 to retain the ring 66 within the housing.

A plurality of spherical ball bearings 72 provide the driving connection between the driving member 52 and the driven ring 66. The ball bearings 72 are seated in a circumferential and arcuate groove or bearing race 74 formed on the driving member 52, and also seat in an opposed and similarly formed circumferential bearing race 76 formed on the inner periphery of the driven ring 66.

The balls 72 are retained in their equally spaced relation by means of an annular cage member 78 which is interposed between the driven ring 66 and the driving member 52. The cage 78 is provided with four equally spaced radial openings 80 therethrough, and one of the balls 72 is disposed in each of the openings 80. The balls 72 are freely rotatable within the openings 80 but are maintained in their spaced relation by means of the cage 78. The balls are frictionally engaged between annular bearing races 74 and 76 so that the balls are free to rotate about their vertical axes upon rotation of driving member 52, thus imparting rotation to ring 66 and housing 58 through the frictional contact between the balls and the driving member 52 and driven ring 66.

The lower end of the cage 78 is provided with downwardly opening slots 82 adapted to receive the inwardly turned ends 84 of a bracket 86 which is secured to the end plate 88 of the electric motor 38. The cage 78 is held against rotation by the bracket 86.

The speed reduction obtained with the ball transmission herein described depends upon the diameter of the balls 72 and the diameters of the bearing races 74 and 76 against which the balls rotate. The transmission of motion to shaft 36 through the ball transmission herein described results in much lower friction than is obtained with the conventional gear-type speed reduction units commonly employed in electrically driven window regulator units, because the balls 72 have substantially only rolling contact with the driving and driven members of the transmission, thus providing a unit which is relatively quiet in operation.

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While I have illustrated and described a preferred embodiment of my invention, it is understood that this is capable of modification, and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a speed reduction transmission for use in a power operated vehicle window regulating mechanism of the type including a rotatable jack screw, an electric motor for driving said screw and a traveling nut mounted on said screw and connected to the supporting frame of the window; a housing secured to said screw, a drive ring carried by said housing, a driving member fixedly secured on the motor shaft and projecting into said ring and coaxial therewith, said ring and driving member having opposed circumferential bearing races formed thereon, a fixed annular retaining member interposed between said driving member and ring and having spaced radial openings therein opposite said bearing races, and ball bearings rotatably disposed in said openings and having rolling frictional engagement with said bearing races for providing a driving connection between said driving member and said ring, said frictional engagement between said bearings and said bearing races providing the sole engagement between the driving and driven members of the transmission.

2. A power operated vehicle window regulating mechanism including a rotatable member connected to the supporting frame of the window and adapted upon ro-

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tation thereof to impart movement to said frame, an electric motor for driving said rotatable member, and a speed reduction transmission drivingly connecting said rotatable member to said motor, said transmission comprising a driven ring secured to said rotatable member, a driving member fixedly secured on the motor shaft for rotation therewith and projecting into said ring, a fixed annular retaining member between said ring and driving member and having radially disposed openings therein, and ball bearings in said openings and freely rotatably supported by said retaining member and having rolling frictional engagement with said driving member and ring for providing a driving connection between said driving member and said rotatable member and for maintaining said ring in axial alignment with said driving member.

3. Regulating means according to claim 2 wherein said retaining member projects from said ring toward said motor, and including a bracket secured to the end plate of said motor and connected to said retaining member for fixedly supporting the same.

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