Jan. 11, 1966 J. E. MARTENS 3,228,677

WINDOW REGULATOR

Original Filed July 11, 1960 2 Sheets-Sheet 1

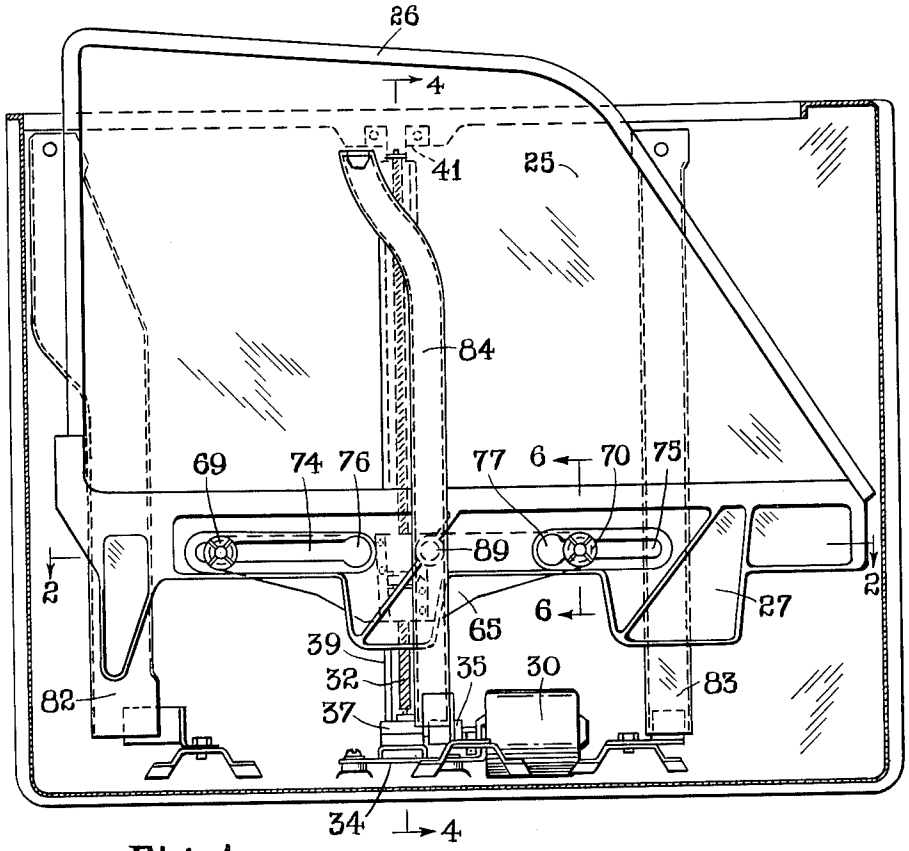


Fig. 1

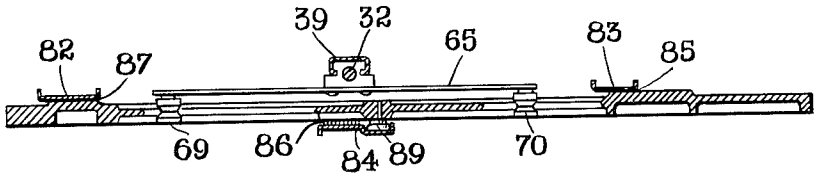


Fig. 2

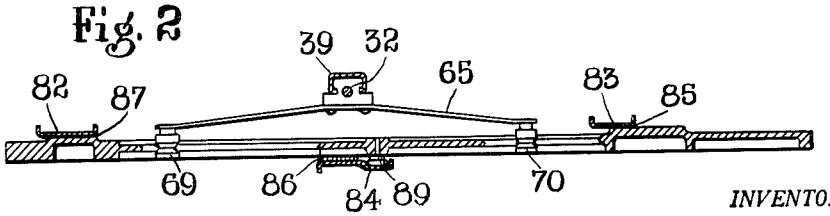


Fig. 3

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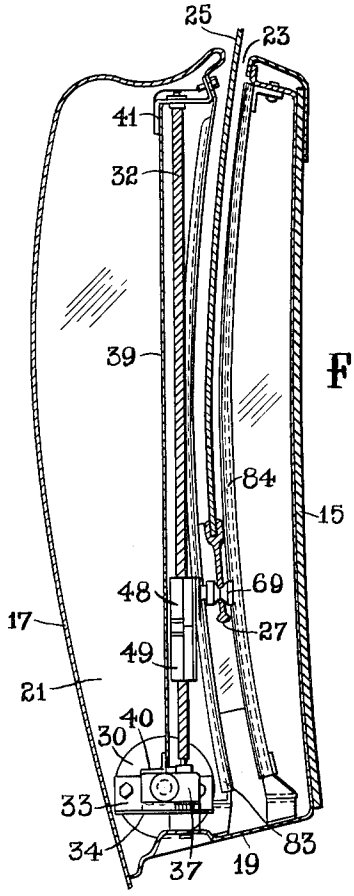


Fig. 4

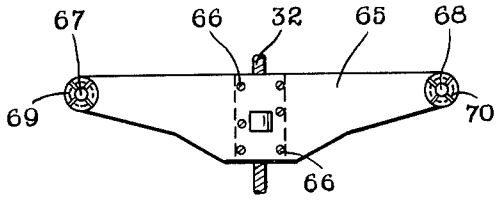


Fig. 5

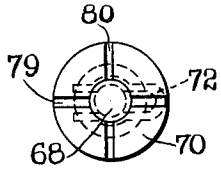


Fig. 7

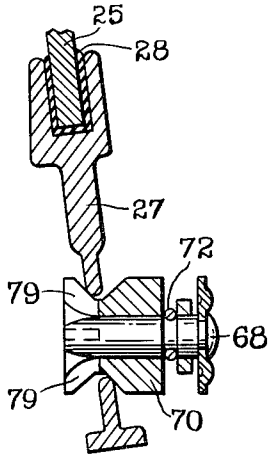


Fig. 6

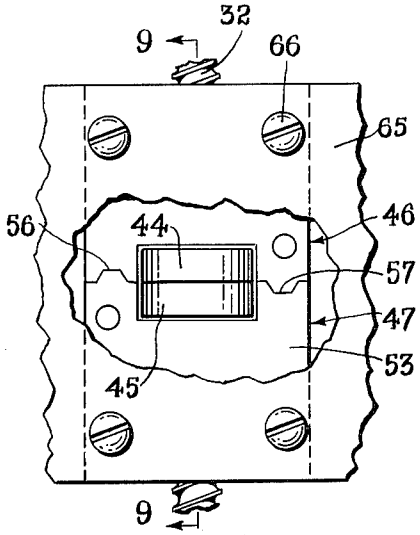


Fig 8

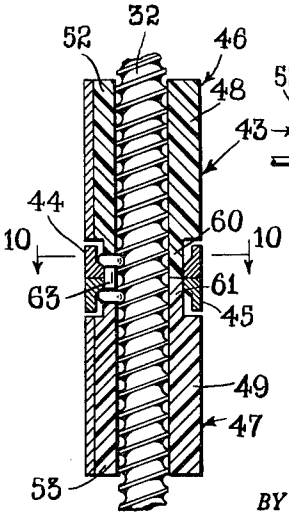


Fig. 9

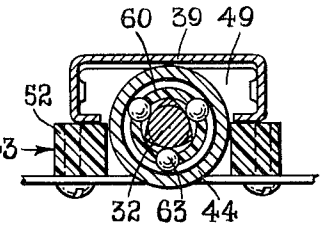


Fig. 10

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3,228,677

WINDOW REGULATOR

Jack E. Martens, Gary, Ind., assignor to The Anderson Company, a corporation of Indiana

Continuation of application Ser. No. 42,021, July 11, 1960. This application June 18, 1962, Ser. No. 203,388
3 Claims. (Cl. 268—124)

This is a continuation of application Serial No. 42,021, filed July 11, 1960, now abandoned.

This invention relates to window regulators adapted to raise and lower window panels.

An object of the invention is to provide an improved window regulator.

Another object of the invention is to provide a window regulator having an improved means for supporting and guiding a window panel.

A further object of the invention is to provide a window regulator having improved means for raising and lowering a window panel.

Another object of the invention is to provide an improved curved glass window regulator.

Still another object of the invention is to provide a window regulator having an improved means for supporting and guiding a curved glass window panel.

An additional object of the invention is to provide a window regulator having improved means for raising and lowering a curved glass window panel.

A still further object of the invention is to provide a curved glass window regulator which is economical to produce, dependable in performance and low in operation cost.

Yet another object of the invention is to provide a curved glass window regulator having fewer parts than former regulators of this type.

An additional object of the invention is to provide a curved glass window regulator in which the driving means for raising and lowering the window panel is unitized so as to be easily replaceable as a unit.

Another object of the invention is to provide improved connecting means between the driving means and a curved glass window panel driven thereby, whereby binding is substantially eliminated.

Other objects and advantages of the invention will become apparent after the description hereinafter set forth is considered in conjunction with the drawings annexted hereto.

FIGURE 1 is an elevational view of the window regulator of my invention, an inside panel of the containing structure having been removed;

FIGURE 2 is a cross-sectional view taken along section line 2—2 of FIGURE 1;

FIGURE 3 is a view similar to FIGURE 2, but showing a flexed condition of the flexible connecting member between the drive means for the curved window panel and the footing therefor;

FIGURE 4 is a cross-sectional view taken substantially along section line 4—4 of FIGURE 1;

FIGURE 5 is an elevational view of the flexible connector;

FIGURE 6 is an enlarged fragmentary cross-sectional view taken along section line 6—6 of FIGURE 1;

FIGURE 7 is an end view of the spool shown in FIGURE 6;

FIGURE 8 is an enlarged fragmentary view taken from the central portion of FIGURE 5;

FIGURE 9 is a cross-sectional view taken along section line 9—9 of FIGURE 8; and

FIGURE 10 is a cross-sectional view taken along section line 10—10 of FIGURE 9.

By way of example, the window-regulator mechanism

of my invention is shown in a door of a vehicle body for convertibles or "hardtops." In FIGURE 4, the inside panel of the door is indicated at 15, the outside panel at 17, and the bottom at 19. These portions of the door define a well 21 in which the mechanism of my invention is contained. It will be understood, of course, that the well 21 can be located in the body proper of a vehicle, as distinct from a door, and that the mechanism of my invention can be used in other types of vehicles besides convertibles or hardtops, and even in stationary structures.

The panels 15 and 17 are formed at their tops to provide an opening 23 through which a curved glass window panel 25 may be raised from or lowered into the well 21 by the mechanism of my invention. The window panel 25 may be supported at its top and side edges by a channel frame 26 (FIGURE 1), which may be made of chrome-plated steel. A footing 27, which may be made of cast aluminum, is provided for mounting the window panel 25 by its bottom edge. A resilient material such as rubber padding 28 (FIGURE 6) may be provided in channel frame 26 and footing 27 to cushion window panel 25.

A reversible electric motor 30, controlled by a switch not shown, and a straight helical screw 32 are operatively connected to the footing 27 for raising and lowering curved glass window panel 25. The motor 30 is detachably secured to an upturned end 33 of a bracket 34, which in turn is detachably secured to raised bosses in bottom 19 of the door. The output shaft of the motor 30 is connected by means of a flexible connector 35 to a gear reduction mechanism 37 mounted on a raised portion of bracket 34 and operatively connected to screw 32.

A channel member 39 is secured at its lower end to the casing of gear reduction mechanism 37 by a bracket 40, and is secured at its upper end to the top portion of panel 17 adjacent opening 23 by a bracket 41. Channel member 39 extends parallel to screw 32, and bracket 41 serves as a mounting for the upper end of screw 32.

A composite nut generally indicated by the numeral 43 in FIGURES 9 and 10 has portions guided in channel member 39 and cooperates with screw 32 to form a motion-transmitting device. The nut 43 is similar to those described in my prior copending application, Serial No. 780,514, filed on December 15, 1958, now Patent No. 3,014,380 and entitled "Motion-Transmitting Device," and includes a hollow cylindrical steel ring member formed of two identical parts or halves 44, 45 and a carrier member also formed of two identical parts or halves 46, 47, which may be made of nylon. The carrier parts 46 and 47 have guide portions 48 and 49, respectively, encased within channel member 39 and connector portions 52 and 53, respectively, adjacent but outside of channel member 39. As shown in FIGURE 8, the top of connector portion 53 of carrier part 47 is provided with a ridge 56 adjacent the left edge thereof and a groove 57 adjacent the right edge thereof. Carrier part 46 is formed identically to carrier part 47, but these parts are inverted with respect to each other and the grove of part 46 mates with ridge 56 of part 47 and the ridge of part 46 mates with groove 57 of part 47 to provide self-aligning means.

As can be noted from FIGURES 4 and 10, the adjacent ends of guide portions 48 and 49 are cut away, and as can be noted from FIGURES 8 and 10, the central portions of adjacent ends of connector portions 52 and 53 are cut away. However, carrier parts 46 and 47 are centrally bored to receive screw 32, and as can be noted from FIGURES 9 and 10, a tubular boss 60 on carrier part 46 projects downwardly into ring part 44 and a tubular boss 61 on carrier part 47 projects upwardly into ring part 45. The tubular bosses 60 and 61 abut each

other and are cut away at equally spaced portions of their peripheries to receive a plurality of bearings or rollers 63 in parallel relationship to screw 32. At opposite ends the rollers 63 have enlarged bearing surfaces engageable with the threads of screw 32 and with oppositely facing raceways provided by ring parts 44 and 45. Carrier parts 46 and 47, including tubular bosses 60 and 61, fit loosely on the screw 32, and tubular bosses 60 and 61 fit loosely within ring parts 44 and 45, respectively.

A wing-shaped flexible connecting member 65 (FIGURE 5) is fastened to connector portions 52 and 53 of carrier parts 46 and 47 by a plurality of screws 66. Pins 67 and 68 are riveted to opposite ends of connecting member 65 and spools 69 and 70 are mounted respectively thereon. A hairpin spring 72 fits in grooves provided on pin 68 and spool 70 to retain the spool on the pin. Spool 69 is similarly retained on pin 67. The footing 27 is provided with horizontal slots 74 and 75 (FIGURE 1) for mounting the footing on spools 69 70. Enlarged ends 76 and 77 of slots 74 and 75 receive the full diameter end portions of spools 69 and 70, respectively, during assembly, but in use of the footing 27 loosely engages peripherally grooved portions of the spools at the narrower portions of the slots, as shown in FIGURE 6. The connecting member 65 is made flexible to enable nut 43 to follow the straight screw 32 while driving footing 27 through a vertically curved path. The footing 27 is inclined in one direction from the vertical in its lowered position and in the other direction from the vertical in its raised position, due to the curvature of its path. Thus, the inclination of footing 27 with respect to spools 69 and 70 changes as the footing is raised or lowered. Formerly it was not uncommon for binding to occur between footing 27 and spools 69 and 70, but it has been discovered that by providing the end of spools 69 and 70 with axial cross grooves, as indicated by numerals 79 and 80 in FIGURE 7, the ends are permitted to flex slightly and binding is prevented, enabling changes in inclination of footing 27 to occur normally so that raising and lowering is trouble-free. More specifically, the grooved portions of the spools constitute receiving portions which receive marginal edge portions of the material defining the horizontal slots in the footing 27 and the axially grooved ends of the spools form one or more integral resiliently flexible deformable portions.

End guide members 82 and 83 (FIGURES 1 and 4) are provided on the same side of curved glass window panel 25 as screw 32, and a central guide member 84 is provided on the opposite side of window panel 25 adjacent inside panel 15. These guide members are vertically curved to correspond substantially, but not exactly, with the curvature of the window panel 25, and are suitably secured at their lower ends to the bottom 19 of the door and at their upper ends to the tops of panels 15 and 17, respectively, adjacent opening 23. The slight difference in curvatures of the guide members and window panel 25 causes a slight bind therebetween and prevents rattling of the window panel. The footing 27 is guided substantially vertically by the guide members 82, 83 and 84 to move curved glass window panel 25 in a path which is substantially an extension of the curvature thereof. Pieces of felt, nylon or other suitable material may be secured to footing 27, as at 85, 86 and 87 in FIGURES 2 and 3, to prevent the rubbing of metal on metal.

A roller 89 is mounted on a central portion of footing 27 for cooperation with a channel track portion of guide member 84 in guiding footing 27 and window panel 25 forwardly in the vehicle door at the end of the raising movement of the window panel. In this connection, the leftward curve in FIGURE 1 in the upper end of the channel track portion of guide member 84 will be noted in conjunction with the slotted connection between connecting member 65 and footing 27. Thus, it will be seen that footing 27 and window panel 25 are guided horizontally forward and backward in the vehicle door and also through a vertically curved path by only the three guide members 82, 83, and 84.

It can be noted from FIGURE 4 that footing 27 is closest to screw 32 when it is at the middle portion of curved guide members 82, 83 and 84, and that it is farther away from screw 32 when it is located toward the upper or lower ends of the guide members. The flexible connecting member 65 compensates for this relative horizontal displacement, as explained heretofore. The changes in position can be seen by a comparison of FIGURES 2 and 3. FIGURE 2 shows connecting member 65 in an unflexed condition representing a central location of footing 27 vertically along the guide members, and FIGURE 3 shows connecting members 65 in a flexed condition representing a location of footing 27 toward the upper or lower ends of the guide members. As previously explained, the axial grooves 79 and 80 in the ends of spools 69 and 70 prevent binding of footing 27 on the spools in the various positions of the footing.

It should be pointed out that motor 30, gear reduction mechanism 37, channel member 39, screw 32, the composite nut 43 and connecting member 65 form an assembly which can be readily removed for replacement by loosening brackets 34 and 41.

Having thus described my invention, it is obvious that various modifications may be made in the same without departing from the spirit of the invention; and, therefore, I do not wish to be understood as limiting myself to the exact forms, constructions, arrangements and combinations of parts herein shown and described.

I claim:

1. A thrust-transmitting device adapted to transmit motion from a first member moving along a first path to a second member moving along a second path disposed at varying distances from the first path comprising in combination:

a resilient spool connected to and movable with said first member,

said spool including a grooved receiving portion and adjacent integral circumferentially spaced resiliently deformable portions forming a part of said receiving portion,

and footing means having one portion connected to said second member and another portion received on the receiving portion of said spool and disposed in engagement with the resiliently deformable portion whereby to permit relative adjustment between said spool and said footing.

2. Mechanism for raising and lowering a curved window into and out of a door along a curved path comprising in combination:

footing means adapted to support one edge of a curved window and move the window between lowered to raised position,

said footing having generally horizontally disposed track means,

a vertically disposed helically threaded screw having nut means operatively received thereon for movement therealong upon rotation of said screw,

said nut being provided with laterally extending resiliently flexible portions supporting rollers disposed in said horizontal track means in vertical driving relation therewith,

a plurality of guide means adapted to be mounted in the door adjacent opposite sides of the footing for guiding said footing along a first path curved laterally of the axis of said screw,

at least one of said guide means including vertical track means coextensive therewith and having an upper portion defining a second path curved in a direction substantially at a right angle to the direction of said first path,

said footing having a bearing portion for mating cooperation with said vertical track means and said

curved guide means whereby said footing is adapted for vertical movement and substantially at a right angle thereto.

3. A thrust-transmitting device adapted to transmit motion from first member to a second member,

said first member including a nut adapted for cooperation with and travel along a linear path of a rotatable screw,

guides cooperable with the second member for guiding it in a path curved relative to said screw path,

a wing-shaped member supported by said nut and carrying spool means,

said spool means including a grooved annular portion and adjacent integral circumferential spaced apart resiliently deformable portions,

and footing means having one portion connected to the second member and another portion received on the grooved annular portion of said spool means and

disposed in engagement with the resiliently deformable portions whereby to permit adjustment between said spool and said footing while linear movement of said first member is transmitted to curved movement of said second member.

References Cited by the Examiner

UNITED STATES PATENTS

2,731,261	1/1956	Drum	268—133
2,966,071	12/1960	Wise	74—459 X
2,969,977	1/1961	Himka.	
3,014,380	12/1961	Martens	74—459

FOREIGN PATENTS

1,037,371	4/1953	France.

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