June 10, 1952 A. D. BRUNDAGE 2,599,744

WINDOW OPERATOR

Filed April 24, 1946 3 Sheets-Sheet 1

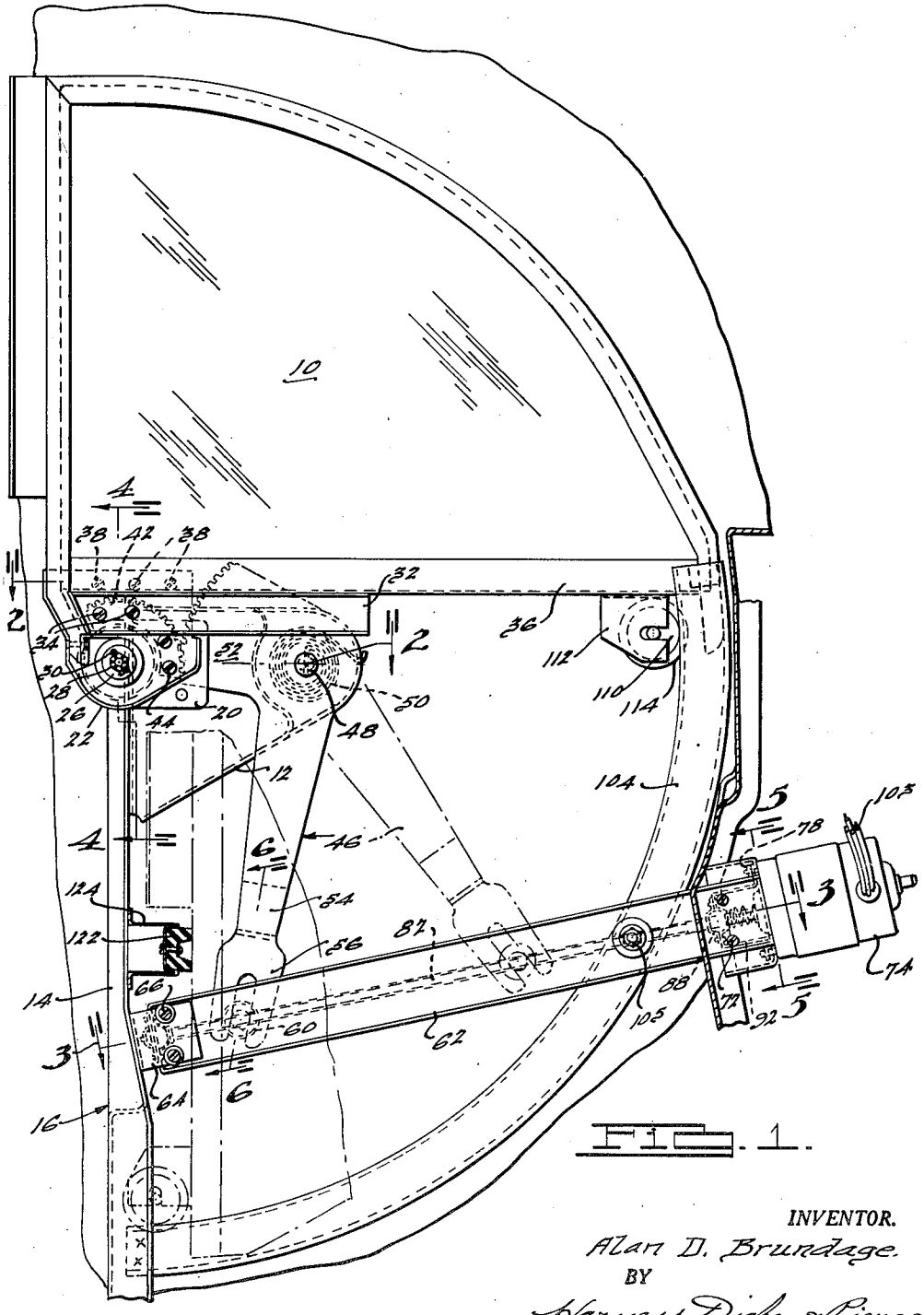


FIG. 1.

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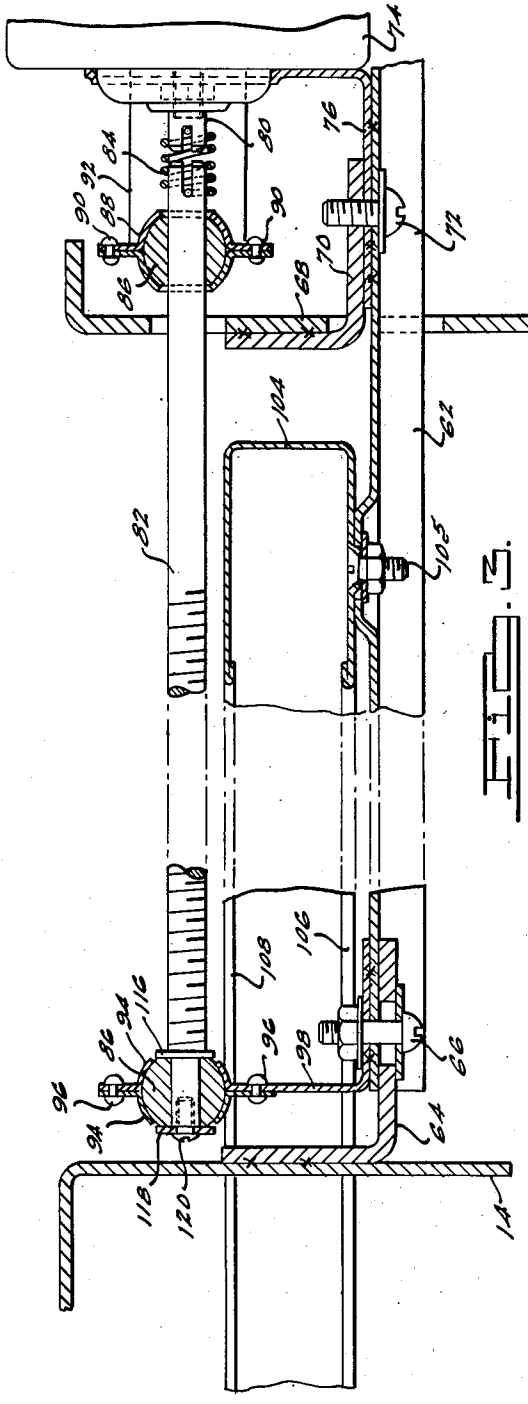


Fig. 1.

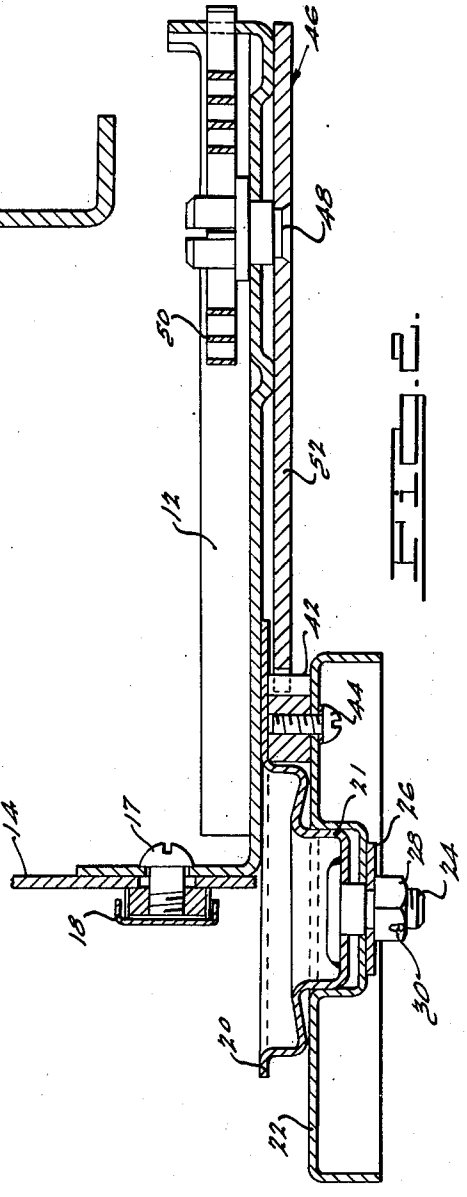


Fig. 2.

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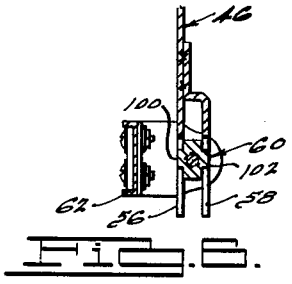


Fig. 5.

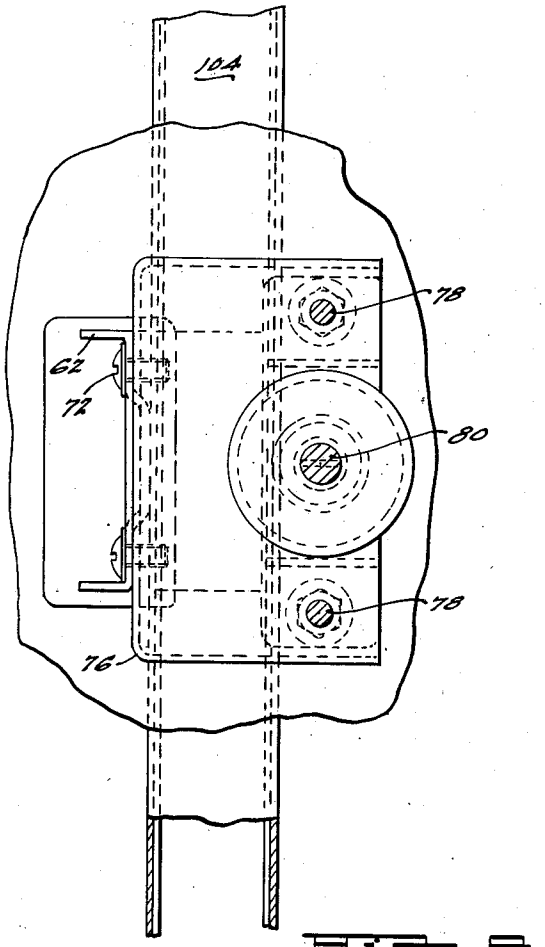


Fig. 3.

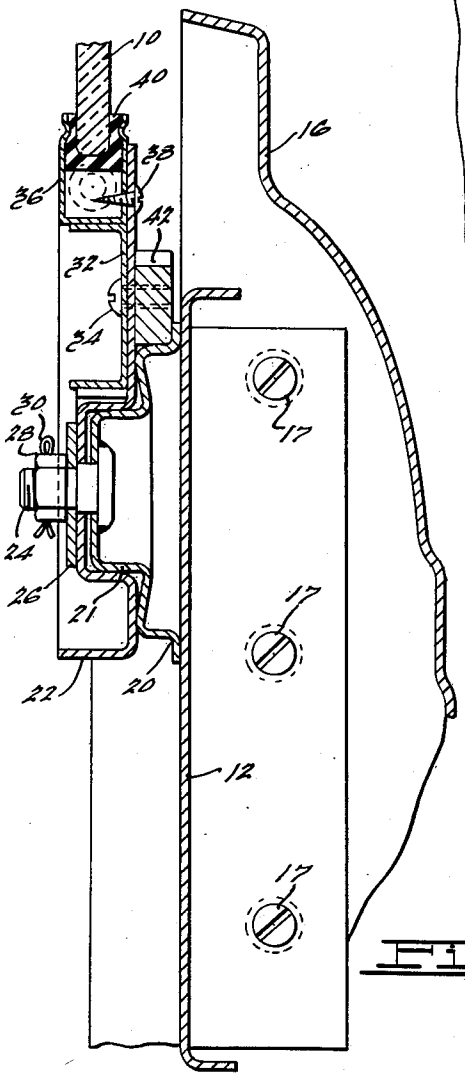


Fig. 4.

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WINDOW OPERATOR

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3 Claims. (Cl. 268—108)

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The present invention relates to window regulator mechanism and more particularly to an improved regulator mechanism especially adapted for opening or closing small or partial windows such as the conventional rear quarter panel window of a convertible coupé model.

One object of the present invention is to provide an improved window regulator mechanism which is simple in construction, economical of manufacture and assembly, and reliable and efficient in operation.

Another object of the present invention is to provide an improved nut and screw drive subassembly which may be readily installed in and removed from the regulator mechanism.

Another object of the present invention is to provide an improved motor driven window regulator mechanism adapted to pivot the window between its closed and open positions.

Another object of the present invention is to provide a window regulator mechanism having improved gear and lever means associated therewith for operating the window.

A further object of the invention is to provide an improved window regulator mechanism having gear means connected to said window and lever means having gear means associated therewith, said gear means being so proportioned that a relatively small movement of said lever means produces a relatively large movement of said window.

A further object of the invention is to provide an improved fully automatic window regulator of the above generally indicated type.

Another object of the invention is to generally improve the construction and operation of window mechanism of the above generally indicated type.

Other objects of the invention will become apparent from the following specification, from the accompanying drawings and from the claims hereinafter set forth.

For a better understanding of the invention reference may be had to the drawings wherein:

Figure 1 is a side elevational view partly in cross section, showing a window regulator mechanism constructed according to one form of the invention;

Figure 2 is an enlarged, partial cross sectional view taken substantially along the line 2—2 of Fig. 1;

Figure 3 is an enlarged, partial broken cross sectional view taken substantially along the line 3—3 of Fig. 1;

Figure 4 is an enlarged, partial cross sectional view taken substantially along the line 4—4 of Fig. 1;

Figure 5 is an enlarged, partial cross sectional view taken substantially along the line 5—5 of Fig. 1; and

Figure 6 is a partial cross sectional view taken substantially along the line 6—6 of Fig. 1.

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Referring to Figs. 1 and 2 of the drawings, the preferred embodiment there illustrated is shown adapted for operating a rear quarter panel window 10 of a convertible coupé model automobile. The regulator includes a triangular shaped bracket 12 supported along one side thereof on the pillar 14 of the body 16, and secured thereto by a plurality of bolts 17 and cage nuts 18. A plate 20 formed to provide a hub 21 thereon, is spot welded to the triangular bracket 12 adjacent one corner thereof. A supporting member 22 is pivotally mounted on the hub 21 and secured to the plate 20 by a shoulder pin 24 which receives a washer 26 and a nut 28 on its outer end. The nut 28 is pinned to the bolt 24 by a cotter pin 30. As best shown by Fig. 4, a channel 32 is secured to the supporting member 22 by a plurality of bolts 34, and is disposed horizontally above the hub upon which the member 22 is pivotally mounted, when the window 10 is in the closed position. The forward portion of the lower side of the window channel 36 rests on the upper edge of the channel 32 and is secured to the supporting member 22 by a plurality of screws 38. The window channel 36 supports the window 10 in the rubber channel mounting 40.

The bolts 34, which secure the channel 32 to one side of the supporting member 22, extend through the member 22 to engage a gear segment 42 and secure it to the other side of the member 22. Below the channel 32 the gear segment 42 is secured to the member 22 by bolts 44, as seen in Figs. 1 and 2.

Still referring to Figs. 1 and 2, a bell crank 46 has its apex pivotally supported on the triangular bracket 12 rearwardly of the hub plate 20 by the pivot pin 48. The inner end of the pin 48 is mounted flush with the surface of the bell crank and the other end is bifurcated to receive one end of a coil counterbalance spring 50, the other end of which is anchored in the bracket 12.

One end of the bell crank 46 comprises a gear sector 52 which extends generally horizontally toward the hub 21 and engages the gear segment 42. The radii of the gear segment 42 and the gear sector 52 are so proportioned that a relatively small angular movement of the sector 52 produces

a relatively large movement of the gear segment 42.

The other end of the bell crank 46 comprises a generally downwardly extending arm 54. Referring to Figures 1 and 6, the arm 54 is provided at its lower end with spaced bifurcated end portions 56 and 58 adapted to engage the nut 60 of a power driven nut and screw means described below.

Referring to Figs. 1, 3 and 5, and particularly to Fig. 3, a channel 62 serves as a frame or supporting member for the nut and screw means referred to above, and is secured at its forward end to the body pillar 14 by an angle bracket 64. The bracket 64 is spot welded to the pillar 14 and is connected to the channel 62 by a bolt 66. At a point spaced from its other end, the channel 62 is mounted on another body pillar 68 by a bracket 70 which is similar to the bracket 64 and has one leg spot welded to the pillar 68 and the other leg connected to the channel 62 by bolts 72. An electric motor 74 is mounted on the channel 62 adjacent the rear end thereof by a bracket 76 which is spot welded to the channel 62 and secured to the motor 74 by bolts 78.

The shaft 80 of the motor 74 is connected to an elongated screw shaft 82 by means of a coil spring 84 which affords a spring drive between the motor 74 and the shaft 82. The shaft 82 is universally mounted at both ends in spherical balls 86 having a bore extending therethrough adapted to receive the shaft 82. The ball 86 adjacent the driven end of the shaft 82 is mounted in two hemispherical elements 88 having outwardly extending flanges secured together by a plurality of rivets 90. One of the hemispherical elements 88 has a bracket portion 92 integrally formed thereon, one end of which is secured to the motor 74 by the bolts 78. The ball 86 at the forward end of the shaft 82 is similarly mounted in a pair of hemispherical elements 94 similarly held together by rivets 96 and one of said elements 94 has a bracket portion 98 integrally formed thereon which is spot welded to the channel 62. As may be seen in Fig. 6, the nut 60 is threadedly received on the screw shaft 82 and is provided with opposed boss portions 100 and 102 adapted to cooperate with the bifurcated portions 56 and 58 of the arm 54 on the bell crank 46.

The ball 86 which universally supports the forward end of the shaft 82 also serves as a thrust bearing to prevent axial movement of the screw shaft 82. As best shown in Fig. 3, a shoulder 116 integrally formed on the shaft 82 engages the ball 86 to prevent axial movement of said shaft in one direction and a disc 118 mounted on the end of the shaft by a bolt 120 engages said ball 86 to prevent movement of the screw shaft 82 in the opposite direction.

The motor 74 is connected to the electrical system of the automobile by wires 103 (Fig. 1), through a control switch (not shown) by means of which power may be supplied to the motor to run it in either direction.

Referring again to Figs. 1, 3 and 5, an arcuate channel shaped guide rack 104 is disposed in the plane of the window 10 and concentric with the hub 21 with the open side thereof presenting radially inwardly. The rack 104 is spot welded at its lower end to the pillar 14, and is secured to the channel 62 by a machine screw 105, the head of which is made flush with the inner surface of the guide by countersinking the guide. Said guide rack 104 is adapted to receive a portion of the window channel 36 of the window 10 as the window is pivoted from the closed to the open position. The inwardly presenting edges 106 and 108 of the guide rack 104 are adapted to engage a roller 110 carried by a bracket 112 mounted on the frame 36 of the window 10. The roller 110 is provided with flanges 114 at either end thereof adapted to receive the guide rack 104 therebetween and engage the opposed external surfaces thereof to prevent lateral movement of the roller 110 and hence the window 10, relative to the guide rack 104.

It will now be appreciated that, by removing the screw 105 and the bolts 66 and 72, the channel 62 and the entire nut and screw drive means mounted thereon may be readily removed as a unit.

The operation of the above described window regulator is as follows. Commencing with the window 10 in the closed position illustrated in Figure 1, the control switch is turned to apply electrical power to the motor 74 and turn it in an opening direction. The motor 74 through its shaft 80 and the spring 84 drives the screw shaft 82 in a direction to cause the nut 60 mounted on the screw shaft 82 to move rearwardly along the shaft 82 or to the right as viewed in Figure 1. This travel of the nut 60, through its engagement with the bifurcated end portions 56 and 58 of the bell crank 46, causes the gear sector 52 to pivot in a counterclockwise direction and drive the gear segment 42 in a clockwise direction. In this manner the glass 10, which is mounted on the same supporting member 22 upon which carries the gear sector 42 is rotated in a clockwise direction about the hub 21 in an open direction. This movement may be continued until the window 10 reaches the position indicated in broken lines in Figure 1 in which the frame 36 abuts against a rubber stopper 122 mounted on the pillar 14 by bracket 124, at which time the window 10 has pivoted through an angle of 90° and is then in the fully opened position. It will be understood that the window may be closed by turning the control switch to a position in which power is supplied to the motor 74 to drive it in the opposite direction and thus reverse the above described operation.

Although only one form of the invention has been illustrated and described in detail it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the claims.

What is claimed is:

1. In combination with a vehicle body, a window disposed in a substantially vertical plane, a bracket mounted on said vehicle body, a frame carrying said window and mounted on said bracket for pivotal movement between open and closed positions and about an axis at right angles to said plane, a pinion gear sector of relatively small radius mounted on said frame coaxial with said axis for movement with said frame, a bell crank pivotally mounted on said bracket for pivotal movement about an axis parallel to said axis, said bell crank having one arm portion shaped to form a gear sector of relatively large radius meshing with said pinion gear sector, an elongated screw shaft, means rotatably mounting said shaft on said body, a nut threaded on said shaft for movement axially thereof upon rotation of said shaft relative thereto, said bell crank having a second arm having a sliding engagement with said nut, a motor mounted on said body and operatively connected to said

shaft, and a counterbalance spring urging said frame toward closed position.

2. A window regulator mechanism for mounting a window on a vehicle body for movement in a substantially vertical plane between open and closed positions, said mechanism comprising a frame adapted to be secured to said window, a bracket adapted to be mounted on said body, means for mounting said frame on said bracket for movement in the plane of said window, a pinion gear of relatively small radius operatively connected to said frame for pivotal movement about a horizontal axis and operable to effect opening and closing movement of said frame, a bell crank mounted on said bracket for pivotal movement about another axis in spaced parallel relation to said horizontal axis, said bell crank having one arm portion shaped to form a gear sector of relatively large radius meshing with said pinion gear sector, an elongated screw shaft, means for rotatably mounting said shaft on said body, a nut threaded on said shaft for movement axially thereof upon rotation of said shaft relative to said nut, said bell crank having a second arm having a sliding engagement with said nut, a motor adapted to be mounted on said body and operatively connected to said shaft, and a counterbalance spring urging said frame in a direction to move said window to said closed position.

3. In combination with a vehicle body, a window disposed in a substantially vertical plane, a bracket mounted on said vehicle body, a frame carrying said window and mounted on said bracket for pivotal movement between an open position and a closed position about an axis at right angles to said plane, a pinion gear sector of relatively small radius mounted on said frame coaxial with said axis for movement with said frame, a bell crank pivotally mounted on said bracket for pivotal movement about an axis parallel to said axis, said bell crank having one arm portion shaped to form a gear sector of relatively large radius meshing with said pinion gear sector, an elongated screw shaft, means mounting said shaft on said body and including an elongated member secured to said body at a pair of points spaced longitudinally of said member and disposed parallel and adjacent to said open position of said window, a nut threaded on said shaft for movement axially thereof upon rotation of said shaft relative thereto, said bell crank having a second arm having a sliding engagement with said nut, a motor mounted on said member and operatively connected to said shaft, a counterbalance spring urging said frame toward said closed position, an arcuately shaped guide rack having one end secured to said body receiving a marginal portion of the window, and means disposed intermediate said longitudinally spaced points of said member securing a portion of said guide rack spaced from said one end thereof to said member to support said guide rack for receiving a peripheral portion of said window during movement thereof from said closed position to said open position.

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