Feb. 13, 1951 C. C. FISH 2,541,579

WINDOW REGULATOR MECHANISM

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FIG. 1

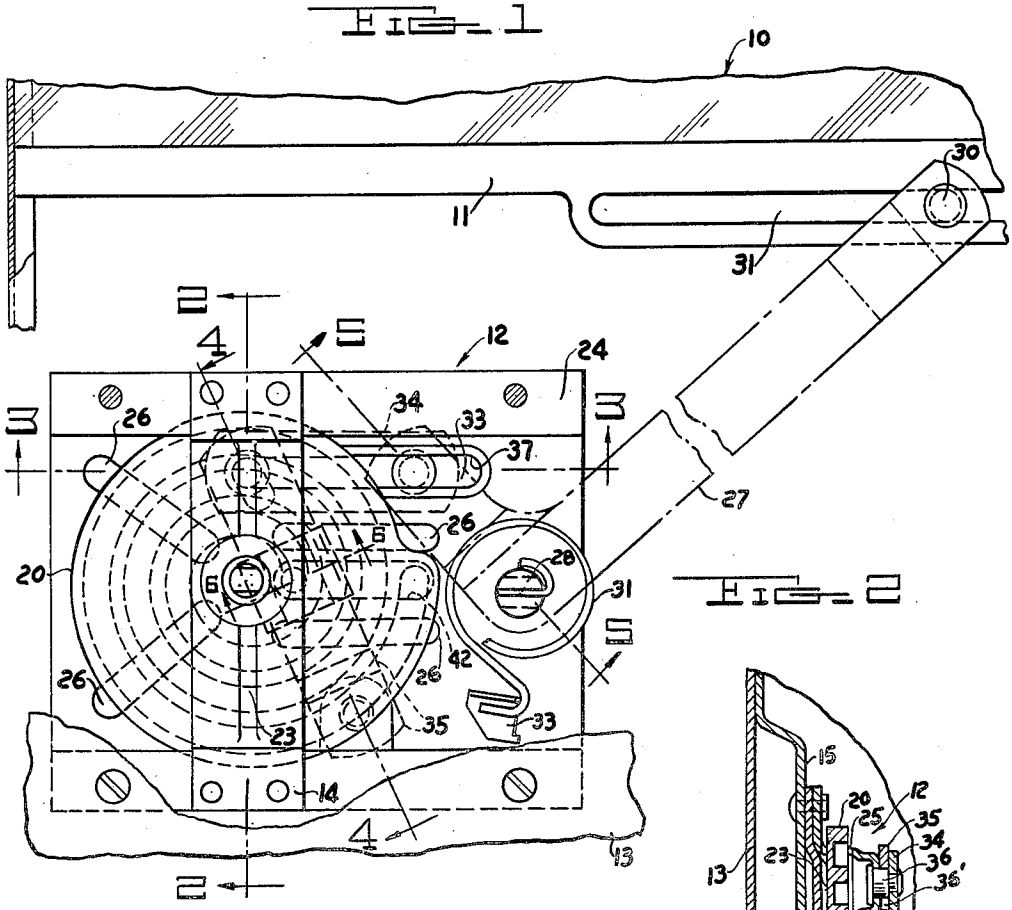


FIG. 2

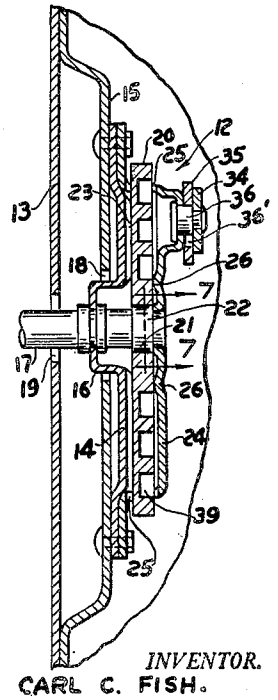
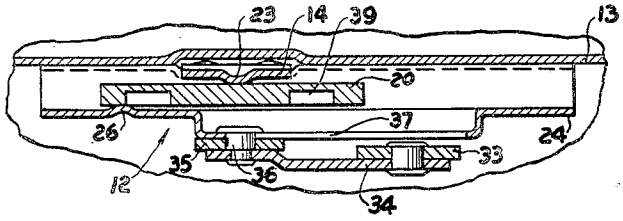


FIG. 3



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FIG. 7

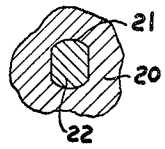


FIG. 4

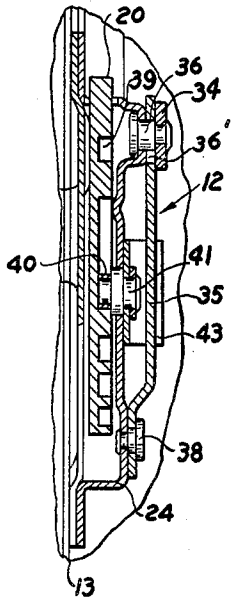


FIG. 6

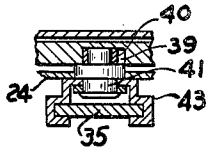


FIG. 5

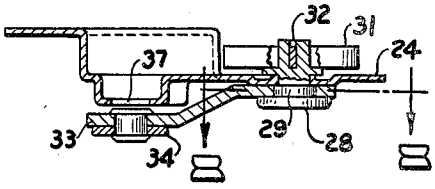
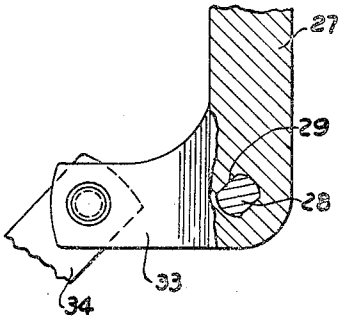


FIG. 8



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WINDOW REGULATOR MECHANISM

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5 Claims. (Cl. 268—126)

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This invention relates generally to window regulators and refers more particularly to improvements in regulators of the type employed in vehicle bodies for raising and lowering the windows usually incorporated in such bodies.

One of the objects of this invention is to substantially reduce the cost of manufacture of window regulators of the above type by simplifying the construction of the several parts involved and by reducing the number of such parts to a minimum.

Another object of this invention is to replace the complicated and expensive clutch unit usually employed in window regulator mechanisms with a relatively simple assembly capable of being inexpensively manufactured, assembled and installed.

A more detailed object of this invention is to provide an operative connection between the window regulator lift arm and the operating shaft or handle, embodying a rotatable plate having a groove in one face extending spirally with respect to the axis of rotation of the plate and engageable with a follower connected to the lift arm for swinging the latter in response to rotation of the plate. With this arrangement rotation of the plate by a force applied to the follower is prevented, and as a result, the window or closure is held in any desired adjusted position without the assistance of a specially constructed clutch.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a fragmentary side elevational view of a window regulator mechanism embodying the features of this invention;

Figures 2, 3, 4, 5 and 6 are respectively sectional views taken on the lines 2—2, 3—3, 4—4, 5—5 and 6—6 of Figure 1;

Figure 7 is a sectional view taken on the line 7—7 of Figure 2; and

Figure 8 is a sectional view taken on the line 8—8 of Figure 5.

Upon reference to Figure 1 of the drawings, it will be noted that the numeral 10 indicates a closure in the form of a window supported for vertical sliding movement and having a channel 11 suitably secured to the bottom edge thereof. The window 10 is operated by a regulator mechanism 12 fixed to a panel 13 which forms one side of a well adapted to accommodate the window when the latter is moved to its open position. The window regulator mechanism 12 is secured

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to the inner side of the panel 13 and occupies a position in the well below the window 10 when the latter is in its raised or closed position. It will be understood, however, that the regulator mechanism 12 is offset from the path of travel of the window 10 to provide sufficient clearance in the well for receiving the window when the latter is moved to its lowermost position in the window well.

In detail the window regulator mechanism 12 comprises a plate 14 secured to a reinforcing frame member 15 which in turn is secured to the panel 13. The plate 14 is embossed laterally inwardly to form a hub 16 having a central opening therethrough for receiving an operating shaft 17. The reinforcement 15 is formed with an opening 18 to provide clearance for the hub 16 and the panel 13 is formed with an aligned opening through which the shaft projects. An operating handle or other suitable driving mechanism may be secured to the inner end of the shaft for rotating the latter.

Positioned at the outboard side of the plate 14 is a rotatable member in the form of a disc 20 having a centrally disposed polygonally shaped opening 21 for receiving a correspondingly shaped enlargement 22 on the outer end of the shaft 17. Thus the disc 20 rotates as a unit with the shaft 17, and the inboard side of the disc has a bearing engagement with the adjacent surface of the plate 14. In order to reduce friction to a minimum, the plate 14 is embossed laterally outwardly at spaced points to form ribs 23 arranged to act as a bearing surface for the disc 20.

A second plate 24 is secured to the outboard side of the plate 14, and is embossed laterally outwardly to provide a space between the plates sufficient to accommodate the disc 20. As shown in Figure 2 of the drawings, the opposite sides of the embossed portion of the plate 24 are formed with slots 25 to enable the peripheral portions of the disc 20 to project therethrough. The plate 24 is also embossed laterally inwardly to form ribs 26 which are spaced from each other in a manner to cooperate with the ribs 23 on the plate 14 to form a bearing for the disc 20.

The plate 24 also forms a support for the lifting arm 27 having one end pivoted to the plate 24 in a manner to enable swinging movement of the arm in a plane parallel to the plane of movement of the window 10. In detail the lifting arm 27 is pivoted to the plate by a pin 28 journalled in an opening formed in the plate beyond the periphery of the disc 20 and having a polygonally shaped portion 29 adapted to fit

in a correspondingly shaped opening formed in the adjacent end of the arm 27. The swinging end of the arm 27 is provided with a laterally extending pin 30 which projects through an elongated slot 31 formed in the channel 11 in accordance with conventional practice. The slot 31 is of sufficient length to compensate for the angular motion of the arm 27. The arrangement is such that upward swinging movement of the arm 27 about the pin 28 imparts a sliding movement to the window 10 in an upward direction and downward swinging movement of the arm 27 about the pin 28 imparts a downward movement to the window 10. In the present instance the weight of the window 10 is counterbalanced to some extent by a spiral spring 34 having the inner end engaged in a slot 32 formed in the pin 28 and having the outer end anchored on the plate 24 by a bracket 33. Thus when the window is lowered by the arm 27, the sprial spring 34 is wound or tensioned, and thereby assists in raising the window 10 by the arm 27.

The regulator arm 27 is formed with an upwardly projecting extension 33 at the pivoted end thereof, and this extension is pivotally connected to one end of a link 34 having the opposite end pivotally connected to the upper end of a lever 35 by a shouldered pin 36. The pin 36 is slidably supported in a slot 37 formed in the plate 24 adjacent the upper end thereof and elongated in a direction parallel to the slot 31 in the window channel 11. It will be noted from Figure 4 that the upper end of the lever 35 is formed with an elongated slot 36' for receiving the pin 36. The length of the slot 36' is sufficient to compensate for the angular movement of the lever 35 about the axis of the pin 28.

The lower end of the lever 35 is pivoted to the plate 24 by a pin 38 in a manner to enable swinging movement of the lever in a plane parallel to the plane of swinging movement of the arm 27. The above construction is such that swinging movement of the lever 35 in a clockwise direction (Figure 1 of the drawings) imparts a downward swinging movement to the arm 27 through the link 34 to lower the window 10. On the other hand, swinging movement of the lever 35 about the axis of the pin 38 in a counterclockwise direction operates the arm 27 through the link 34 to raise the window 10.

In accordance with the present invention the lever 35 is operated in response to rotation of the disc 20. This is accomplished herein by forming a groove 39 in the outboard face of the disc 20, and this groove extends spirally with respect to the axis of rotation of the shaft 17. A follower 40 in the form of a roller is engaged in the spiral groove, and is mounted on the inner end of a pin 41. The outer end of the pin 41 projects through an elongated slot 42 formed in the plate 24 and is connected to the lever 35 through a guide 43. The slot 42 extends parallel to the slot 37 and the center line of the slot 42 lies in a plane including the axis of the shaft 17. The construction is such that the pin alternately moves in opposite directions lengthwise of the slot 42 in response to rotation of the disc 20 in opposite directions by the drive shaft 17. The guide 43 is channel-shaped in cross section and is slidably supported on the lever 35 intermediate the ends of the latter. Thus movement of the pin along the slot 42 in response to rotation of the disc 20 imparts a corresponding movement to the guide 43 and effects a swinging movement of the lever 35 in a direction depending upon the direction of rotation of the disc 20. Inasmuch as the upper end of the lever is connected to the arm 27 by the link 34, it follows that the arm 27 is operated by the disc 20 to in turn operate the window 10.

What I claim as my invention is:

1. A regulator for a closure supported for sliding movement in an up and down direction, comprising a plate fixed to one side of the path of sliding movement of the closure, a member supported on the plate for rotation and having grooves at one side thereof defining a spiral path having as its center the axis of rotation of the member, a lever positioned to overlie the grooves and having one end pivoted to the plate for swinging movement in a plane substantially parallel to the plane of rotation of said member, a follower supported on the lever for sliding movement lengthwise of said lever and guided by the grooves, a lifting arm having one end portion pivoted on the plate and having the swinging end connected to the closure, and an operative connection between the swinging end of the lever and said lifting arm.

2. A regulator for a closure supported for sliding movement in an up and down direction, comprising a plate fixed to one side of the path of sliding movement of the closure, a member supported on the plate at one side of the latter for rotation and having a groove in one face thereof extending spirally with respect to the axis of rotation of the member, a lever positioned at the opposite side of the plate and having one end pivoted to the plate for swinging movement in a plane substantially parallel to the plane of rotation of the member, a follower supported on the lever for sliding movement lengthwise of the lever and extending through a slot in said plate into the spiral groove, said slot extending radially outwardly from the axis of rotation of the member and having the opposite ends respectively registering with opposite ends of the groove, a lifting arm having one end pivoted to the plate and having the swinging end connected to the closure, and a connection between the swinging end of the lever and lifting arm for swinging the latter in response to swinging movement of the lever.

3. A regulator for a closure supported for sliding movement in an up and down direction, comprising a support fixed to one side of the path of sliding movement of the closure, a member mounted on the support for rotation and having grooves in one face defining a spiral path having as its center the axis of rotation of the member, a lever positioned to overlie the face aforesaid of the member and having one end pivoted to the support for swinging movement in a plane substantially parallel to the plane of rotation of said member, a follower supported on the lever for sliding movement lengthwise of the lever and guided by the grooves, means on the support and engageable with the follower to confine movement of the follower in a straight line path of travel extending generally radially with respect to the axis of rotation of said member, a lifting arm having one end portion pivoted on the support and having the opposite end portion connected to the closure, and a link connecting the swinging end of said lever to the lifting arm.

4. A regulator for a closure supported for sliding movement in an up and down direction, comprising a support fixed to one side of the path of sliding movement of the closure, a member mounted on the support for rotation and having

grooves in one face defining a spiral path having as its center the axis of rotation of the member, said path having a plurality of relatively closely spaced convolutions arranged in a common plane substantially parallel to the plane of rotation of the member, a slot in said support extending radially outwardly from the axis of rotation of said member in overlying relation to the convolutions of the spiral path, a lever overlying the face aforesaid of the member and having one end pivoted to the support for swinging movement in a plane substantially parallel to the plane of rotation of the member, a follower supported on the lever for sliding movement lengthwise of said lever and guided by the grooves, means on the follower slidably supported in said slot for confining movement of the follower in a straight line path of travel, a lifting arm having one end portion pivoted on the support and having the opposite end portion connected to the closure, and an operative connection between the swing end of said lever and the lifting arm.

5. A regulator for a closure supported for sliding movement in an up and down direction, comprising a support fixed to one side of the path of sliding movement of the closure, a member mounted on the support for rotation and having grooves in one face defining a spiral path having as its center the axis of rotation of the member, a lever positioned to overlie the face aforesaid of the member and having one end

pivoted to the support for swinging movement in a plane substantially parallel to the plane of rotation of said member, a follower supported on the lever for sliding movement lengthwise of the lever and guided by the grooves, an elongated slot in the support extending in the general direction of swinging movement of the lever and located adjacent the swinging end of said lever, a lifting arm having one end portion pivoted on the support and having the opposite end connected to the closure, a link having one end pivotally connected to the lifting arm and having the opposite end slidably supported in said slot, and a slotted connection between the said opposite end of the link and the swinging end of said lever.

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