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REGULATOR FOR VEHICLE WINDOWS OR THE LIKE

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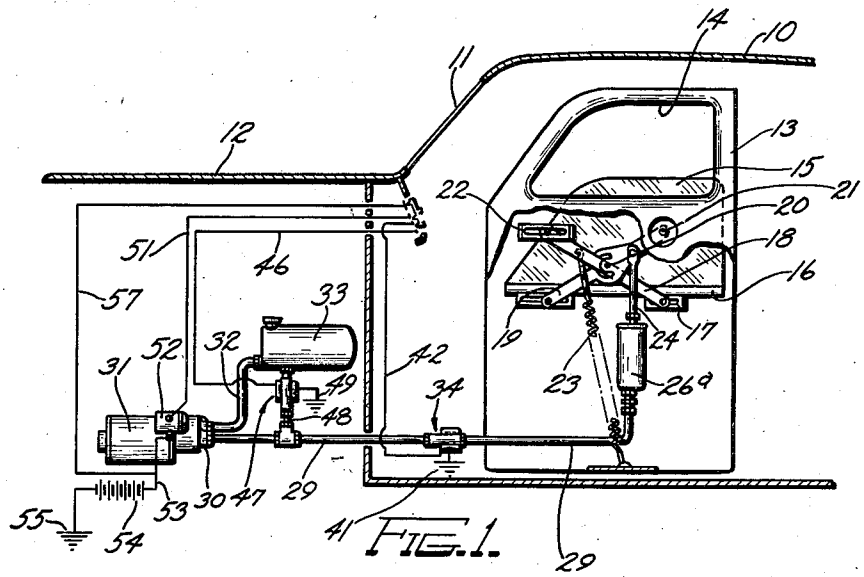


FIG. 1.

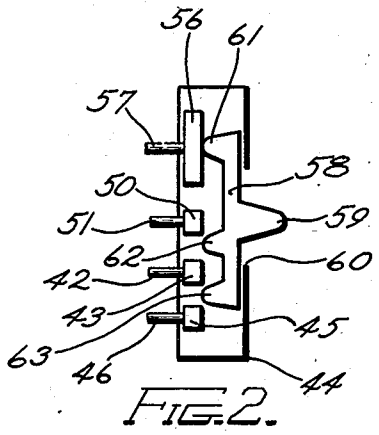


FIG. 2.

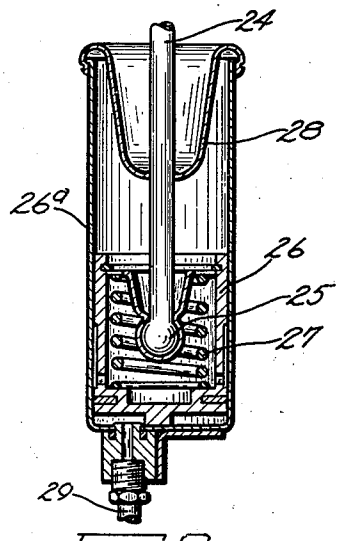


FIG. 3.

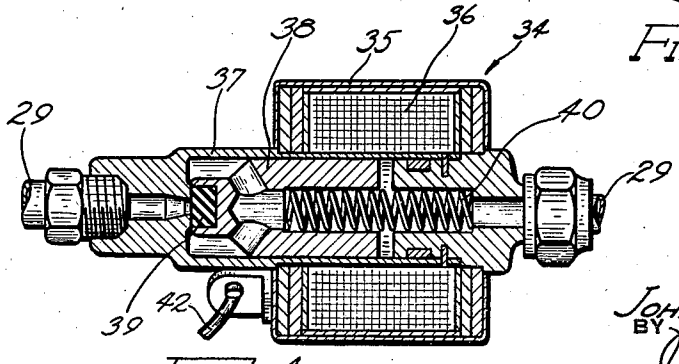


FIG. 4.

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REGULATOR FOR VEHICLE WINDOWS OR THE LIKE

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Application November 13, 1940, Serial No. 365,525

1 Claim. (Cl. 268—125)

This invention relates to vehicle window regulator mechanism for actuating the window to and from closed position but more particularly is concerned with regulators for automobile windows which are adapted to be operated by manipulation of a simple control device.

An object of this invention is to produce a vehicle window regulator mechanism by which hydraulic means operates to move the window in one direction and means separate from the hydraulic means operates to move the window in the opposite direction.

Another object is to produce regulator mechanism for moving a part, such as a vehicle window, between two limits of adjustment, motion in one direction being effected by electrically actuated means and in the opposite direction by spring means.

A further object is to produce a new and improved vehicle window regulator by which the window is actuated in one direction by hydraulic mechanism and in the opposite direction by separate means, both the hydraulic mechanism and the separate means being controlled by a common manually operated control device.

Other objects and advantages of the invention will hereinafter appear and for purposes of illustration but not of limitation an embodiment of the invention is shown on the accompanying drawing in which:

Figure 1 is a diagrammatic sectional elevation of a portion of an automobile body showing the regulator mechanism connected to operate the vehicle window toward and away from closed position;

Figure 2 is a diagrammatic view of the control button or switch, manipulation of which renders effective the regulator mechanism for moving the window in one direction or the other;

Figure 3 is an enlarged vertical sectional elevation of the cylinder and piston, the piston rod of which is connected to the cross arm regulator for operating the window in one direction; and

Figure 4 is an enlarged longitudinal sectional elevation of one of the solenoid controlled valves.

The illustrated embodiment of the invention comprises an automobile body 10 having the usual windshield 11 and hood 12. The body is shown diagrammatically as having a side door 13 on the upper portion of which is a window opening 14 which is adapted to be covered and uncovered by a window glass or panel 15 which may be guided for vertical reciprocatory movements to and from the usual well in the door disposed below the window opening 14. Embracing the lower horizontal edge portion of the window glass 15 is a channel 16 from which depends a pair of horizontally slotted retainers 17. Studs on the ends of regulator arms 18 and 19 are adapted to ride in the slots of the retainers 17 during the raising and lowering movements of the window glass. The regulator arms 18 and 19 are crossed, one extending through an arcuate slot in the window and being pivoted thereto at 20. The opposite end of the arm 19 has a fixed pivot 21 and the opposite end of the arm 18 has a stud mounted for horizontal sliding movement in a horizontally slotted bracket plate 22.

A helical coil spring 23 connects at its lower end to the door 13 and at its upper end to the regulator arm 18 intermediate the pivot 20 and the bracket plate 22. It will be observed that the spring 23 inclines from the lower end thereof to the left of Figure 1 and this arrangement is of decided importance in order to effect substantially uniform tension upon the cross arm regulator arrangement tending to urge the window glass 15 downwardly to its open position. More detail description and illustration of this structure is contained in my co-pending application Serial No. 355,350, filed September 4, 1940, to which reference is here made. Since the detail construction and arrangement of these parts form no part of the present invention, further description and illustration is not considered necessary.

As will hereinafter appear, the spring 23 plus the weight of the window glass 15 and the associated parts moves the window to its open position but movement of the window glass 13 to its closed position is effected hydraulically. For this purpose, the piston rod 24 is pivotally connected to the regulator arm 19 intermediate the pivotal connection 20 and the fixed pivotal mounting 21 thereof. The lower end of the piston rod 24 has a ball and socket connection 25 with a piston 26, a coil spring 27 being interposed between the ball and socket connection and the piston for compensating for any additional movement which may be imparted to the piston when the window is in its closed position. The piston 26 is reciprocable within a cylinder 26a and carried by the open end of the cylinder 26a is a dust guard 28 which is preferably non-metallic and engages the piston rod 24 by light frictional contact. The lower end of the cylinder 26a is closed but leading therefrom is a tube 29 which connects with a pump indicated at 30. This pump may be of any suitable character such as a gear pump which is driven from an electric

motor 31. The inlet end of the pump 30 is connected by a tube 32 to a reservoir 33 containing fluid such as oil. It will be apparent that in the operation of the motor, the liquid is drawn from the reservoir 33 through the tube 32 and thence forced by the pump 30 through the tube 29 into the cylinder 26a thereby forcing the piston 26 upwardly and upward movement of the piston 24 imparts upward movement to the window glass 15 to close or cover the window opening 14.

The liquid in rear of the piston 26 within the cylinder 26a is trapped for retaining the window panel 15 in its adjusted position by means of a solenoid actuated valve 34 which is interposed in the line of tubing 29. As clearly shown in Figure 4, the solenoid actuated valve 34 comprises generally a casing 35 having a solenoid 36 surrounding a two-part casing 37 in which a valve 38 is slidable, the valve having a head 39 which is normally held in closed position to prevent the flow of liquid from the cylinder 26a in a direction toward the motor 30 by a coil spring 40. The detail construction of the solenoid actuated valve forms no part of the present invention and it is believed that the above description is sufficient to afford a proper understanding of its construction and operation. Reference is hereby made to my co-pending application Serial No. 346,983, filed July 23, 1940, where complete details of the construction and operation of this structure are shown. The solenoid 36 is shown grounded at 41 and has a lead 42 extending to a contact piece 43 within the switch housing 44.

Disposed at one side of the contact piece 43 in the switch housing is a contact piece 45 which has a lead 46 extending to a solenoid actuated valve 47 connected in a line of tubing 48 which is connected to the reservoir 33 at one end and which joins to the tubing 29 at a point between the solenoid actuated valve 34 and the pump 30. The valve arrangement 47 is similar to the valve arrangement 34 so that further details or description and illustration are not believed necessary. The solenoid actuated valve 47 is grounded at 49.

On the opposite side of the contact piece 43 is a contact piece 50 which has a lead 51 extending to a relay 52 which dominates the motor 31, the relay 52 being connected by a lead 53 to a battery 54 which is gounded at 55.

Likewise arranged within the switch housing 44 is a relatively long contact piece 56 which has a lead 57 which joins the lead 53 in order to be supplied with electric current at all times from the battery 54. A switch member 58 has a handle or knob 59 which projects through a slot 60 in the switch housing 44 and also has three contact projections 61, 62 and 63. The projection 61 is at all times in sliding engagement with the contact piece 56 but the projections 62 and 63 can either be moved into engagement with the contact pieces 50 and 43 respectively or with the contact pieces 43 and 45 respectively. When the switch projections 62 and 63 are in engagement respectively with the contact pieces 50 and 43, the motor 31 and the solenoid actuated valve 34 are energized in order to force liquid from the reservoir 33 into the cylinder 26a for forcing the window panel 15 in an upward direction. On the other hand, when the switch member 58 is moved so that the projections 62 and 63 engage the contact pieces 43 and 45 respectively, the solenoid actuated valve 47 and the solenoid actuated valve 34 are energized to move their respective valves to open position. This enables the spring 23, aided by the weight of the window panel 15, to move the window downwardly. In such downward movement of the window panel 15 the liquid within the cylinder 26a is forced through the tube 29 and past open valves in the structures 34 and 47 and the tube 48 into the reservoir 33. Obviously the strength of the spring 23 must be so chosen as to enable the piston 26 to force the liquid back into the reservoir 33 as above indicated, as well as to operate the cross arm regulator for lowering the window. When the switch 58 is moved away from the contact pieces 43 and 45, the solenoid actuated valves 34 and 47 are deenergized enabling the coil springs such as the spring 40 abruptly to move the respective valves to closed position, trapping the liquid within the cylinder 26a and the adjacent portion of the tube 29 for holding the window in the adjusted position.

From the above description, it is manifest that an extremely simple and efficient window regulator is produced by which the window may be moved in one direction by hydraulic means and in the opposite direction by other means such as a coil spring. A single control button is effective for controlling the direction of movement of the window. It should be understood that although this mechanism is admirably adapted for use in actuating vehicle windows to and from closed position, it may be used also to advantage in effecting the movement of other parts of the vehicle such for example as the adjustment of the seats or the actuation of the top in a convertible automobile. In some cases it may be desirable that the solenoid controlled valve 47 be normally open but being adapted to be actuated to closed position when the window is moved upwardly or toward its closed position. This arrangement is of importance particularly in case the electric motor 31 is the starter motor for the vehicle engine so that in the operation of the starter motor, the liquid can be freely pumped to and from the reservoir 33.

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claim.

What I claim is:

A device for operating a window or like member movable between two limits, including a pump, an electric motor connected to operate said pump, a tank providing a liquid supply for the pump, a cylinder having a piston therein and a rod connected to the piston, a pipe leading from said pump to the cylinder, a second pipe leading from said tank to said first pipe, electromagnetic valve means in said first pipe interposed between said second pipe and said cylinder for controlling the admission of liquid into the cylinder, mechanism for effecting movement of the member to be operated in one direction, means to connect the rod to said mechanism for positively actuating the latter, means independent of the liquid pressure means for effecting movement of the member in an opposite direction, a second electromagnetic valve in said second pipe adapted when open to allow liquid to be returned to said tank upon operation of said independent means and upon opening of said first valve, and a switch common to said motor and said electromagnetic valves for selectively energizing same.

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