April 20, 1948. A. RAPPL 2,439,863

VACUUM OPERATED THREE-WAY VALVE

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Fig. 1.

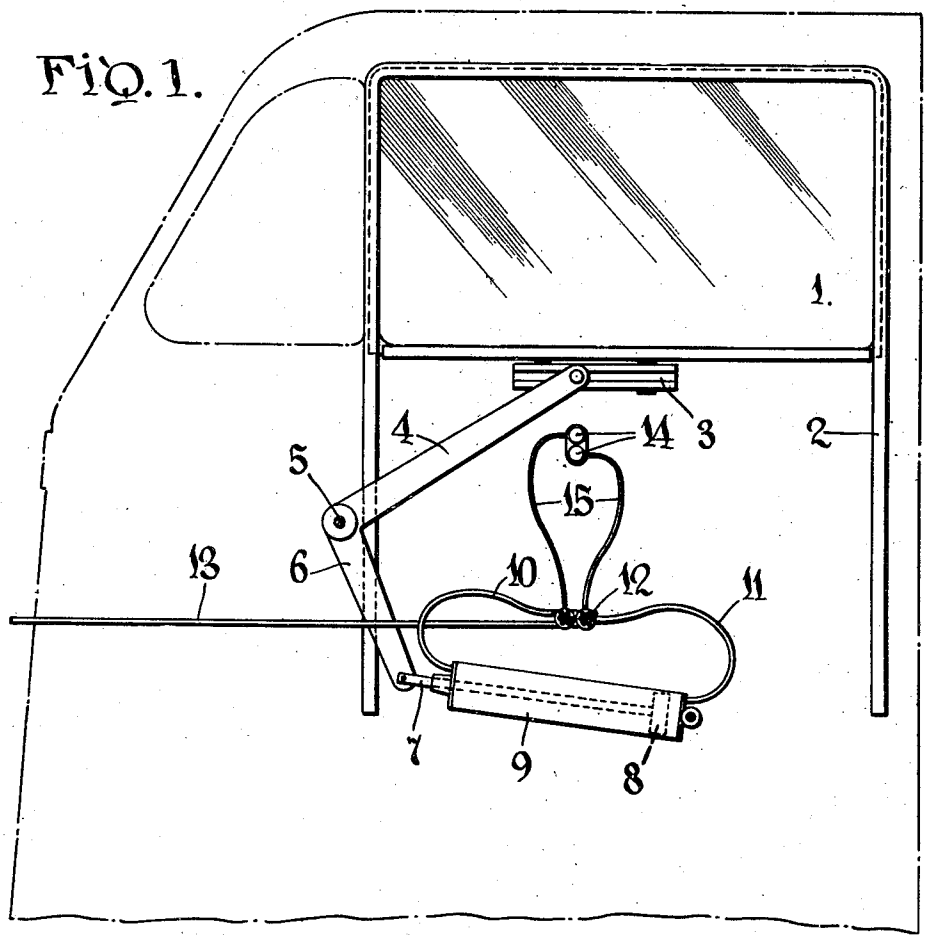


Fig. 5.

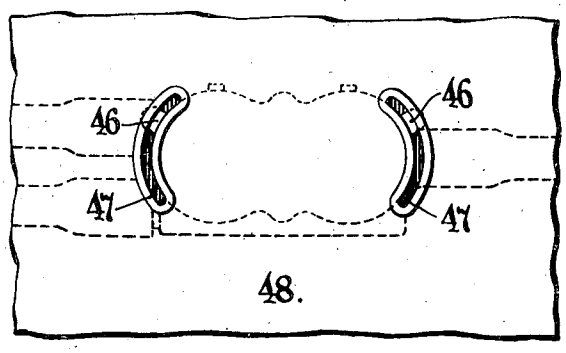
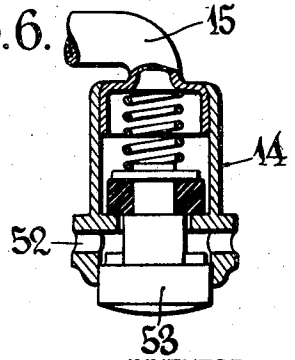


Fig. 6.



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Fig. 2.

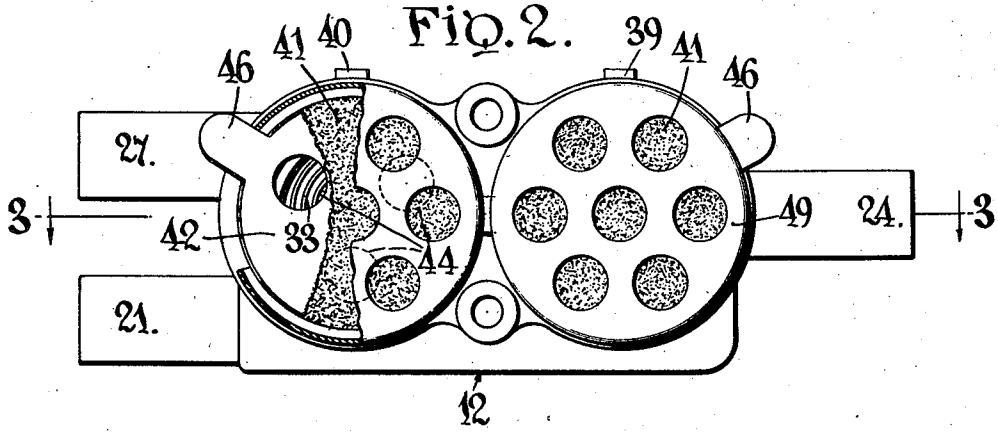


Fig. 3.

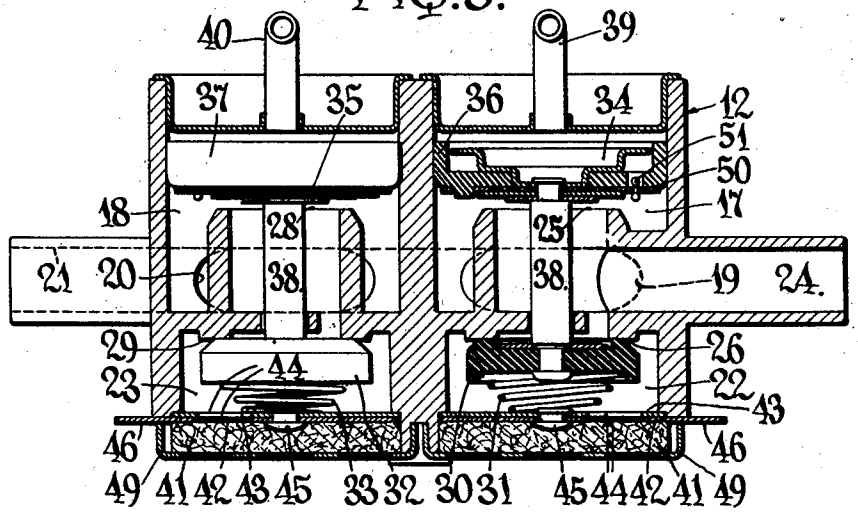
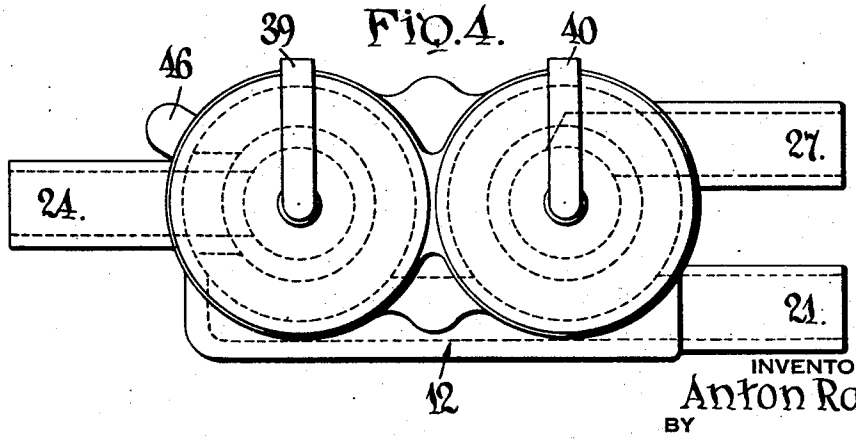


Fig. 4.



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VACUUM OPERATED THREE-WAY VALVE

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Application May 4, 1942, Serial No. 441,612

3 Claims. (Cl. 121—44)

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This invention relates to closure operators and is directed especially to a fluid operated window system for motor vehicles.

It has heretofore been proposed to open and close the windows of automobiles by fluid pressure, utilizing the intake manifold of the power plant as a source of operating pressure. In such installation the fluid motor is usually concealed within the confined quarters found in the lower portion of the hollow door of the vehicle. Consequently, the air conduits must be arranged to the best advantage so as to dispose the operating control toward the upper portion of the door to be accessible to the motorist. This has necessitated rather long tubes leading between the operating control and the motor which tended to delay the responsiveness of the motor.

The present invention has for an object to provide a window or closure system which is practical and readily adapted for installation within the door compartment. Further, the invention has for its aim to provide an all-fluid remote control for the motor by which the motor operating unit may be located in proximity to the fluid motor while a more distant operating control may be arranged in a position accessible to the motorist. The invention chiefly has for its object to provide an all-fluid window system which is efficient in operation and easily installed in that a single power line only is required to be brought over into the door.

In the drawings:

Fig. 1 is a diagrammatic view of an automobile door equipped with the window operator of the present invention;

Fig. 2 is a front elevation of the remote motor operating unit;

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 2 through the motor operating unit, parts being left in elevation;

Fig. 4 is a rear elevation of the unit;

Fig. 5 depicts the manner of adjusting the responsiveness of the unit; and

Fig. 6 is a detailed sectional view of the selector accessible to the motorist.

Referring more particularly to the drawing, the numeral 1 designates the window panel slidable in the guideways 2 and carrying on its bottom edge a bracket 3 in which the arm 4 of the bell crank lever is slidably engaged, the lever being pivoted at 5 and having its power arm 6 pivotally connected by a piston rod 7 to the piston 8 of a fluid motor. The motor chamber 9, at the opposite sides of the piston, is connected by the branch conduits 10 and 11 to the motor operating unit 12 located adjacent the fluid motor and in turn connected to the pressure supply line 13, leading to a source of pressure, such as the intake manifold of the vehicle engine. For selectively actuating the operating unit to open or close the window, valves 14 are provided in a position readily accessible to the motorist, being connected by conduits 15 to the unit 12.

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The motor control valve unit comprises a body having a pair of vacuum chambers 17 and 18, arranged side by side and opening through ports 19 and 20 into the pressure supply passage 21. The body also has a pair of atmospheric chambers 22 and 23 which are correspondingly related to the vacuum chambers, one for each. A motor passage 24 opens through seats 25 and 26 into one of the vacuum chambers and its associated atmospheric chamber, respectively, and a like motor passage 27 opens through seats 28 and 29 into the other vacuum chamber and its atmospheric chamber, respectively, the two motor passages being joined by conduits 10 and 11 to the motor. A valve 30 is normally held engaged with the seat 26 by an underlying spring 31, while a similar valve 32 is normally held engaged with the seat 29 by a spring 33. The vacuum chambers 17 and 18 are designed to receive the piston-like valves 34 and 35 for engaging the seats 25 and 28, such valves preferably being slidably mounted and sealed against air leakage by packing flanges 36 and 37, respectively. The seats of each pair are preferably in axial alinement and at the opposite ends of a passage through a partition wall so that the valves may be joined by a simple interposed spacer rod 38 whereby the seating of one valve will effect an unseating of the connected valve.

The vacuum chambers at the remote or upper side of the piston valves are connected by nipples 39 and 40 to the conduits 15 leading to the selector valves 14, the arrangement being such that as one or the other of the selector valves 14 is depressed to vent its conduit 15 to the atmosphere, the higher pressure will act upon the upper side of the selected piston valve and force it to its seat to interrupt the suction communication and, through the spacer rod 38, unseat the atmospheric valve to vent the respective end of the motor chamber to the atmosphere. The outside air may enter each atmospheric chamber through a filter 41, and in order to regulate the speed of motor operation this air flow may be throttled or determined, as by a rotary disc valve 42 engaging on a perforated closure wall or seat 43. The valve and seat are formed with registrable open-

ings 44 and are pivotally connected by a pin 45. An operating handle 46 extends from the valve disc so that the registrable ports may be brought more or less out of full registry to throttle the air flow into the atmospheric chamber. When installed, these handles may be rendered accessible by suitable means such as the slots 47 in the finishing panel 48 of the door. The filter pad may be secured in place by a foraminous retaining frame 49.

In the operation of the system, both ends of the fluid motor chamber are normally in communication with the suction source and when either selector valve is actuated to vent the connected upper end of the corresponding vacuum chamber the higher pressure will cause the piston valve to seat, for interrupting the suction communication, and the atmospheric valve to unseat whereby the atmospheric air will enter the fluid motor chamber and unbalance the piston 8 to move the window or closure. When the selector valve is closed, the spring (31 or 33) will seat the atmospheric valve and unseat the companion piston valve. To facilitate this restoration a small bleed orifice 50 may be provided in the piston valve to expedite the pressure equalization on opposite sides thereof outside the seat. The size of the equalizing bleed opening may be practically determined by mounting a smaller wire or plug 51 therein for giving a predetermined clearance.

The window system is an all-fluid one necessitating only one fluid line being brought over to the door from its supporting jamb. No electrical or mechanical remote controls are utilized and therefore the arrangement is simplified. The motor operating unit 12 being located adjacent the fluid motor provides for short fluid communications between the latter and the pressure line. This not only facilitates the installation of the fluid motor but also renders the motor quickly responsive to the touch of the motorist. The piston valves actually constitute auxiliary fluid motors for operating the valves of the motor operating unit from the remote selector controls. Each selector valve 14 may be of any suitable form to admit air through an inlet 52 into the conduit 15 when the valve button 53 is depressed.

The term "window" is used herein as inclusive of doors and other closures, the foregoing description being given in detail for clearness and not by way of limitation since the inventive principles involved are applicable to other physical embodiments without departing from the spirit of the invention or its scope as defined by the appended claims.

What is claimed is:

1. A fluid motor system having a fluid motor with a normally suction-balanced member therein, a motor control unit comprising a body having plural compartments each divided by a partition to provide a vacuum chamber and in an atmospheric chamber with the partition having a passage therethrough opening through valve seats in each chamber, a valve in the atmospheric chamber supported by a sustaining spacer from a valve in the vacuum chamber with the spacer acting to unseat one valve as the other seats, a pressure responsive wall in the vacuum chamber operative under a fluid pressure differential to seat the valve in the vacuum chamber, the vacuum chamber at the opposite side of the wall having a normally closed venting passage, pressure equalizing means normally providing restricted communication between the portions of the vacuum chamber at opposite sides of the wall, a suction supply line opening into each vacuum chamber, a chamber port from each partition passage leading to the fluid motor to so suction balance the member, a perforated closure wall for each atmospheric chamber, a perforated disk valve oscillatable upon the closure wall to register the perforations more or less in regulating the speed of operation of said fluid motor, means operable to selectively vent either venting passage, and spring means between each atmospheric valve and the respective perforated wall for normally seating such valve and unseating its associated vacuum valve.

2. A fluid motor system having a fluid motor with a normally suction-balanced member therein, a motor control unit comprising a body having plural compartments each divided by a partition to provide a vacuum chamber and an atmospheric chamber with the partition having a passage therethrough opening through valve seats in each chamber, a valve in the atmospheric chamber supported by a sustaining spacer from a valve in the vacuum chamber with the spacer acting to unseat one valve as the other seats, a pressure responsive wall in the vacuum chamber operative under a fluid pressure differential to seat the valve in the vacuum chamber, the vacuum chamber at the opposite side of the wall having a normally closed venting passage, pressure equalizing means normally providing restricted communication between the portions of the vacuum chamber at opposite sides of the wall, a suction supply line opening into each vacuum chamber, a chamber port from each partition passage leading to the fluid motor to so suction balance the member, a perforated closure wall for each atmospheric chamber, a perforated disk valve oscillatable upon the closure wall to register the perforations more or less in regulating the speed of operation of said fluid motor, means operable to selectively vent either venting passage, an air filter pad overlying each perforated disk valve, an open retaining frame overlying the pad and anchored to the body, and spring means between each atmospheric valve and the respective perforated wall for normally seating such valve and unseating its associated vacuum valve.

3. A fluid motor system having a fluid motor chamber with a piston therein, a motor control having plural compartments one for each side of the chamber, each compartment divided by a partition to provide a vacuum chamber and an atmospheric chamber with the partition having a passage therethrough opening through valve seats in each chamber, a valve in the atmospheric chamber and supported by a sustaining spacer from a valve in the vacuum chamber with the spacer acting to unseat one valve as the other seats, a pressure responsive wall in the vacuum chamber operative under a fluid pressure differential to seat the valve in the vacuum chamber, the vacuum chamber at the opposite side of the wall having a normally closed venting passage, pressure equalizing means normally providing restricted communication between the portions of the vacuum chamber at opposite sides of the wall, a suction supply line opening into each vacuum chamber, a chamber port from each partition passage leading to the fluid motor to actuate the piston, a perforated closure wall for each atmospheric chamber, a perforated disk valve oscillatable upon the closure wall to register the perforations more or less in regulating the speed of operation of said fluid motor, means operable to selectively vent either

venting passage, and spring means between each atmospheric valve and the respective perforated wall for normally seating such valve and unseating its associated vacuum valve.

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