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WINDOW OPERATOR

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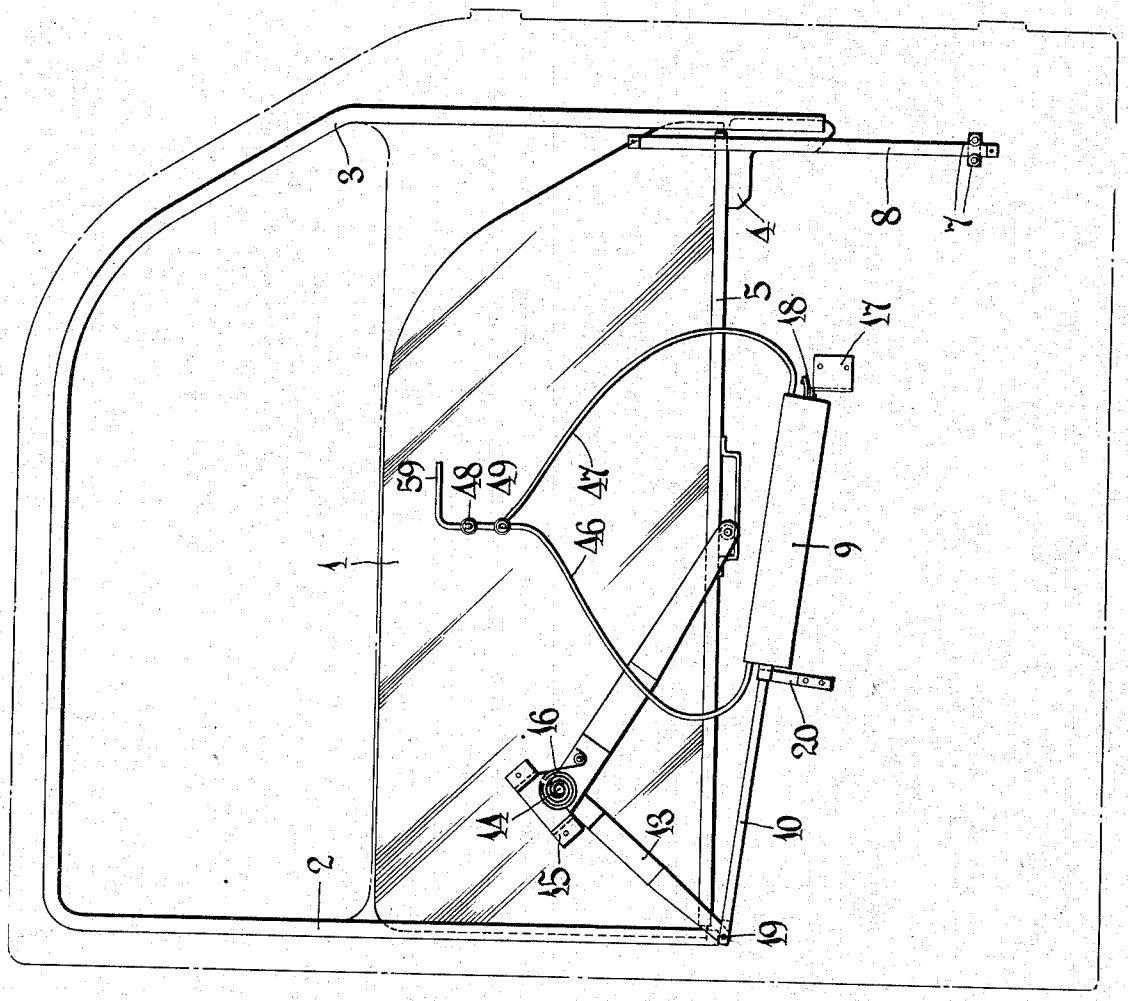

Fig. 1.

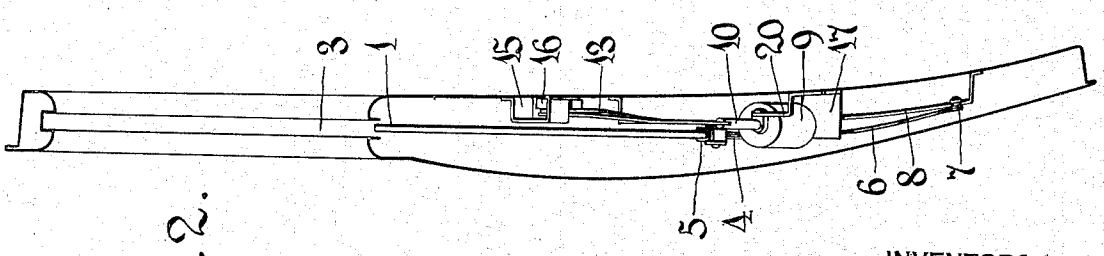

Fig. 2.

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Fig. 3.

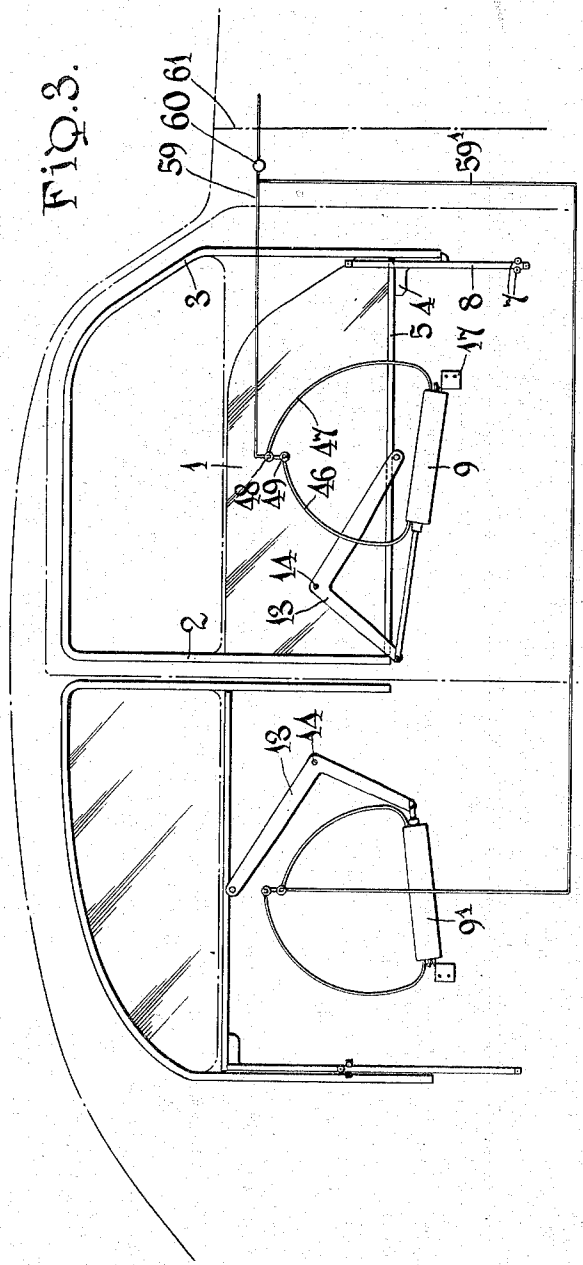


Fig. 6.

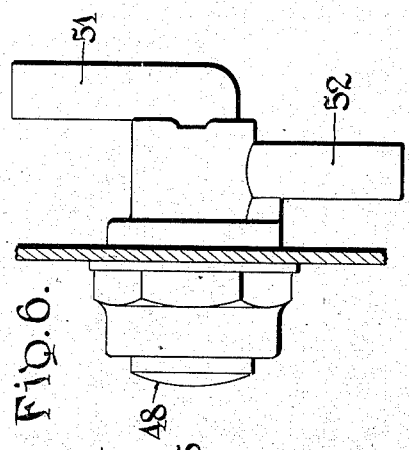


Fig. 5.

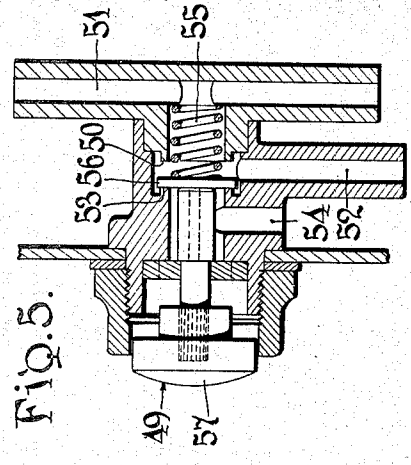


Fig. 7.

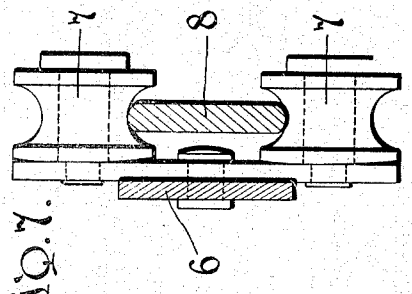
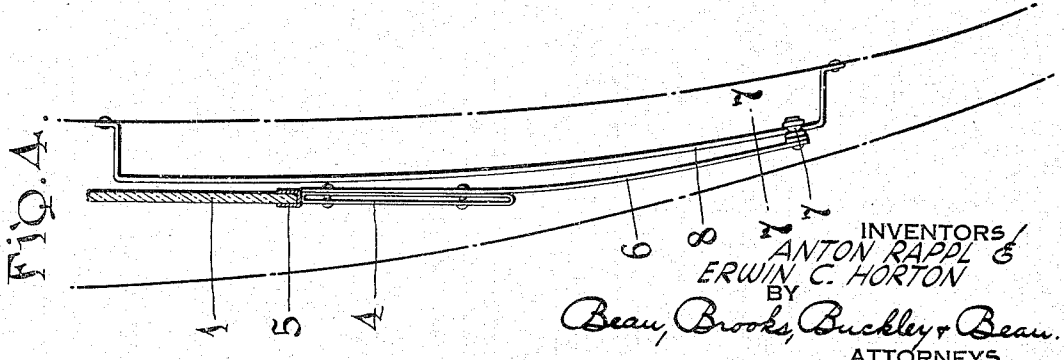


Fig. 4.



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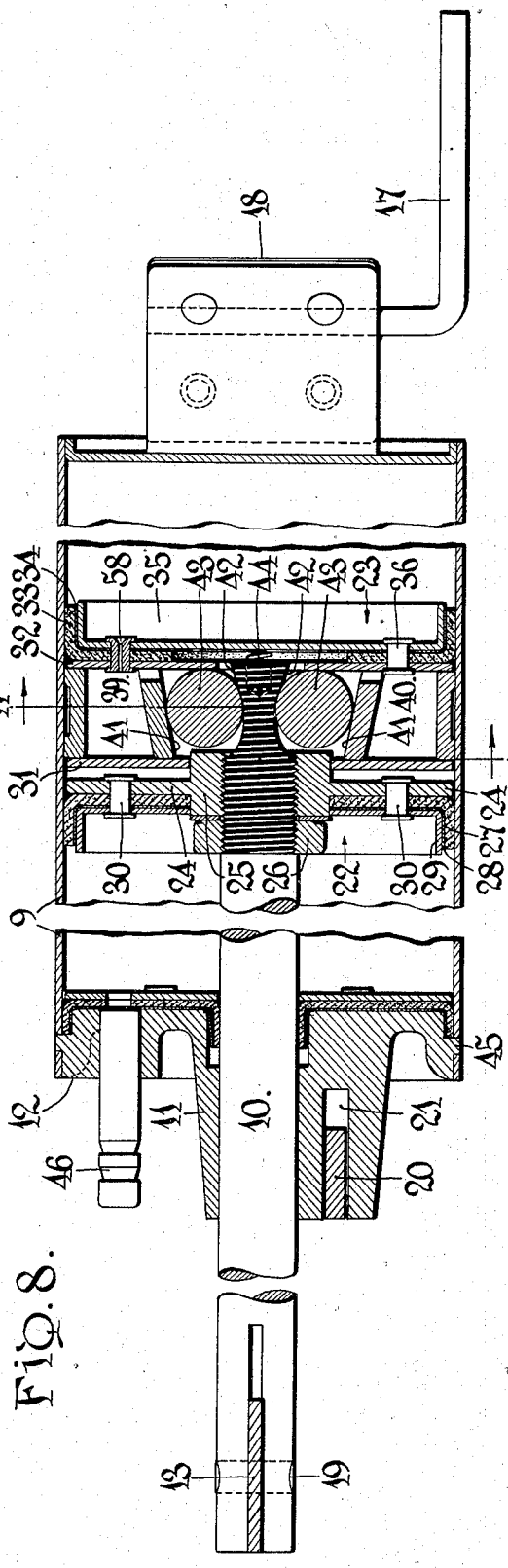

Fig. 8.

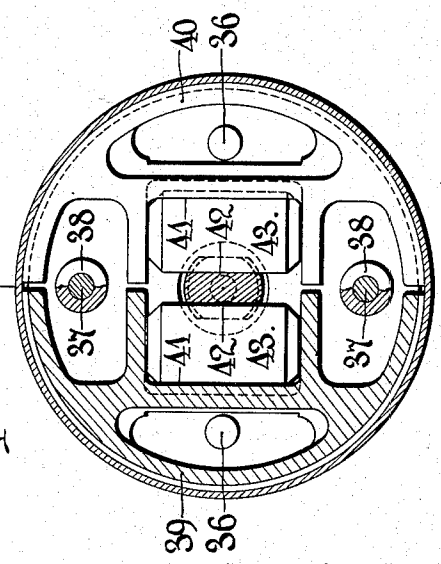

Fig. 11.

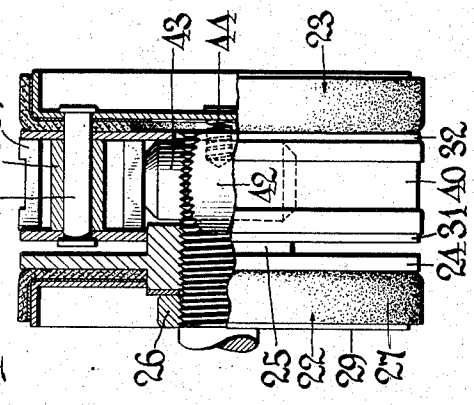

Fig. 10.

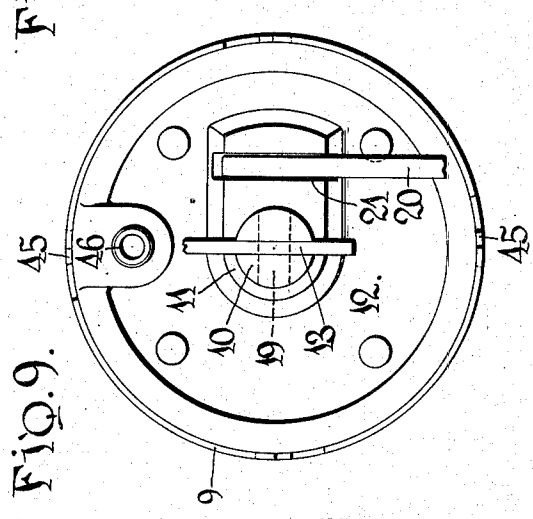

Fig. 9.

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UNITED STATES PATENT OFFICE

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WINDOW OPERATOR

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Application September 17, 1940, Serial No. 357,140

4 Claims. (Cl. 268—20)

This invention relates to an operating mechanism for the windows of automobiles and other motor vehicles and more particularly to the fluid pressure type of window operator.

It has heretofore been proposed to open and close the windows of automobiles by fluid pressure, such as by an air pressure differential utilizing the suction influence maintaining in the intake manifold of the power plant. In such prior disclosure the source of suction was placed in communication with the air motor cylinder at that side of the piston toward which it was desired to cause the piston to move. This necessitated the evacuation of the air content in such side of the piston chamber through a small and relatively long passage to the manifold in which latter the pressure influence was ever varying. Consequently there was a slight but noticeable lag in the response of the motor after opening the control valve.

The object of the present invention is to provide a window operator of this character which is more responsive to the demand of the motorist for greater efficiency. The invention further resides in an improved construction by which the operating mechanism is rendered more practical and durable.

In the accompanying drawings

Fig. 1 is a phantom view of a portion of an automobile body showing the present invention incorporated therein;

Fig. 2 is a vertical section through the automobile body showing the mechanism in end elevation;

Fig. 3 is a view similar to Fig. 1 but showing rather diagrammatically the operating mechanisms of plural windows;

Fig. 4 is an enlarged vertical section depicting more clearly the sash or window guide;

Fig. 5 is a sectional view through the window raising or closing control;

Fig. 6 is an elevation of the window lowering or opening control;

Fig. 7 is a cross sectional view about on line 7—7 of Fig. 4;

Fig. 8 is an enlarged fragmentary longitudinal section through the fluid motor of one of the window operators;

Fig. 9 is an end elevation of the motor;

Fig. 10 is a sectional view through the piston at right angles to the plane of Fig. 8, a portion of the piston being left in elevation; and

Fig. 11 is a transverse sectional view through the piston about on line 11—11 of Fig. 8.

Referring more particularly to the drawings, the improved mechanism has been depicted in connection with the vertically sliding type of window for the sake of illustration. This window is designated by the numeral 1 which is guided vertically in channel ways 2 and 3, and where the window tapers off toward one side, as illustrated in Fig. 1, a bracket part 4 may be secured to the bottom rail 5 of the window to extend the effective bearing in the particular guideway.

To insure against the glass tilting or binding in its guideways a bracket arm 6 (Fig. 4) extends downwardly from the bracket extension 4 and carries a pair of rollers 7 for running along a fixed track 8. By reason of the contour of the modern motor vehicle, wherein the lower portion of the door curves inwardly, the fixed track 8 is also given a conforming curvature and consequently the bracket arm 6 is provided of resilient material so as to readily yield and follow the track 8 without impairing the guiding and steadying influence thereof on the vertically slidable glass.

The window glass is elevated by means of a fluid motor, preferably one utilizing an air pressure differential in which the low pressure influence of the intake manifold may be used. As illustrated, the motor comprises a cylinder 9 (Fig. 8) having therein a movable wall serving in the capacity of a piston. The piston rod 10 extends through an elongated bearing 11 in the cylinder head 12 and has its protruding end operatively connected to the window to elevate and lower the same as desired. The connection disclosed embodies a bell crank lever 13 pivoted on a stud 14 carried by a bracket 15, and to this stud is fixed one end of a convolute spring 16 to counterbalance the sash, the opposite end of the spring being fixed to the sash connected arm of the bell crank. The cylinder is given free pivotal or yielding support on a bracket 17 by a short spring leaf 18 which permits the opposite end of the cylinder with its protruding piston rod to swing in a vertical plane for accommodating the arcuate travel of the pivotal connection 19 between the free end of the piston rod and the other arm of the bell crank lever incidental to the sliding motion of the piston. A steadying influence is exerted on the cylinder during this swinging movement by a fixed guide finger 20 which works in a slot 21 of the cylinder head 12.

The window operating mechanism incorporates means for self-locking the window against any attempt to force it open. According to the present disclosure such locking means are embodied in the motor unit. The piston comprises a fixed section 22 and a floating section 23, the former

being fixed to the piston rod and consisting of a body plate 24 having a hub 25 threaded on the piston rod and locked by a jam nut 26. On the body plate 24 is seated a cupped packing member 27, an expander 28 serving to hold the packing flange outwardly against the cylinder wall, and a retainer 29, the several parts being secured to the body plate by fastening means 30. The floating section comprises spaced guide plates 31 and 32, the latter having a cupped packing 33, an expander 34, and a retainer 35, suitably secured together as by fastening means 36, while the guide plate 31 is ring shaped and secured to this assemblage in spaced relation thereto by fasteners 37 and cooperating spacing sleeves 38. The spacing of plates 31 and 32 forms a chamber to guidingly receive a plurality of radially slidable brake or clutch shoes 39 and 40. Each shoe is formed with an inwardly facing cam surface 41 disposed in opposition to a cooperative cam face 42 on the fixed piston section, the faces 42 being conveniently formed on an extension of the piston rod which projects through the ring plate 31 as illustrated. Between each pair of cooperating faces 41 and 42 is a roller 43 which, upon relative movement of the two piston sections away from each other, serves to expand the shoes against the inner wall of the cylinder to lock the motor parts rigid and thereby effectively resist any unauthorized opening movement of the window.

For example, if the window 1 is attempted to be pushed downwardly from the outside of the vehicle, the rod 10 will be pulled and the cam faces 42 moved between the rollers 43 to urge them apart and effect movement of the shoes radially outward against the wall of the cylinder chamber. However, the effectiveness of the brake is nullified by any fluid pressure actuation of the piston since the pressure differential will act to push the trailing piston section toward the companion section and cause the shoes to be relieved of any roller pressure as the rollers move toward the lower ends of their cooperating cam faces.

The guide plate 31 may be given sliding support on the hub 25 of the fixed section, and a light spring 44 may be utilized to lightly urge the piston sections apart, thereby to cause the shoes to bear lightly upon the cylinder wall when the piston is at rest. The shoes may be cored out for lightness, and their cam faces 41 may constitute the bottom walls of the channels in which the rollers 43 are confined, as shown more particularly in Fig. 11. The cylinder head 12 may be secured in position by having a bayonet and slot coupling 45 to the cylinder.

Since the working pressure differential obtainable when using suction and the outside atmosphere is relatively small as compared with that obtained when using superatmospheric pressure it is highly desirable to secure a ready response to the available pressure differential in order to effect a prompt operation of the window. An important feature of the present invention resides in an arrangement by which the sensitiveness of response may be materially increased. This is accomplished herein by having the piston normally subjected to suction on both sides. The opposite ends of the cylinder are connected by conduits 46 and 47 through the respective controls 48 and 49, to the intake manifold or other suitable course of suction. Each control has a valve seat 50 between a suction passage 51 and a cylinder port 52 and a seat 53 between the cylinder port 52 and an atmospheric port 54, with a spring 55 serving normally to hold the valve member 56 on the atmospheric seat 53 so that the cylinder port 52 will be in communication normally with the suction supply passage 51. The valve member 56 is depressible by a knob 57 to uncover the atmospheric seat 53 and to close the suction seat 50, thereby venting the respective end of the cylinder to the atmosphere.

To avoid an objectionable pressure being maintained within the shoe chamber of the piston which might cause the floating section to move toward the companion section there is provided a restricted communication 58 in the floating section for providing a controlled equalization of pressure on the opposite sides thereof. For example, by momentarily lifting on the window to push on the piston an increase in the pressure in front of the floating section would result which would eventually pass through conduits 46 and 47 to equalize the pressure to the rear of the piston but before this equalization could take place, and assuming in the absence of the vent 58 that the pressure in the shoe chamber was substantially equal to that to the rear of the piston, then the momentary build-up of pressure in advance of the piston would provide a pressure differential on the floating section which would act to move it toward the fixed section and thereby temporarily release the shoes. Now should the window quickly be pushed down this temporary release of the shoes would permit the piston to slide without resistance for a brief interval or until the pressure differential dissipated sufficiently to be overcome by the spring 44. The provision of this vent will prevent the building up of a pressure difference sufficient to counteract the spring. The restriction of the vent is such, however, as not to defeat the functioning of the piston to actuate the window.

By this arrangement the suction is constantly applied to both sides of the piston when the motor is at rest. Upon venting one side or the other of the piston chamber to the atmosphere the pressure difference will quickly reach its maximum since the line of communication to the atmosphere is a relatively short one. Furthermore, the suction supply line 59, which connects the passages 51 to the intake manifold, is provided with a check valve 60 serving to prevent the dissipation of the low pressure in the motor cylinder should the manifold influence more closely approach atmospheric pressure. The importance of this is apparent when it is realized that the piston is normally adjacent one end of the cylinder and therefore the working chamber is unequally divided into two compartments so that if there were free two-way communication between the chamber and the intake manifold any reduction in the suction value would impress itself more quickly on the smaller one of the compartments and momentarily create a difference in the pressures at the opposite sides of the piston. This pressure differential would tend to manifest itself on the window and might even impart movement thereto at certain times when the engine throttle is quickly moved to a fully opened position. Then, too, with the more constant atmospheric pressure the build-up in pressure differential will be more rapid than under conditions where the cylinder is constantly open to the atmosphere at both sides of the piston and the air content at one side must be evacuated to create the working pressure differential.

Again, where plural window operating mechanisms are utilized the several cylinder chambers will be in constant intercommunication with each

other whereby the vacuous conditions in the companion motors may serve as a reserve supply for the operation of any particular mechanism to raise or lower the window after the engine is stopped. This general system is illustrated in Fig. 3 wherein a second motor 9' is shown having suction communication through conduit 59'. The check valve 60 is preferably located within the passenger compartment adjacent the dash 61 to foil any attempt to open the window by tampering with the window operating mechanism.

While the foregoing description has been given in detail it is obvious that the inventive teachings herein expressed may be incorporated in other physical embodiments without departing from the spirit of the present invention or from the scope defined in the appended claims.

What is claimed is:

1. In combination with a movable window, a fluid motor operatively connected thereto and having a chamber, a piston relatively slidable therein, said motor having fluid passages normally establishing communication between the chamber at opposite sides of the piston and a source of suction, and said piston comprising relatively movable sections each having fluid packing contact with the chamber wall for independent fluid actuation in a direction opposite to that of the other section, a piston rod connected to one of said sections whereby attempt to force the window open from the outside will move such section relative to its companion section, one way clutch means operable by such relative movement from the outside force to lock the piston against sliding on the chamber wall in a window opening direction while permitting manual closing of the window, and a controlled pressure equalizing communication through said companion section to avoid the building up of an operating pressure differential on the companion section by such outside force on the window during window closing movement whereby to avoid the buildup of any pressure effective to actuate said companion section.

2. In combination with a slidable window, a fluid motor operatively connected thereto and having a chamber, a piston relatively slidable therein, said motor having fluid passages normally establishing communication between the chamber at opposite sides of the piston and a source of suction, and said piston comprising relatively movable sections each having fluid packing contact with the chamber wall for independent fluid actuation, a piston rod connected to one of said sections whereby attempt to force the window open from the outside will move such section relative to its companion section, the latter section having a pressure equalizing passage therethrough, one way clutch means operable by such relative movement from the outside force to lock the piston against sliding on the chamber wall in a window opening direction while permitting manual closing of the window, and resilient means acting on the piston sections to urge the lock means toward an operative position, the equalizing passage serving to equalize the pressures on the opposite sides of such companion section when moved by the window toward a closed position whereby said resilient means will apply the lock immediately upon a reverse window imparted movement of the piston in a window opening position unhindered by any counteracting pressure buildup in advance of the companion section.

3. Window operating mechanism comprising, in combination with a window and a source of suction, a fluid pressure motor having a chamber and a piston slidable therein, means operatively connecting the piston to the window, means providing a constant communication between the source of suction and the chamber at both sides of the piston simultaneously to normally balance the latter by the suction or low pressure, means for interrupting the suction communication selectively at either side of the piston and venting the selected side to the atmosphere to effect an operative fluid pressure differential on the piston to adjust the window toward and from a closed position, and window actuated means operable to lock the piston and thereby hold the window in its adjusted position, said locking means being rendered inoperative by and during fluid imparted movement of the piston.

4. In a motor vehicle having plural windows, a fluid pressure operated member for each window operating in a chamber and dividing the latter into opposed compartments from which the fluid contents may be exhausted, conduits normally interconnecting the several compartments of the plural chambers at the opposite sides of the respective pressure operating members whereby the remaining compartments may serve as an auxiliary supply for a selected compartment, a suction supply line communicating with the conduits, means preventing air flow from the supply line into the conduits, and means for selectively venting any compartment while leaving the others interconnected for mutual assistance in effecting the desired pressure differential for the operation of the selected window.

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