Nov. 11, 1930. J. L. NILSON ET AL 1,781,189

MOTOR FOR OPERATING WINDSHIELD CLEANERS

Filed June 6, 1927 2 Sheets-Sheet 1

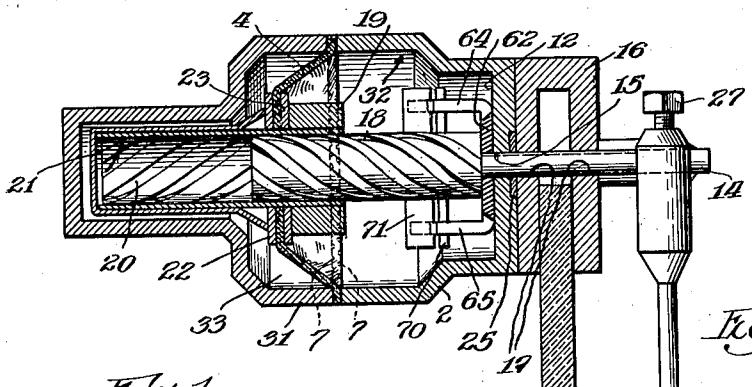


Fig. 1

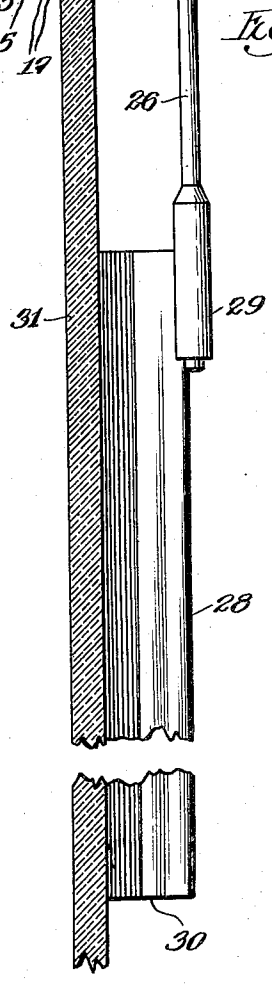


Fig. 2

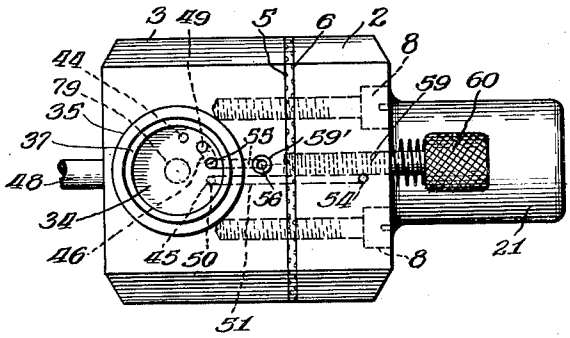


Fig 5

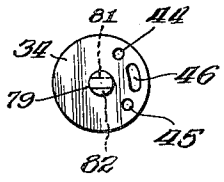


Fig. 6

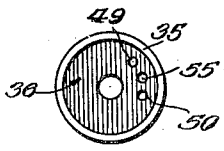
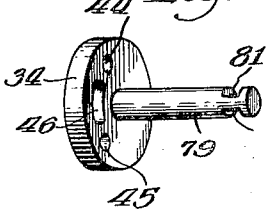


Fig. 7



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Nov. 11, 1930. J. L. NILSON ET AL 1,781,189

MOTOR FOR OPERATING WINDSHIELD CLEANERS

Filed June 6, 1927 2 Sheets-Sheet 2

Fig. 3.

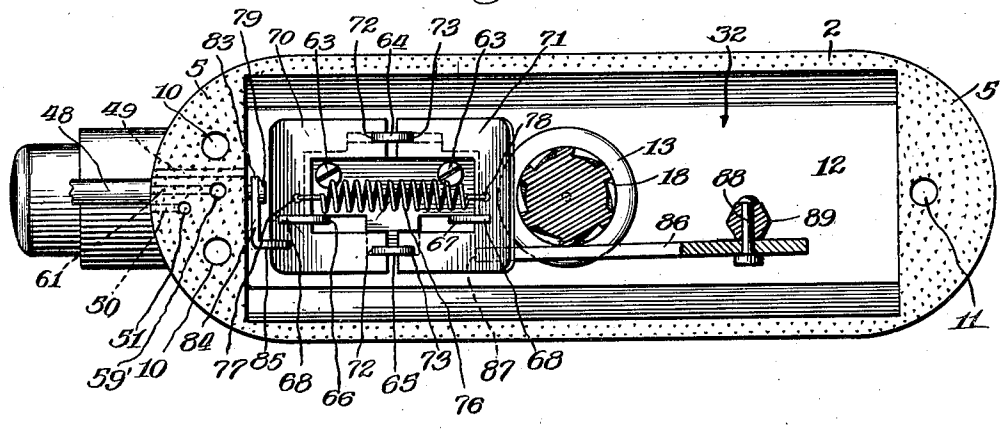
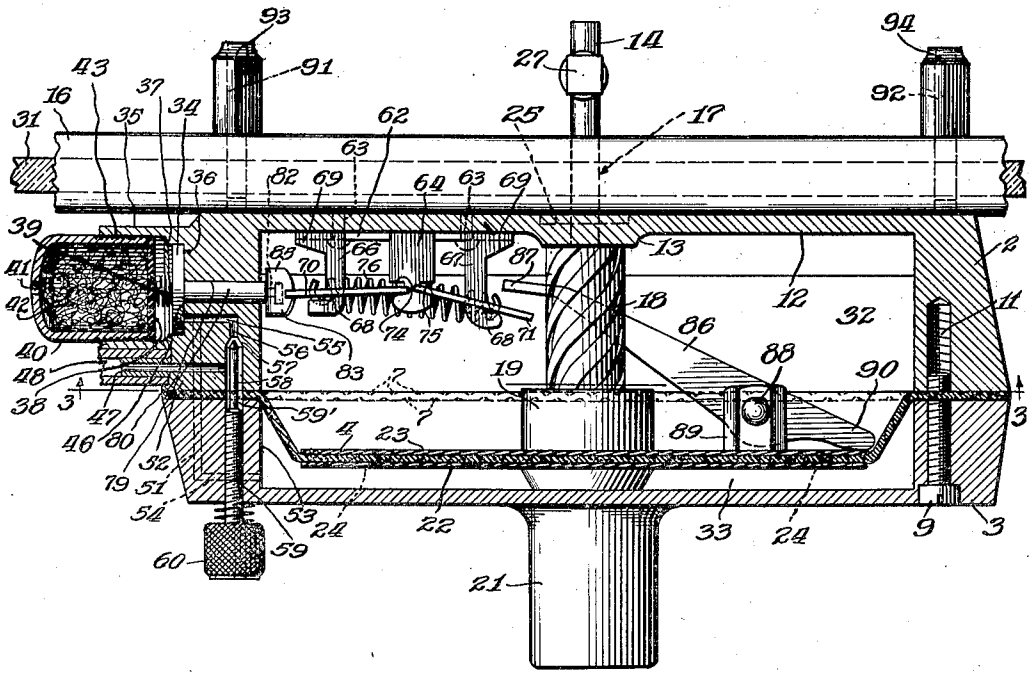


Fig. 4.



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UNITED STATES PATENT OFFICE

JOHN L. NILSON AND JOHN F. PRINCE, OF CHICAGO, ILLINOIS

MOTOR FOR OPERATING WINDSHIELD CLEANERS

Application filed June 6, 1927. Serial No. 196,700.

This application is a substitution for application Serial Number 503,913, filed September 28, 1921.

Our invention relates to motors for operating windshield cleaners and has particular reference to automobile windshields. One of the objects of the present invention is to provide improvements in diaphragm-operated mechanism described in our pending application No. 196,701, to the ends of practically confining the operating mechanism to the frame portion of the shield, to make it substantially a shield or cover for said mechanism; to still further simplify the construction; to increase its power; to reduce friction in the valve movement; to provide a form of valve that always covers all of the surface on which it moves and thus prevents ingress of dust, sand or other foreign matter between the valve and its seat; to shorten the path of movement of the valve; to provide automatic self-adjustment for the valve whereby wear will be taken up and the valve always held in substantially airtight contact with its seat; to improve the seal and the grip between the diaphragm and its casing, and to improve the accessibility to and assembly of the different parts.

With the above and other objects in view as will appear, our invention consists in the novel construction, combination and arrangement of parts, all as hereinafter described in detail, illustrated in the accompanying drawing and more particularly pointed out in the appended claims.

In the drawing—

Figure 1 is an outside end view, showing the end of the casing in which the valve and its ports are located, the positions of the latter being shown by dotted lines, parts being broken away and the valve removed.

Figure 2 is a transverse section of the casing in a position the reverse of that of Figure 1, and taken on line 2—2, Figure 4, with parts omitted, showing our windshield cleaner mounted on a section of windshield partly broken away, drawn to the scale of a working size.

Figure 3 is an open side view of one of the casing sections and its edges between which and the correspondingly configured edges of the cover section of the casing the edges of the diaphragm are clamped and sealed. Said figure is a section taken substantially on the line 3—3 of Figure 4.

Figure 4 is a top plan view of Figure 2 at right angles to the Figure 2 position and a section taken longitudinally thereof through the filter and to one side of the valve operating mechanism and of the valve actuating element.

Figures 5 and 6 are elevations of the contacting faces or surfaces of the valve and its seat, respectively.

Figure 7 is a perspective view of the controlling valve.

In the several views 2 and 3 represent the casing sections between the edges of which a diaphragm 4 is clamped. These edges 5 and 6 are roughened, or provided with small barbs, spurs, promiencies, or projections 7, 7 which are forced into the opposite sides of the clamped edge-portions of the diaphragm by screws or bolts 8 and 9 which occupy threaded holes or bores 10 for two bolts 8 by means of which the valve-end of the casing sections are drawn together, and a similar threaded bore 11 for the single bolt 9 clamping together the opposite ends of the casing sections.

The edges 5 and 6 of the two sections are so shaped as to bring their middle portions first into contact with the opposite sides of the diaphragm, leaving slight spaces between the end portions of the sections and the diaphragm after the middle portion is in contact. By then tightening the end screws and drawing the ends of the sections together the diaphragm will be very firmly clamped and air-sealed. This clamping, aided by the entry of the projections 7 into the fiber of the diaphragm will insure a firm grip upon the edges of the latter, the hollow casing sections being sufficiently flexible to sustain the slight bending thereof.

Within the section 2 its bottom 12 is formed with a boss 13 to thicken the bottom at that point as a bearing for a shaft or spindle 14 for which a bore 15 is made through said thickened bottom portion. In the windshield

frame 16 said bore is continued to carry the cleaner-arm end of the spindle to the outside of the shield, as indicated at 17 in Figures 2 and 4. Said spindle 14 is preferably a reduced or journal portion of a helical screw 18 to which a rotary oscillatory motion is imparted by means of a non-rotating and reciprocating nut the threads 20 in which are continued in an extension 21 of the nut projecting from the side of the diaphragm 4 opposite to that from which the nut 19 extends. The middle portion of the diaphragm is clamped between a pair of rectangular plates 22 and 23 secured together by rivets 24, or otherwise. The spindle 14 is held against longitudinal movement in one direction by the shoulder formed between the screw 18 and the spindle, and in the opposite direction it is held against similar movement by a collar 25 shrunk on, or otherwise secured to, said spindle. The latter carries the well known cleaner-arm 26 secured by a set-screw 27. In the present improvement this arm is made shorter and more rigid than heretofore, and instead of being secured to the middle of the cleaner or squeegee, as at 28 it is rigidly secured to the inner end of the squeegee 29, or the end thereof which describes the smallest arc, and which therefore has the slowest movement and produces the least friction between the cleaner and the shield.

The diaphragm divides the interior of the casing into two chambers 32 and 33 which are opened to the atmosphere and to any suitable air-suction chamber, such as the intake manifold of an automobile engine, through a single valve 34 in the form of a comparatively thin circular disc, shown separately in Figure 5. The valve-seat is shown separately in Figure 6, and a similar view of the latter is shown in Figure 1, while an edge view and section thereof is shown in Figure 4. The numeral 35 indicates a combination valve casing and filtering chamber of cylindrical form. The bottom of this chamber or casing 35 is counterbored to a depth slightly greater than the thickness of the valve 34, as most plainly shown in Figure 4, to provide a valve seat 36 and an annular shoulder 37 which forms a stop designed to limit movement toward the valve of a disc 38 between which and the valve is a spring 39. The disc 38 forms the bottom of an air filtering chamber and is brought to bear pressure against the spring by means of a thimble-form cap and extension 40 of the filtering chamber in the end of which cap is one or more air inlet holes 41. In the filtering chamber is packed any suitable filtering substance 42 and the cap is caused to engage the inner walls of the filtering chamber to vary its projection thereinto and its pressure against the disc 38, by any suitable arrangement. In the present embodiment of our invention we have shown a threaded engagement 43 between the filter cap and the disc 38. The latter is of larger diameter than the valve 34 and of slightly less diameter than the interior of the chamber 35 or valve casing outside of its annular shoulder 37, so that air may pass between the disc 38 and the walls of its chamber when the disc is not perforated for the same purpose. The shoulder 37 prevents the disc from closing the ports in the valve 34.

The valve is provided with a port 44 adapted to open the chamber 32 to the atmosphere through the chamber 35 and a similar port 45 which opens the chamber 33 in like manner. An elongated port 46 in the form of a depression in the seat face of the valve is adapted to alternately open the chambers 32 and 33 to any suitable suction chamber, such as the intake manifold of an engine (not shown), through a hose or pipe-nipple 47, and which nipple is connected by means of a suitable tube 48 with said suction chamber. The port 44 is adapted to be placed in register with a port 49 a straight bore through the end wall of the casing 2 and leads into the chamber 32. The valve port 45 is rotatable into register with a port 50 which leads to the diaphragm chamber 33 through a bore 51 communicating with the bore or port 50, but at right angles thereto. The port bore 51 continues through the end wall sections 52 and 53 and through the diaphragm, as shown clearly by dotted lines in Figure 4, to a point near the bottom of the casing section 3, or casing cover, where it connects with a bore 54 which leads into the diaphragm chamber 33 beyond the path of movement thereinto of the diaphragm 24. A port 55 passing through the valve seat is arranged to be always open to the depression 46, or elongated port in the valve. Said port 55 extends part way through the thickness of the wall portion 52, and is continued in a passage 56 which parallels the passage 51 and terminates in a valve seat 57 for a needle valve 58 on an enlarged and threaded stem 59 which has threaded engagement with a bore 59′ and is provided with a knurled head 60 whereby the valve may be adjusted to open, close, or modify the size of the passage by way of said needle valve. The span of the port or depression 46 is that of the distance from the central port 55 to and including either the port 49 or the port 50, and when, say, the port 46 places 55 and 50 in communication with each other to open the chamber 33 to the suction passages 56, 58 and the nipple 47 which is extended to 59′ by a bore 61 the port 44 will register with the port 49 and thus open the diaphragm chamber 32 to the atmosphere or air filtering chamber. Likewise when the port 46 is moved to connect 55 and 49 the port 45 will register with the port 50 to open the other chamber 33 to the atmosphere and open the chamber 32 to

the suction passages controlled by the valve 58.

The valve 34 is moved instantaneously, or with a snap movement, by a switch which is set into independent motion by the diaphragm movement. The switch mechanism comprises a base plate 62 secured by screws 63 to the bottom 12 of the casing section 2 out of which plate is struck up two pivot posts or uprights 64 and 65 and a pair of stop-members 66 and 67, each having a hook or lug 68 and an inclined shoulder 69, which serve to limit them respectively, outward and inward movements of a pair of pivotally movable U-shaped switch members 70 and 71 in each of the free ends of which is a pair of slots or notches 72 and 73. The latter are engaged with oppositely disposed notches 74 and 75 in the outer ends of each of the posts 64 and 65. The switch members are tensioned toward each other and held in engagement with the notches by a coiled spring 76 the ends of which are looped in bores 77 and 78 in the switch members and hold them in the angular relation either toward or away from the bottom 12 in which they are shown in Figure 4.

The swinging end of the switch member 70 is connected to move the valve 34 through a stud shaft 79 which is secured to and projects from the seat face of the valve and occupies a bearing bore 80 through the wall portion 52. Said shaft projects into the diaphragm chamber 32 and in the projecting end is a pair of oppositely disposed notches 81 and 82 which are engaged by a forked or bifurcated end 83 of a lever 84 with a bifurcated lug 85, the bifurcation or notch of which, engages the opposite sides of the switch member 70 as shown in Figures 3 and 4. The movements of said switch member impart a rocking movement to the lever 84 which rotates the shaft 79 and the valve 34 secured thereto.

The switch member 71, and therewith the member 70, is moved past "dead center" by a finger bar 86 having a contact finger 87 as a part thereof that lifts the swinging end of the lever 71 past "dead center" when the diaphragm moves toward the position in which it is shown in Figures 2 and 4. The bar 86 is pivoted on a pivot 88 mounted in a stud 89 and the latter is secured to the diaphragm clamp plate 23. The bar 86 has a heel 90 which limits its movement on its pivot and supports it against pivotal movement while moving the switch member 71. The pivoting of said bar 86 permits it to yield then its finger comes in contact with the bottom 12 prior to the end of the movement of the diaphragm in that direction.

The switch member 71, together with its co-operating member 70 are moved, through the spring 76, by the nut 19 carrying said members 71 past dead center during its movement toward the bottom 12. Thus the finger 87 moves the member 71 to the point where the independent switch operating spring 76 carries the members 70 and 71 to the positions in which they are shown in Figures 2 and 4 while the nut 19 starts the independent switch movement to bring the switches to the abutments 69. The quick, or snap movement, of the switch prevents keeping the chambers 32 and 33, or both sides of the diaphragm, simultaneously and partly open to the suction, which would be the case if the gradual movement of the diaphragm alone opened and closed the valve, or moved it from one position to another. The cleaner operating mechanism is set into motion, stopped, or its speed of operation varied, by simply manipulating the needle valve 58. The spring 39, or its equivalent, holds the valve 34 always closely to its seat, and if not absolutely perfect contact at first, the friction of the valve against its seat will improve its contact. By simply removing the three screws 8 and 9 all of the parts are made easily accessible and the valve and switch mechanism may be quickly taken apart by the process of simply "unhooking" and lifting the parts apart. The air filtering chamber provided by the cap 40 which serves to bear pressure against the spring 39 through the disc 38 practically eliminates the need of special arrangements for that purpose.

The diaphragm casing may be clamped onto the windshield frame in any preferred manner, but since the present construction involves drilling a hole through the frame for the spindle 14, a couple of additional holes may be drilled for a pair of bolts 91 and 92 having their ends secured to or cast in the back of the casing sections and provided with nuts 93 and 94 between which and the casing the windshield frame is clamped.

In Figure 1 the position of the connecting port 46 in the valve is shown dotted in one the seat 36 as having by the movement of the diaphragm toward the cover rotated the valve 34 to switch the suction from the chamber 33 to the chamber 32, the latter having just been placed in communication with the suction tube 48 through the channels 47, 61, 59′, 55, 46 and 49. The valve 44 is also dotted to show its closed position to the left of the port 49.

What is claimed as new is:—

1. A windshield cleaner actuating mechanism embodying a casing, an actuator member movable therewith, a valve seat, ports leading from said seat to the opposite side of said member, a suction port, a valve operable to alternately connect the first said ports with the said suction port, a pivotally mounted member operatively connected with the valve to oscillate the valve, a lever pivotally connected intermediate its ends with said actuator member and bodily movable

therewith, one end of said lever operating upon said pivotally mounted member for moving the latter about its pivot to actuate the valve in one direction, the other end of said lever contacting with said actuator member for maintaining the lever against movement about its pivot when the first said end thereof engages and actuates said pivoted member, a spring for assisting in the actuation of said pivotally mounted member, and means for actuating the valve in the other direction.

2. A windshield cleaner actuating mechanism embodying a casing, an actuator member movable therewith, a valve seat, ports leading from said seat to the opposite side of said member, a suction port, a valve operable to alternately connect the first said ports with the said suction port, a pivotally mounted member operatively connected with the valve to oscillate the same, a lever pivotally connected intermediate its ends with said actuator member and bodily movable therewith, one end of said lever operating upon said pivotally mounted member for moving the latter in one direction about its pivot, the other end of said lever contacting with said actuator member for maintaining the lever against movement about its pivot when the first said end thereof engages and actuates said pivoted member, a spring for assisting in the actuation of said pivotally mounted member, and means connected with said actuator member for moving the said lever in the opposite direction about its pivot.

In testimony whereof I, JOHN F. PRINCE, have signed my name to this specification, on this 6th day of May, A. D. 1927.

JOHN F. PRINCE.

In testimony whereof I, JOHN L. NILSON, have signed my name to this specification, on this 6th day of May, A. D. 1927.

JOHN L. NILSON.