May 10, 1927. 1,627,989

J. L. NILSON ET AL

AUTOMATIC WINDSHIELD CLEANER

Filed Feb. 10, 1923 2 Sheets-Sheet 1

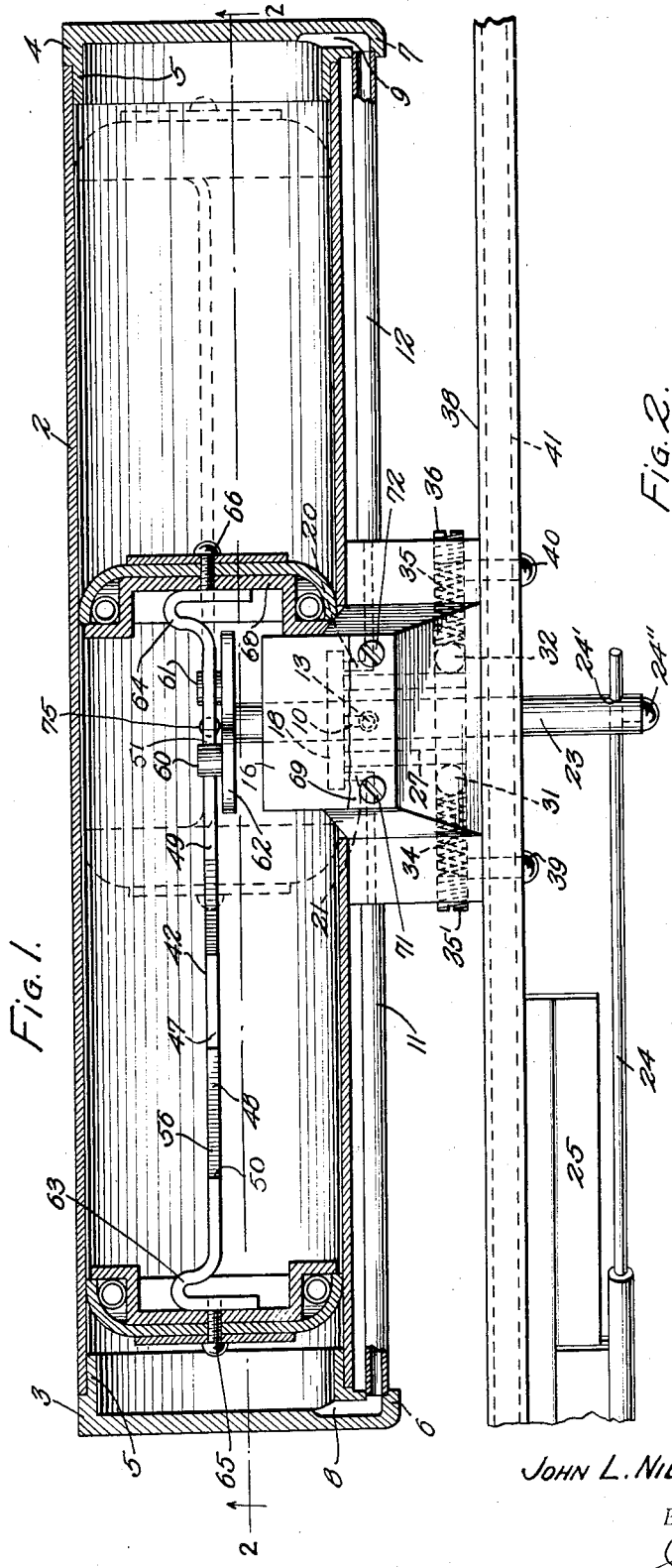


Fig. 1.

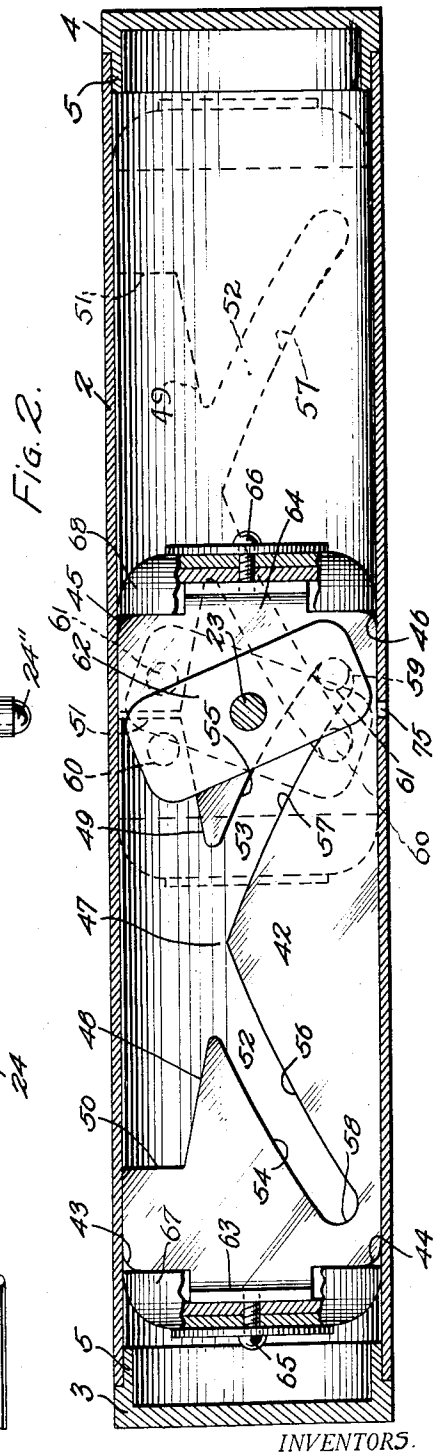


Fig. 2.

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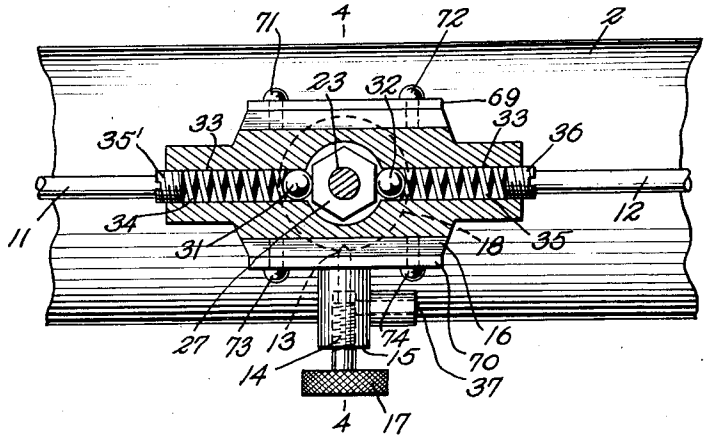
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Fig. 3.



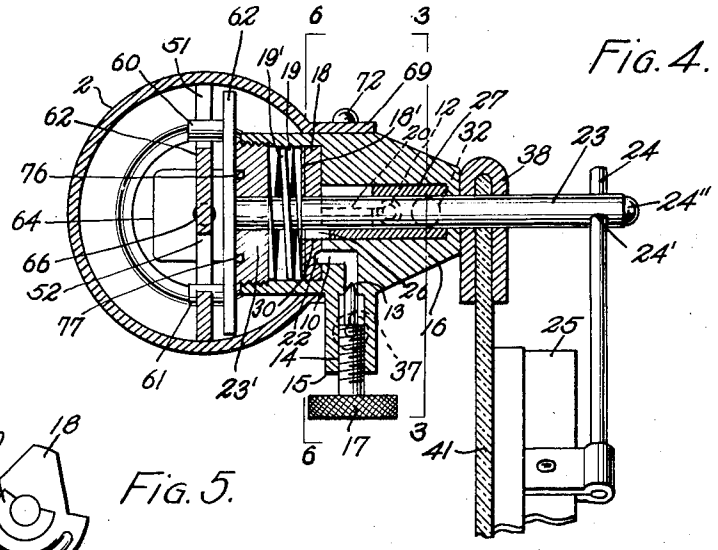


Fig. 4.



Fig. 5.

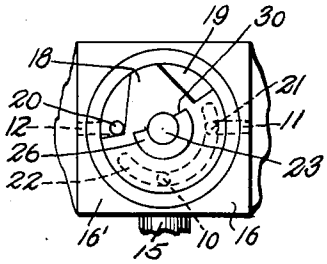


Fig. 6.

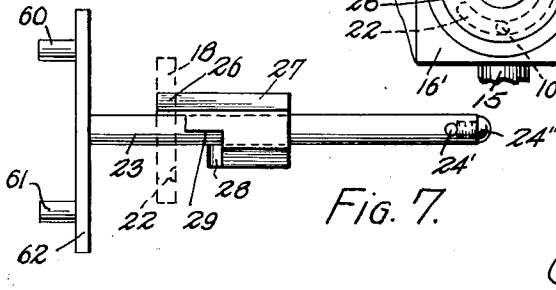


Fig. 7.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC WINDSHIELD CLEANER.

Application filed February 10, 1923. Serial No. 618,174.

Our invention relates to wind-shield cleaners, with particular reference to automobile wind-shields.

The general objects of our present improvement are to overcome the limitations to which the existing automobile wind-shield cleaners are confined with respect to the windshield frame to which they are attached and the transparent portion, or glass, which it is sought to leave unobscured as much as possible by the motor or driving mechanism; to make possible the extension of the latter to the full width or length of the wind-shield, if so desired; to provide a construction wherein the length of reciprocating movement which is changed into a rotary oscillating movement in the cleaner, or cleaner-arm, is not limited, as in former constructions, by the length of the arc of rotary movement. In the present improvement the cleaner motor may extend the whole length of the windshield to lessen the abruptness of the track incline by lengthening it between its predetermined highest and lowest point. The steeper the grade the more power is required to push an object up such a grade, but, of course, the "push" will be so much longer sustained and the swinging squeegee arm will swing with a slower swinging movement when the dip of the grade is increased. Thus, looking at Figure 2, for instance, the track 56 if extended from its lowest point indicated by the numeral 58 to its highest horizontal plane which may be represented, substantially, by the numeral 48 the upper end of the track will necessarily be moved farther to the right to reach said plane 48, and in so doing the inclination of said track will necessarily be lessened between the suggested horizontal planes indicated, as suggested, by said numerals 58 and 48. This also provides a simplified construction at a reduced cost whereby these devices are made available to the greater number of present would-be users who cannot afford to purchase expensive machines. Other objects are to obviate gears and gear racks as well as screw and nut movements, and to simplify the assembling.

And with the above named general objects in view our invention consists in the novel construction, combination and arrangement of parts, hereinafter described in detail, illustrated in the accompanying drawing and more fully pointed out in the appended claims.

In the drawing—

Figure 1 is a plan view of the operating mechanism, the cylinder being shown in horizontal section and parts broken away, same being shown attached to a section of wind-shield.

Figure 2 is a section taken substantially on the line 2—2 of Figure 1 showing in elevation the shaft-rotating elements, parts of the pistons being broken away to disclose a side view of the piston-connecting and shaft-rotating plate, bar or member.

Figure 3 is a section of a broken away portion of the mechanism, said section being taken substantially on the line 3—3 of Figure 4.

Figure 4 is a section taken substantially on the line 4—4 of Figure 3, including a broken away section of the wind-shield.

Figure 5 is an inner face view of the oscillating valve alone.

Figure 6 is a broken away portion of the shaft-bearing and valve-mechanism member and chamber, taken substantially on the line 6—6 of Figure 4.

Figure 7 is a longitudinal view of the shaft with the double lever or crank secured to and substantially integral with the shaft, the hexagon snap-over member loosely mounted on the shaft the dotted lines indicating the valve the opposite sides of which are shown in Figures 5 and 6.

Referring in detail to the several views, the cylinder 2 is provided with suitably secured ends, heads or caps 3 and 4, each of which has a reduced portion 5 which enters telescopically the end of the cylinder as shown in Figures 1 and 2. The cylinder and its ends 3 and 4 are free from moving mechanisms or valve attachments other than the pistons and the member which connects them, which member, as hereinafter shown, is a simple bent and apertured plate which serves both as a piston connecting-bar and a shaft-crank rotator. The remaining part of the mechanism, such as the shaft-bearing, the valve-bearings and ports, and the independent valve-shifting mechanism, or "snap-over" movement, is contained in a single member which is held between fixed jaws, struck-out lips, ledges, or brackets which are cut and bent out from the cylinder body. The shaft which supports the

cleaner or squeegee also serves as a bearing for the rotary disk valve and its snap-over member to be hereinafter more fully described.

The caps or cylinder-ends 3 and 4 have integral lugs 6 and 7 in which are port bores or passages 8 and 9 that communicate with the interior of the cylinder at its respective ends as shown in Figure 1. An air-suction, or actuating fluid port 10 is alternately placed in communication with the respective ends of the cylinder through the valve shown alone in Figure 5 connecting said port 10 with the cylinder port 8 through a pipe 11, and similarly with the port 9 through a pipe 12 the ends of which are broken away at the lugs 6 and 7 to show their interiors at their entrances to the ports 8 and 9. The port 10 is controlled by a needle throttle-valve 13 the position of which is shown in Figures 1, 3 and 4. This valve has an enlarged threaded stem portion 14 which has threaded engagement with a boss 15 projecting from, as an integral part of, the shaft-bearing and valve-casing member—16. The stem of the valve 13 is turned with the aid of a knurled head or finger piece 17. The valve—18 is seated in a valve-chamber 19 through which leads a port 21 that is in communication with the pipe 11 and left hand end of the cylinder when looking at Figures 1 and 2. A similar port 20 leads through the duct 12 to the opposite end of the cylinder. Either of these ports 20 and 21 is placed in communication with the throttle-valve port 10 through a port 22 which is a curved depression, groove or trough in the inner face of the valve 18.

The valve 18 is bored for and loosely mounted on the cleaner-oscillating shaft —23— which has its bearing in a plug 23′ that has threaded engagement with the inner walls of the valve-chamber 19. Between said plug 23′ and the valve 18 is interposed a spring 19′ which is tensioned to press against a washer 18′ that bears against the valve 18 and holds it pressed against its seat. On the outer end of the shaft 23 is secured a squeegee or cleaner arm 24 for which a hole 24′ is made through the shaft and a set screw 24″ holds the arm 24 in an adjusted position. On the arm 24 is the usual cleaner or squeegee —25— the construction of which is not involved in the present invention.

The valve 18 is rotated by a projecting lug portion 26 on a sleeve 27 the bore in which loosely fits the shaft 23 while its outer surface is many-sided, or hexagon in cross-section, as shown in Figure 3. The sleeve itself is rotated by means of a pin, stud or lug 28 that is secured to and projects from the shaft 23 as shown in Figure 7. The end of the sleeve 27 has a major cut-away portion to form the lug 26. Adjacent to the latter is a smaller cut-away portion 29, as the construction is shown in the present embodiment. The pin or key 28 has a rotary movement with reference to the sleeve to the extent of the space provided by the cut-away 29, or until the valve is about to close one and open the other of the two ports 20 and 21. As a wind-shield operating mechanism, or motor, has no fly-wheel or its equivalent, but is, on the contrary, impeded by an always set "brake" in the squeegee 25 when the latter is operated at the comparatively slow speed that a cleaner or squeegee 25 must be swung to and fro, it is necessary to provide an independent valve-shifting mechanism having its own power that will operate to advance the valve from the position in which it has been stopped at the end of the shaft rotation. Assuming that position to be the position of the valve 18 with reference to the port 20 open to the atmosphere, as shown in Figure 6, the valve shifting mechanism referred to will rotate the valve 18 in a clockwise direction to close the port 20 and open the port 21 to the atmosphere. The lug 26 has a free movement with reference to the valve 18 to the extent of a slot 30 through said valve adjacent to the shaft 23, as shown in Figure 6, which permits the valve to remain stationary during the oscillation of the shaft to the extent of the sweep of the squeegee 25 and until the shaft movement has set in motion the independent valve-shifting movement under its own power. The latter consists of a pair of spring-pressed anti-friction balls 31 and 32 which bear against opposite sides of the hexagon 27, and when these balls bear against opposing apexes formed by the angles between the six sides of the hexagon, or snap-over member, or are slightly over said angles the pressure of the balls will cause the valve to be rotated by the lug 26 to the extent of about the difference in inclinations between the position of the valve in Figure 5 and its position in Figure 6. In Figure 3 the dotted line positions of the balls are those when the balls are at the apexes of opposing angles while the full line positions of the balls show them at rest against opposing flat sides of the hexagon 27, or as supporting the valve in a position similar to that in which it is shown in Figure 6, until a reverse movement of the shaft reverses that position to close the port 21.

The balls 31 and 32 occupy a transverse bore 33 in the member 16 in which are compressed coiled springs 34 and 35 by means of screw plugs 35′ and 36 which plug up the ends of said bore 33, as shown in Figures 1 and 3.

On the valve boss 15 for the port 10 is a hollow nipple 37 which communicates with

the passage formed around the reduced valve-stem portion 14 and the port 10 controlled by the valve 13. To said nipple may be attached a pipe or hose leading from a suitable source of pressure or suction (not shown), as frequently heretofore illustrated in this art.

The valve-casing and shaft-bearing member 16 is held on the wind-shield frame portion —38— by means of screws 39 and 40, or otherwise if desired. 41 represents the transparent portion, or glass, of the wind-shield. Said casing is held in the cylinder between a pair of struck out plate portions 69 and 70 the middle portion of the cylinder being cut to provide an opening into which the member 16 may be inserted, as shown in Figures 1 and 4, as well as supports for said member 16, to which the latter is secured by means of screws 71, 72, 73 and 74.

Referring, now, to the improved and greatly simplified means for rotating the shaft, referred to in the foregoing as effected through a simple plate which serves as a connection between the pistons to cause them to move as a unit. Said connection is a rectangular plate 42 with rounded corners 43, 44, 45 and 46. Said plate spans the interior diameter of the piston, or substantially so as herein shown, although that is not essential. In the plate 42 is a cut-away upper portion 47 producing clearance inclines 48 and 49 with ends at 50 and 51. From said cut-away 47 extend oppositely inclined slots through the plates indicated as 52 and 53 which provide upper guide-ways or tracks 54 and 55 and similar lower ways 56 and 57 with ends 58 and 59. The inclined edges 54 to 57 engage studs or crank-pins 60 and 61 which are on the ends of a double lever or crank arm or plate 62. The latter is secured to the inner end of the shaft 23 as shown separately in Figure 7. When the piston-connecting plate or member 42 is moved to the right from the position in which it is shown in Figures 1 and 2, the pin 60 will move down the incline 49, thereby gradually tilting the crank 62, which tilting will continue until the position of the crank is substantially reversed, when the pin 60 enters the slot 52 and the edge 54 thereof brings pressure thereon towards the right, the pin 61 being then free of the slot 53 and continuing to turn counter clockwise until the pin 61 meets the incline 48. Obviously the said turning movement of the crank will be reversed when the plate 42 is returned to the left.

As a connecting member between the pistons the plate 42 has reduced ends bent to form attachment lugs, hooks or brackets 63 and 64, as shown in Figures 1 and 2. These lugs have threaded apertures which are engaged by screws 65 and 66 that pass through the pistons as shown, the details of piston construction disclosed by cross-sectioning to show the attachments, not being specifically involved in the present invention. Air is admitted from the atmosphere to the cylinder space between the pistons, through a hole 75 in the bottom of the cylinder, as shown in Figures 1 and 2.

While the edges of the plate 42 are shown as bearing slidably against the opposite sides of the piston, there is abundant space within that portion of the cylinder for the provision of suitable anti-friction bearings for said plate 42. Mounting the valve 18 on the same shaft that carries the driving-lever or crank 62 and the driven lever, or squeegee-arm 24, obviates the usual intermediate mechanisms and the more involved valve mechanisms with their connections with the cleaner-arm shaft 23. The plug 23′ which closes the valve chamber 19 containing the valve and its spring, is shown in Figure 4 with two holes 76 and 77 in its outer face. These holes may be engaged by a suitably studded spanner-wrench to turn said bearing 23′ on its threads.

We claim as our invention—

1. Mechanism for actuating a windshield cleaner shaft, said mechanism embodying a cylinder and piston, a lever connected with said shaft and having two operating portions, a reciprocating member connected with the piston and having two oppositely inclined slots extending in the direction of the reciprocation of the member and arranged end to end, said slots being open at one end at their point of divergence, whereby when said member is reciprocated the said operating portions of the lever will alternately enter the respective individual slots, the said open portion of the slot operating to cause the lever to rock back and forth at predetermined times in the cycle of reciprocation of the said member.

2. Mechanism for actuating a windshield cleaner shaft, said mechanism embodying a cylinder and piston, a lever connected with said shaft and having two operating portions, a reciprocating member connected with the piston and having two oppositely inclined slots extending in the direction of the reciprocation of the member and arranged end to end, said slots being open at one end at their point of divergence, whereby when said member is reciprocated the said operating portions of the lever will alternately enter the respective individual slots, the said open portion of the slot operating to cause the lever to rock back and forth at predetermined times in the cycle of reciprocation of the said member, and means responsive in its operation to the reciprocation of said member for controlling the direction of movement of the member.

3. Mechanism for oscillating a windshield cleaner shaft, said mechanism embodying a

cylinder and piston, a lever connected with said shaft and having two separate track engaging portions, a reciprocating member connected with the piston and having diverging inclined track portions arranged end to end and adapted to be alternately engaged by the respective said track engaging portions of the lever, and guides individual to and spaced above the respective track portions, said guides terminating short of each other adjacent the point of divergence of the said tracks, whereby when the piston is reciprocated the lever will be rocked back and forth and one of the track engaging portions of the lever will pass out of engagement with its respective track and guide and into the said open portion when the other track engaging portion of the lever moves into engagement with its respective track portion and guide.

4. Mechanism for oscillating a windshield cleaner shaft, said mechanism embodying a cylinder and piston, a lever connected with said shaft and having two separate track engaging portions, a reciprocating member connected with the piston and having diverging inclined track portions arranged end to end and adapted to be alternately engaged by the respective said track engaging portions of the lever, guides individual to and spaced above the respective track portions, said guides terminating short of each other adjacent the point of divergence of the said tracks, whereby when the piston is reciprocated the lever will be rocked back and forth and one of the track engaging portions of the lever will pass out of engagement with its respective track and guide and into the said open portion when the other track engaging portion of the lever moves into engagement with its respective track portion and guide, and means responsive in its operation to the reciprocation of the piston for reversing the direction of movement of the piston.

In testimony whereof we have hereunto signed our names.

JOHN L. NILSON.
JOHN F. PRINCE.