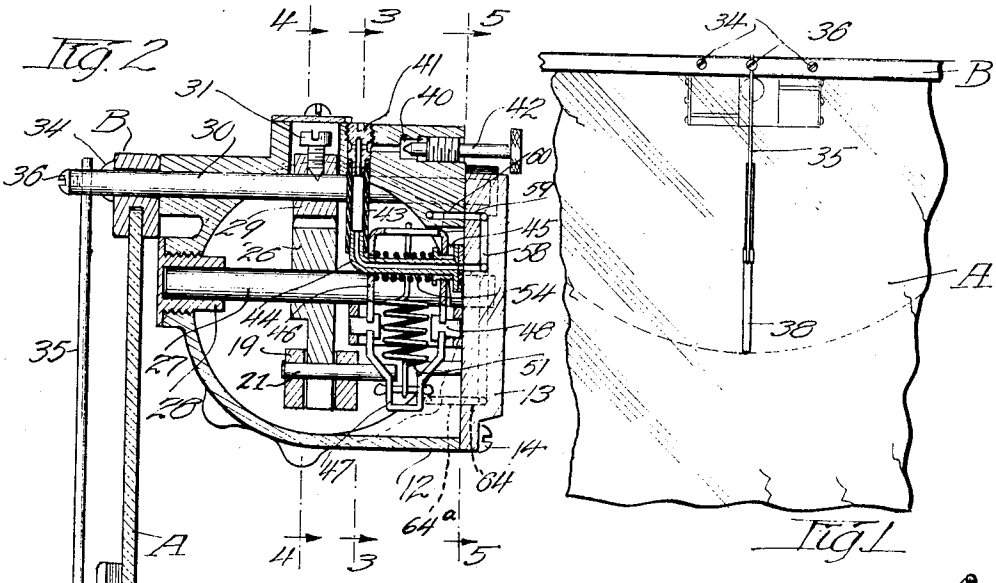
S. G. SKINNER.

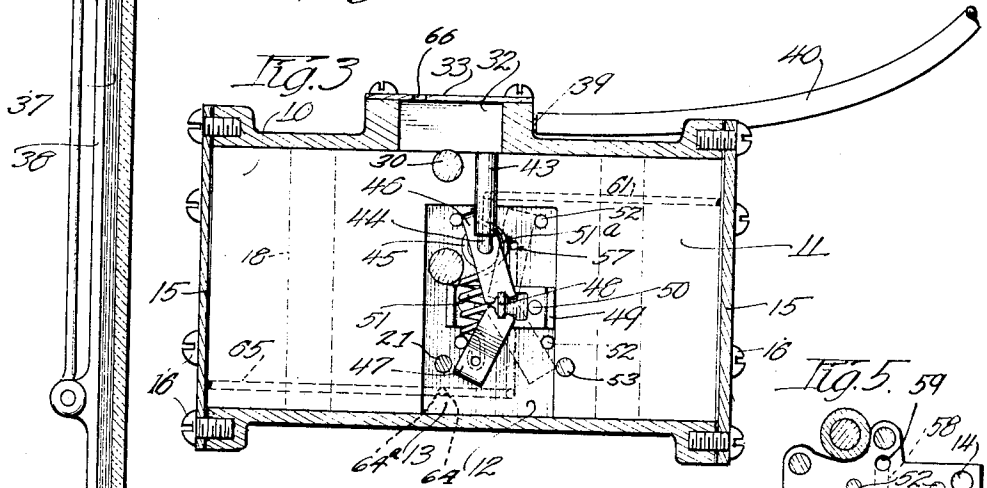
WINDSHIELD CLEANER.

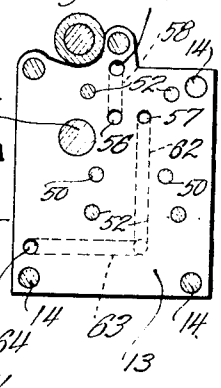
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UNITED STATES PATENT OFFICE.

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WINDSHIELD-CLEANER.

1,395,604. Specification of Letters Patent. Patented Nov. 1, 1921.

Application filed February 14, 1921. Serial No. 444,718.

To all whom it may concern:

Be it known that I, STEPHEN G. SKINNER, a citizen of the United States, and resident of Wilmette, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Windshield-Cleaners, (Case 14,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a cleaner for the windshields or drivers' windows of automobiles or other self-propelled vehicles, and contemplates the provision of a device of this class that is compact in its construction, involves a small number of parts, and can be economically manufactured.

The device hereinafter described and subsequently claimed is caused to operate by varying the air pressures exerted upon opposite ends of a reciprocating piston structure which is mechanically connected with the element which contacts with and moves over the windshield to clean the same. The piston structure operates within suitable cylinders and I effect the variations in air pressure which cause actuation of the piston by alternately connecting the cylinders with a suitable suction means, for instance the intake manifold of an automobile internal combustion engine. Pneumatic connection between the intake manifold and the cylinders is effected through a conduit which consists wholly or in part of rubber tubing. One end of this conduit is connected with the intake manifold of the engine, and the other end of the conduit is so disposed and so related to reciprocating parts of the cleaner actuating mechanism that it is moved bodily first to communicate with a port leading to one cylinder and then to communicate with a port leading to the other cylinder. This construction enables me to dispense with valves which are expensive to manufacture and install and which are difficult to repair or replace if they become damaged while the device is in use.

One of the salient features of the present invention is the novel means I provide for maintaining an extremely effective seal between the movable terminal of the suction conduit and a smooth plane surface on that portion of the structure in which the cylinder ports are formed. Other features of novelty will appear as the following detailed description progresses.

In the accompanying drawings illustrating my invention,

Figure 1 is the front elevation view on reduced scale illustrating the manner in which the device is mounted upon an automobile windshield;

Fig. 2 is a central vertical sectional view of a full sized device embodying my invention;

Fig. 3 is a section taken on the line 3—3 of Fig. 2, looking in the direction indicated by the arrows;

Fig. 4 is a view taken on the line 4—4 of Fig. 2, looking in the direction indicated by the arrows; and

Fig. 5 is a view taken on the line 5—5 of Fig. 2, looking in the direction indicated by the arrows.

Similar characters of reference refer to similar parts throughout.

Referring to the drawings, at A I have illustrated a glass windshield which is provided with the usual metal framework B. The framework B is provided with spaced apertures which receive the oscillating shaft of the cleaning device, and the bolts or screws wherewith the cylinder structure is secured upon the framework, all of which will more clearly hereinafter appear.

The cylinder structure comprises a casting—preferably a die casting—which is conformed to provide the opposed cylinders 10 and 11 and the offset portion 12, which is located intermediate the cylinders and which houses the mechanism for moving the terminal of the suction conduit. The offset portion of the housing is provided with an opening which is closed by a removable side plate, the details of which are most clearly shown in Figs. 3 and 5. Plate 13 is held in position by a plurality of screws 14—14. The heads of the cylinders 10 and 11 are preferably in the form of metal stampings 15—15, which are held in position by screws 16—16, coöperating with suitable lugs formed integral with the die casting. Paper or other suitable gaskets effectively prevent air leakage at the cylinder heads.

The piston structure comprises pistons 18—18, which are disposed and adapted to reciprocate.

The pistons 18 are preferably formed in-

tegral with a connecting piece 19, which is disposed below the common axis of the pistons and cylinders. Connecting piece 19 is provided with a longitudinal slot 20 and a crosspin 21, the purpose of which will presently be made clear.

Each piston is provided with a cup leather 22 held in position by stamping 23 and screws 24, as shown. Snug fits between the cup leathers and the cylinder walls are assured by helical springs 25 which are disposed in annular grooves in the pistons. The springs tend to move out of the grooves and press against the inner faces of the cup leathers in a well known manner.

The crosspin 21 of the piston structure coöperates with the slotted lower end of the gear sector 26, which is fixed upon a shaft 27. One end of the shaft 27 bears a removable side plate 13, and the other end of said shaft is journaled in a bearing sleeve 28 which is threaded into the cylinder casting as is clearly shown in Fig. 2.

The teeth of the sector 26 coöperate with the gear sector 29, which is fixed upon a shaft 30 by means of set screw 31. The set screw and certain other parts of the apparatus which are presently to be mentioned are accessible through an opening 32 in the upper part of the cylinder casting, this opening being normally closed by a plate 33. Shaft 30 is journaled in the cylinder casting, projects forwardly from the casting, and extends freely through an aperture in the windshield frame B. The cylinder casting and parts carried in and on the same are held in position by screws 34—34, which extend through apertures in the windshield frame B and have threaded engagement with lugs at the upper portions of the ends of that side of the casting which lies adjacent the windshield.

At its forward end the rock shaft 30 is provided with an aperture which receives the upper end of a cleaner arm 35. The cleaner arm is preferably formed of relatively stiff wire and is fixed to the staff 30 by set screw 36. Pivoted to the lower end of the cleaner arm is the cleaner device, which consists of a rubber squeegee 37 carried in a suitable frame 38.

From the description thus far, it will be understood that when the piston structure reciprocates within the cylinders, the squeegee 37 will be caused to move across the front face of the windshield in the arc of a circle having the axis of shaft 30 as its center.

I shall now describe the means whereby the suction of the engine intake manifold is utilized to effect the reciprocation of the piston structure. Projecting from the upper portion of the cylinder casting is a nipple 39, over which is slipped one end of a rubber tube 40, the other end of which has suitable connection to the source of suction; as for instance the intake manifold of the engine. The nipple 39 communicates with the bore 40, which in turn communicates with the space afforded by an annular groove in a nut 41, which threads into a vertical bore in the cylinder casting. The flow of air through bore 40 may be shut off entirely or regulated as desired by needle valve 42 (Fig. 2). Nut 41 is provided with a longitudinal bore which communicates with the space afforded by the aforesaid annular groove in the nut. The lower end of the nut 41 is reduced in diameter to fit within the upper end of a flexible tube 43, the other end of which is fitted over the upturned end of a metal tube 44, the other end of which is provided with a flange 45, which is faced with leather or other yielding material. The leather or other yielding material carried by flange 45 is designed to lie snugly against the plane inner surface of the removable side plate 13.

The mechanism for moving the tube 44 relative to the plate 13 consists of a "snap-over" device comprising the substantially U-shaped members 46 and 47. The extremities of the members 46 and 47 are notched and engage over lugs 48—48, which are struck from a substantially rectangular supporting frame 49. The frame 49 is attached to side plate 13 by screws or rivets indicated at 50. The horizontal portion of the upper U-shaped member 46 and a crosspiece carried by the lower U-shaped member 47 are connected by a tension spring 51. It will be noted that the spring 51 is provided, near its upper end, with a pronounced loop or offset portion 51^a, so that the spring will not interfere with tube 44 at any time during the operation of the snap over mechanism. Stop pins 52—52 carried by plate 13 limit movement of the arms 46 and 47. Pins 21 and 53, which project laterally from the portion 19 of the piston structure, serve to engage arm 47, to effect the operation of the snapover mechanism in a manner that will be readily understood.

It will be noted that the tube 44, which constitutes the terminal of the suction conduit, extends freely through alined apertures in the legs of the upper U-shaped member 46 of the snapover mechanism. A coil compression spring 54 is disposed around tube 44, one end of this spring bearing against the left-hand leg (Fig. 2) of member 46, the other end of the spring bearing against bushing 55. The bushing in turn bears against flange 45 of the tube 44. It will thus be understood that spring 55 at all times tends to hold the flanged end of tube 44 against the inner surface of plate 13.

When the snapover mechanism occupies the position shown in full lines in Fig. 3, the bore of the tube 44 registers with a hori-

zontal bore 56 in plate 13; and when the snapover mechanism occupies the position indicated by dotted lines, the tube 44 registers with a horizontal bore 57 in plate 13. Bore 56 communicates with a vertical bore 58, which in turn communicates with a second horizontal bore 59. Bore 59 registers with the horizontal bore 60 in the cylinder casting, and bore 60 communicates with a longitudinal bore 61, which communicates with cylinder 11, through a slot in the end of the cylinder, which extends from the bore 61 to the inner surface of the cylinder.

The bore 57 of removable side plate 13 communicates with a vertical bore 62, which in turn communicates with a horizontal bore 63. Bore 63 communicates with a horizontal transverse bore 64, which registers with a horizontal bore 64^a in the cylinder casting. Bore 64^a communicates with a longitudinal bore in the cylinder casting, indicated at 65, which communicates with the cylinder 10 in exactly the same way that the previously mentioned bore 61 communicates with the cylinder 11. It may be well to suggest at this point that for the purpose of clearness and illustration, I have deemed it necessary to illustrate only so much of the several bores as is necessary in order to show the necessary suction passages. The manner in which to perform the machine work necessary to form these bores and the manner in which to block the bores wherever necessary will be readily understood by persons familar with the manufacture of devices of the general class to which my invention relates.

By virtue of the several suction passages in the side plate 13 and cylinder casting, suction is applied to the cylinder 11 when the snapover mechanism occupies the position indicated by full lines in Fig. 3. When the snapover mechanism occupies the position indicated by dotted lines, suction is applied to the cylinder 10.

At 66 (Fig. 3) I have illustrated a vent, by virtue of which atmospheric pressure always exists in the space between the pistons 18—18.

Now let us assume that the piston structure and parts operated thereby are in the several positions shown in Figs. 2, 3 and 4, and that the valve 42 has been opened to establish communication between the intake manifold and the windshield cleaner. In this case, suction will be applied to the cylinder 11, causing the piston structure to move to the right (Fig. 4). As the piston structure moves to the right, one of the pins for operating the snapover mechanism engages the lower U-shaped member 47 of the snapover mechanism and moves the same toward the dotted line position indicated in Fig. 3. As soon as the element 47 has been moved to such a position that the axis of spring 51 lies to the right (Fig. 3) of the axis of the members 46 and 47, the arm 46 is snapped to the dotted line position indicated in Fig. 3. When the arm 46 is snapped over as just explained, the suction is removed from the cylinder 11 and is applied to the cylinder 10, whereupon the piston moves in the opposite direction. This operation is repeated at the end of each stroke of the piston structure. With the valve 42 open, the cleaner continues to operate so long as the engine with which it is connected is in operation and is developing sufficient suction to operate the cleaning device.

Having thus described my invention, what I claim is new and desire to secure by Letters Patent of the United States, is:

1. A device of the class described comprising a pair of opposed cylinders, connected pistons adapted to reciprocate in said cylinders, a suction conduit, said suction conduit comprising a terminal in the form of a tube having a flanged end, means carried with the cylinders providing a surface over which the flanged end of the conduit is adapted to move, there being two ports in said last mentioned means with which said tube may communicate, each port communicating with one of said cylinders, a snapover device comprising a quick motion arm movable in a plane parallel to the surface aforesaid, an aperture in said arm through which said tube freely extends, a spring acting between said arm and the flanged end of said tube, and tending at all times to urge the flanged end of the tube against the aforesaid surface, and means carried with the pistons adapted to operate the snapover device to cause said tube alternately to communicate with said ports.

2. A device of the class described comprising a cylinder structure and a movable element adapted to reciprocate within the cylinder structure, said movable element caused to operate by varying the air pressure upon its opposite ends, a suction conduit comprising a terminal in the form of a tube having a flanged end, means carried with the cylinder structure providing a surface over which the flanged end of the tube is adapted to move, there being two ports in said last mentioned means with which said tube may communicate, each port communicating with the space at one end of the movable structure, a snap-over device comprising a quick motion arm movable in a plane parallel to the surface aforesaid, said tube being carried by said quick motion arm, but being capable of movement relative thereto, a spring acting between said arm and the flanged end of the tube, and tending at all times to urge the flanged end of the tube against the aforesaid surface, and means whereby reciprocation of the movable

element causes the operation of the snap-over mechanism.

3. A device of the class described comprising a cylinder structure and a movable element adapted to reciprocate within the cylinder structure, said movable element being caused to reciprocate by varying the air pressure upon its opposite ends, means carried by the cylinder structure providing a plane surface, two ports in said last mentioned means, each port communicating with the space at one end of the movable element, a snap-over device comprising a quick motion arm movable in a plane parallel to the surface aforesaid, and a hollow member carried by said quick motion arm, said hollow member bearing against said plane surface and adapted alternately to register with the aforesaid ports.

4. A device of the class described comprising a cylinder structure and a movable element adapted to reciprocate within the cylinder structure, said movable element being caused to reciprocate by varying the air pressure upon its opposite ends, means carried by the cylinder structure providing a plane surface, two ports in said last mentioned means, each port communicating with the space at one end of the movable element, a snap-over device comprising a quick motion arm movable in a plane parallel to the surface aforesaid, a hollow member carried by said quick motion arm, said hollow member bearing against said plane surface and adapted alternately to register with the aforesaid ports, together with spring means at all times urging said hollow member into close contact with the plane surface aforesaid.

In witness whereof, I hereunto subscribe my name this 11th day of February, 1921.

STEPHEN G. SKINNER.

Witnesses:
ARTHUR W. CARLSON,
ANDREW F. WINTERCORN.