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WINDSHIELD CLEANING MECHANISM

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2 Sheets-Sheet 1

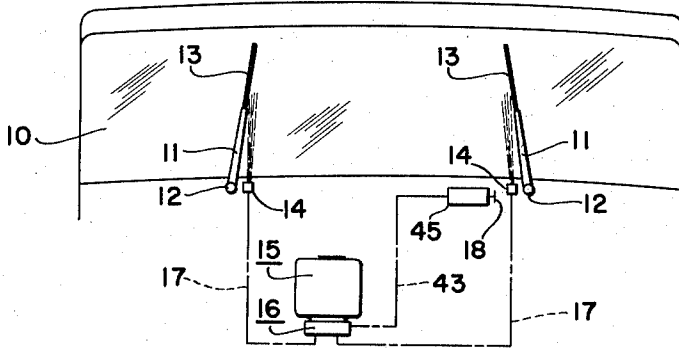


Fig. 1

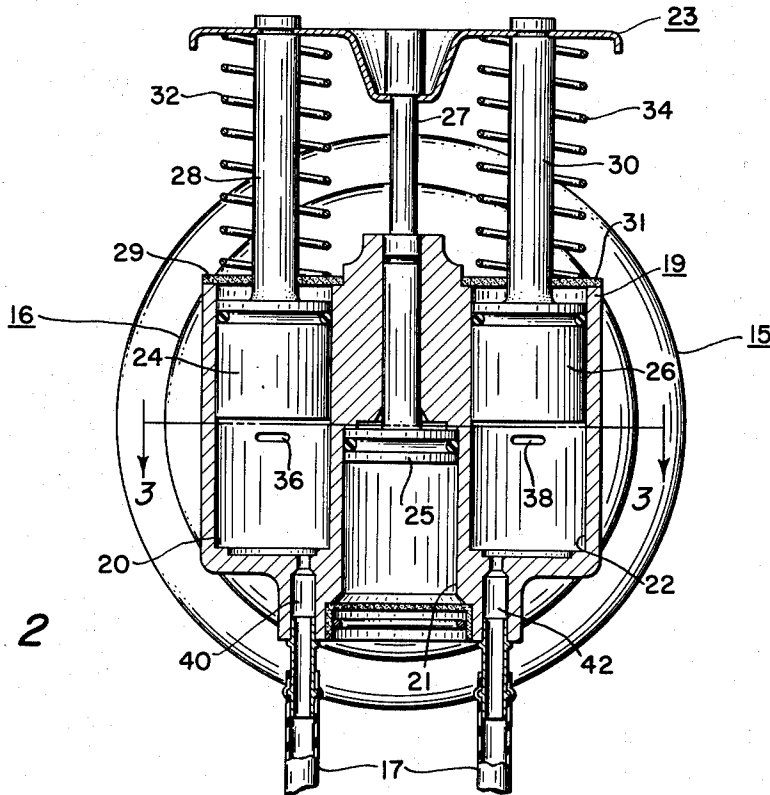


Fig. 2

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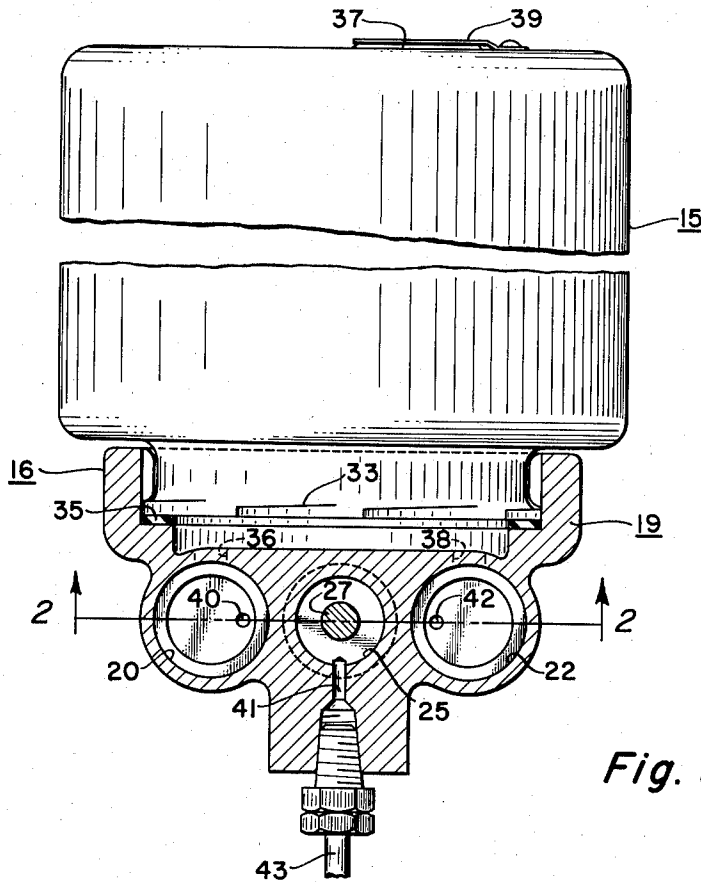


Fig. 3

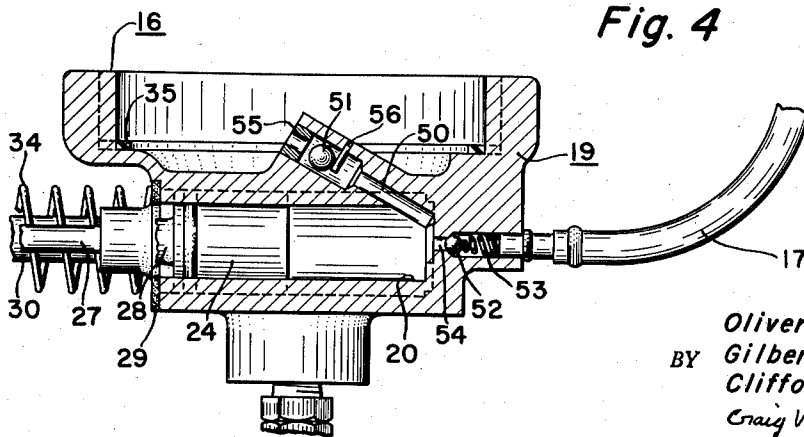


Fig. 4

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1

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WINDSHIELD CLEANING MECHANISM

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4 Claims. (Cl. 20—40.5)

This invention pertains to the art of windshield cleaning, and particularly to apparatus for discharging a liquid solvent onto the windshield of a motor vehicle.

Heretofore, it has been proposed to operate the pumping apparatus for windshield washers with fluid under pressure, suction, or electricity. However, prior pump designs of the fluid pressure type embodied a single piston and cylinder arrangement, thereby enabling the actuating fluid medium to become intermingled with the liquid solvent. This possibility is obviated in the present invention. Accordingly, among our objects are the provision of pumping mechanism for windshield washers including independent power and pumping units; the further provision of a washer arrangement whereby the lines, or conduits, interconnecting the pumping mechanism and the discharge nozzles will not be filled with liquid solvent above the liquid level in the reservoir when the pumping mechanism is inactive; and the still further provision of a washer pump assembly whereby liquid solvent is supplied to the pumping means by gravity.

The aforementioned and other objects are accomplished in the present invention by mounting the pumping mechanism below the liquid solvent reservoir. Specifically, the pumping mechanism comprises a housing having three parallel cylinder bores. Each bore contains a reciprocable piston having an extending rod. The three piston rods are operatively interconnected by means of a tie plate. The center piston and cylinder combination constitutes the motor while the other two piston and cylinder combinations constitute pumps, the outlet ports of which are connected to separate washer nozzles on opposite sides of the medial portion of a vehicular transparency. The tie plate is spring biased in one direction, and the power, or motor piston is capable of fluid pressure actuation in the other direction. In this manner, co-mingling of the actuating medium and the solvent medium is precluded.

In the preferred embodiment, liquid solvent is admitted to the pumping cylinders by gravity inasmuch as the solvent reservoir is disposed above the pump housing. Thus, during fluid pressure actuation of the power piston, the solvent will be discharged from the pumping cylinders. Conversely, during spring actuation of the power piston, liquid solvent will be withdrawn from the discharge lines, thereby preventing the freezing of solvent in the lines above the liquid level in the reservoir.

In another embodiment, the pumping cylinder is connected with the reservoir through check valves whereby solvent is drawn into the pumping cylinder during spring actuation of the pistons. The discharge lines may, or may not, have spring biased check valves therein. Prefer-

2

ably, the discharge lines do not include spring biased check valves so as to permit drainage of the liquid solvent from the discharge lines when the pumping mechanism is inactive.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Fig. 1 is a schematic view of an automobile washer system embodying the present invention.

Fig. 2 is a fragmentary view, partly in section and partly in elevation, of the preferred form of pumping mechanism taken generally along line 2—2 of Fig. 3.

Fig. 3 is a fragmentary view, partly in elevation and partly in section, taken along line 3—3 of Fig. 2.

Fig. 4 is a fragmentary view, partly in section and partly in elevation, of a modified form of pumping mechanism.

With particular reference to Fig. 1, the pumping mechanism of this invention is illustrated in combination with a vehicle having a windshield 10. According to conventional practice, the vehicle includes a pair of cleaner assemblies, which are disposed on opposite sides of the medial portion of the windshield. Each cleaner assembly comprises an arm 11, which is drivingly connected with a wiper shaft 12 capable of imparting oscillatory movement to the arm 11 and the wiper blade 13, which is detachably connected thereto. Each cleaner assembly also includes a nozzle 14 through which liquid solvent is sprayed onto the windshield surface. The liquid solvent is drawn from a reservoir 15 and forcibly ejected through the nozzles 14 by pumping means generally designated by the numeral 16. As depicted in Fig. 1, each nozzle is connected by an independent conduit 17 with the pumping means 16, the pumping means having an intake stroke and a delivery stroke. Operation of the pumping means 16 may be controlled by a knob 18, which is mounted on the dashboard of the vehicle.

According to the present invention, the pumping mechanism 16 is disposed below the solvent reservoir 15. In this manner, liquid solvent may be supplied to the pumping means by gravity, as will be pointed out more particularly hereinafter.

With particular reference to Fig. 2, the preferred form of pumping means 16 will be described. The pumping means comprises a housing 19 having three parallel cylinder bores 20, 21 and 22. The cylinder bores 20, 21 and 22 have disposed therein reciprocable pistons 24, 25 and 26, respectively. The piston and cylinder combination 21—25 constitutes the motor, or power means, for the pumping assembly. Thus, the piston 25 is formed with an extending rod 27, which is operatively connected to the medial portion of a tie plate 23. The pistons 24 and 26 also include extending rod portions 28 and 30, respectively, which are also operatively connected with the tie plate 23. As seen in Fig. 2, the three piston rods 27, 28 and 30 extend through the end wall of the housing 19. In addition, the rods 28 and 30 are encompassed by coil springs 32 and 34, respectively.

The coil springs 32 and 34 are confined between the tie plate 23 and the end cap members 29 and 31 of the pumping cylinders 20 and 22, respectively. As seen in Figs. 2 and 3, both pumping cylinders 20 and 22 are

formed with suction ports 36 and 38, which ports interconnect the cylinders 20 and 22 and the reservoir 15. It should be noted that the suction ports 36 and 38 are located in the medial portions of the cylinders 20 and 22 so that communication may only be had between the cylinders 20 and 22 and the reservoir 15 when the pistons 24 and 26 are substantially fully retracted, as shown in Fig. 2.

According to conventional practice, as depicted in Fig. 3, the reservoir 15 may be flange connected with the pump housing by any suitable means, such as threads 33. In addition, a suitable gasket 35 is interposed between the reservoir and the pump housing 19. In addition, the reservoir, or bottle, 15 may have an opening 37 at the top thereof so as to permit filling. As shown in Fig. 3, this opening 37 may be closed by a pivotally mounted cap member 39.

The cylinder 20 also includes an outlet port 40, while the cylinder 22 includes an outlet port 42. The outlet ports 40 and 42 are connected to conduits 17, which interconnect the outlet ports with the nozzles for each cleaner assembly. In addition, the power cylinder 27, as shown in Fig. 3, includes a pressure supply port 41, which is connected to a conduit 43. The conduit 43 is preferably connected with a valve 45, which may be controlled by the dashboard knob 18. Thus, the power piston 25 is capable of fluid pressure actuation in one direction, and spring actuation in the other direction.

Preferably, although not necessarily, the pumping mechanism may be controlled by a coordinated windshield wiper control valve unit of the type disclosed in our copending application, Serial No. 487,196, now Patent No. 2,847,978, filed of even date herewith. In addition, the discharge nozzles for the washer system may be attached to and movable with the wiper arms 11, as disclosed in our copending application, Serial No. 487,033, filed of even date herewith.

Operation of the preferred pumping mechanism disclosed in Figs. 1 through 3, is as follows. When the pumping mechanism is inactive, the power cylinder 21 is exposed to drain through the valve 45. Consequently, the springs 32 and 34 will be rendered operative to move the three pistons 20, 21 and 22 upwardly to the position shown in Fig. 2. Thus, the springs 32 and 34 constitute the means for effecting the intake stroke of the power piston 25 and the pumping pistons 24 and 26. During initial movement of the pumping pistons 24 and 26 away from the head ends of their cylinders, liquid solvent remaining in the lines 17 will be drawn into the cylinders 20 and 22. In this way freezing of the liquid solvent above the level in the reservoir 15 will be precluded. In addition, by reason of the power piston and cylinder being independent of the pumping cylinders and pistons, the likelihood of co-mingling of the actuating fluid medium and the liquid solvent medium is obviated.

When the valve 45 is adjusted by the knob 18 so as to admit fluid pressure to the power cylinder 21 through the conduit 43, fluid under pressure will be admitted to the cylinder 21, which acts upon the rod end of the piston 25; thereby effecting downward movement of the piston 25 and the rod 27. This downward movement will, likewise, effect downward movement of the tie plate 23 and the pumping pistons 24 and 26. Initial downward movement of the pistons 24 and 26 will effect closure of the intake ports 36 and 38. After the ports 36 and 38 have been closed, the liquid solvent remaining in the pumping cylinders 20 and 22 will be discharged through the outlet ports 40 and 42 and ejected through the washer nozzles 14. During the delivery strokes of the pump piston energy is stored in the springs 32 and 34. During spring retraction of the pumping pistons 24 and 26, the air which is drawn from the lines 17 will pass through the intake ports 36 and 38 and into the reservoir 15.

With reference to Fig. 4, another form of pumping

mechanism is disclosed, wherein the pumping cylinders are of modified construction. In particular, the housing 19 is formed with a suction port 50, which includes a ball type suction valve 51. The suction port connects with the pumping cylinder 20. The pumping cylinder has disposed therein a reciprocable piston 24, which includes a rod portion 28, which is encompassed by the spring 32. The head end of the cylinder 20 is also modified to include a check valve assembly comprising a ball 52, which is urged against its seat by a spring 53. Thus, during spring actuation of the piston 24, liquid will be drawn through the suction port 50 due to a fluid pressure differential acting on the ball 51, which will then rest against an abutment 56, as shown in Fig. 4. At this time, the spring 53 will maintain the discharge port 54 closed by urging the ball 52 into sealing relation therewith. During movement of the piston 24 to the right, as viewed in Fig. 4, the ball 51 will be urged against its seat 55 while the ball 52 will be moved away from its seat 54. The embodiment disclosed in Fig. 4 enables a greater quantity of liquid solvent to be displaced during the pumping stroke.

If desired, the spring 53 may be omitted from the discharge valve 52 so that the liquid solvent will drain out of the lines and back to the reservoir during periods when the washer mechanism is inactive. In this manner, the possibility of damage to the washer lines due to freezing will be prevented.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. Windshield washer mechanism for displacing liquid from a reservoir and discharging it onto a windshield surface, including, a pump having a liquid displacing member with an intake stroke and a delivery stroke, a line connected with said pump through which said liquid is discharged onto said windshield surface, and means whereby any liquid remaining in said line after the delivery stroke of said pump will be withdrawn from said line during the intake stroke of said pump before said pump communicates with said reservoir.

2. Windshield washer mechanism including in combination, a reservoir containing liquid, a pump disposed beneath said reservoir for displacing liquid from said reservoir, a nozzle through which liquid may be discharged onto a windshield surface, and a line interconnecting said pump and said nozzle, said pump having a fluid displacing member with an intake stroke and a delivery stroke, the arrangement being such that any liquid remaining in said line after the delivery stroke of said pump above the liquid level in said reservoir will be withdrawn from said line during the intake stroke of said pump before said pump communicates with said reservoir.

3. Windshield washer mechanism including in combination, a reservoir containing liquid, a pump disposed beneath said reservoir for displacing liquid from said reservoir, a nozzle through which liquid may be discharged onto a windshield surface, and a line interconnecting said pump and said nozzle, said pump including a cylinder with a liquid displacing member therein, said liquid displacing member having an intake stroke and a delivery stroke, and a port interconnecting said cylinder and said reservoir, said port being so located in said cylinder with respect to said liquid displacing member that during the intake stroke of said liquid displacing member any liquid remaining in said line above the liquid level of said reservoir will be withdrawn from said line before said port is opened.

4. Windshield washer mechanism including in combination, a reservoir containing liquid, a pump disposed beneath said reservoir for displacing liquid from said reservoir, a nozzle through which liquid may be discharged onto a windshield surface, and a line interconnecting said pump and said nozzle, said pump having a liquid displac-

ing member with an intake stroke and a delivery stroke, energy storing means acting constantly upon said member for effecting one stroke, and power means operatively connected with said member for effecting the other stroke, the construction and arrangement being such that any liquid remaining in said line after the delivery stroke of said member above the liquid level in said reservoir will be withdrawn from said line during the intake stroke of said member before said pump communicates with said reservoir.

10

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