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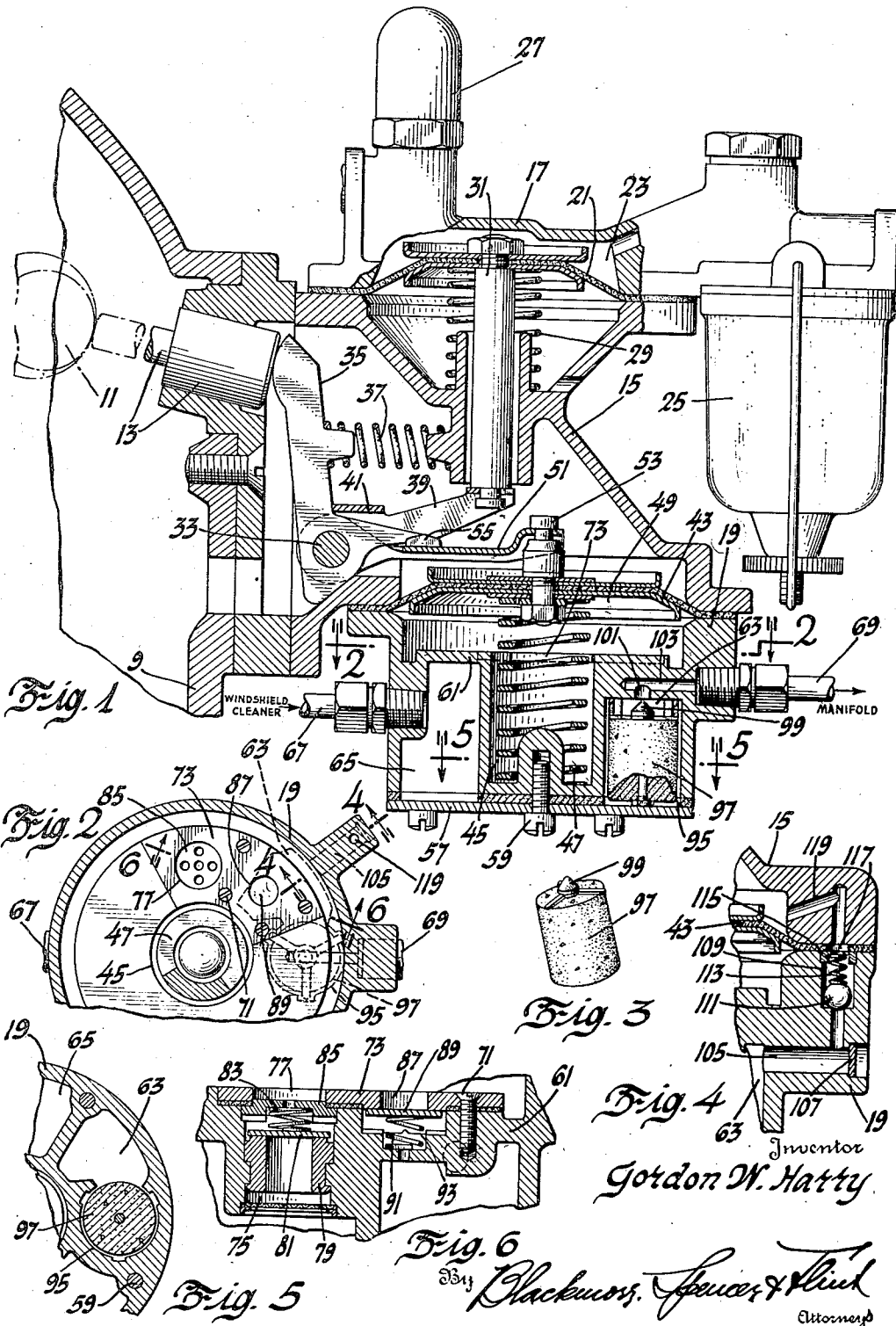
G. W. HARRY

2,079,406

OIL TRAP FOR VACUUM PUMPS

Filed Sept. 15, 1934

2 Sheets-Sheet 1



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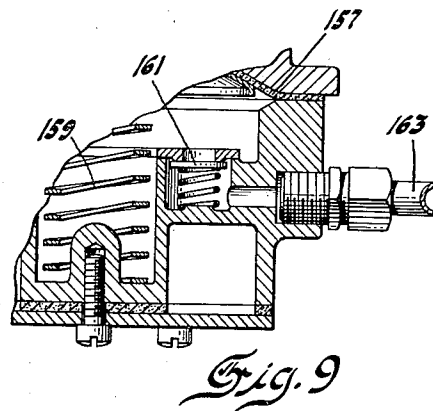
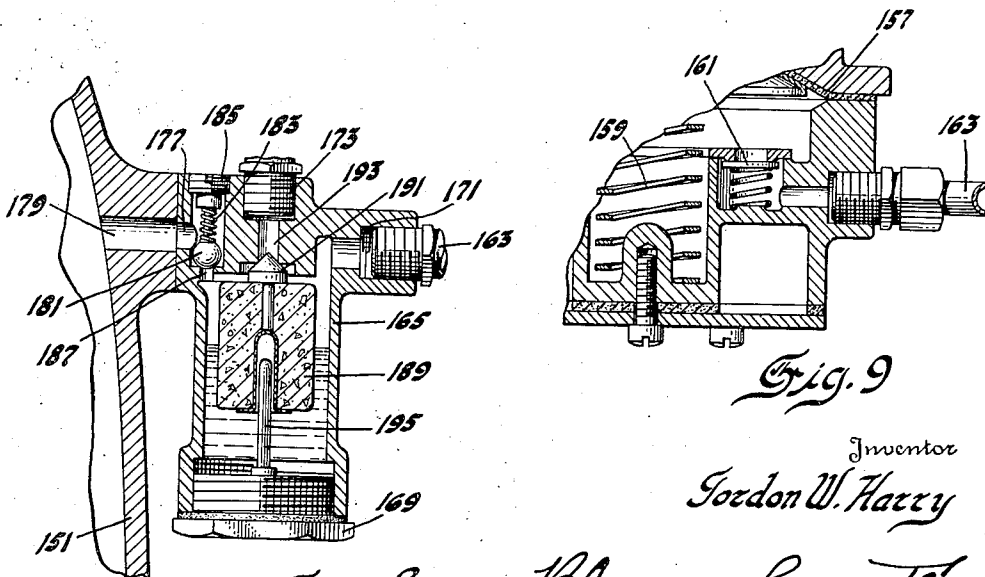
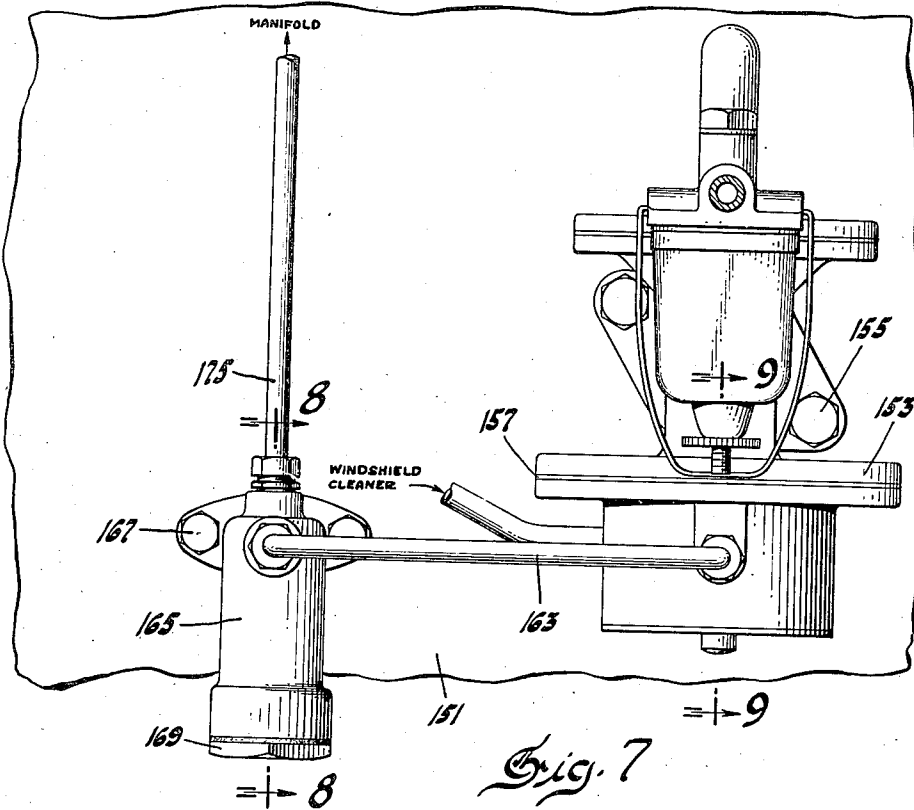
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Fig. 8
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UNITED STATES PATENT OFFICE

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OIL TRAP FOR VACUUM PUMPS

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10 Claims. (Cl. 230—170)

This invention relates to pumps and particularly to a pump operable by the engine of a motor vehicle to withdraw air from the motor of a windshield cleaner. Pumps of this kind are frequently of the booster type, the pump chamber being in the path of air flow from the windshield cleaner to the engine manifold whereby the manifold suction may normally operate, unassisted by the vacuum pump, to evacuate the windshield cleaner motor, but in the event of insufficient engine suction the normal operation may be supplemented by the operation of the pump to keep the windshield cleaner in action. This invention has been incorporated in a pump of the booster type and is shown associated with such a pump having structurally combined therewith a fuel pump. In such an installation it is customary to use flexible diaphragms and to operate these diaphragms by mechanical parts extending into the engine crank case. It sometimes happens that hot oil from the crank case reaches the vacuum pump diaphragm and burns it so that more or less oil leaks into the pump chamber. The suction of the engine thereupon carries the oil to the manifold. This results in high oil consumption, excessive carbon formation on the cylinder, valves, spark plugs, and cylinder head and interferes with the proper operation of the engine.

It is an object of the present invention to overcome such interference with the engine operation and loss of oil by preventing the flow of the oil to the manifold in the event of a leak through the pump diaphragm.

It is a further object of the invention to return the escaping oil to the engine crank case.

The accompanying drawings illustrate structural embodiments to attain the above objects. In the drawings Fig. 1 shows in vertical section a combined pump having my invention incorporated therein.

Fig. 2 is a section on line 2—2 of Fig. 1.

Fig. 3 is a perspective of a float used in a chamber of the vacuum pump.

Fig. 4 is a section on line 4—4 of Fig. 2.

Fig. 5 is a section on line 5—5 of Fig. 1.

Fig. 6 is a section on line 6—6 of Fig. 2.

Fig. 7 is a side elevation of another form of the invention.

Figs. 8 and 9 are sections on lines 8—8 and 9—9 of Fig. 7.

Referring by reference characters to the drawings, numeral 9 designates the crank case of an engine of a motor vehicle. At 11 is an engine-

operated cam actuating in one direction of reciprocation a push rod 13 guided as shown.

The pump is formed from three castings 15, 17, and 19. Casting 15 contains the operating mechanism for the upwardly positioned fuel pump and the downwardly located suction pump. The upper casting 17 is clamped to casting 15 together with a diaphragm 21 therebetween. The diaphragm constitutes the movable wall underlying the fuel pump chamber 23. The fuel pump is not a part of this invention and the showing of the suspended filter cup 25 and the air dome 27 are intended merely to illustrate well known parts of such a pump. A spring 29 beneath the diaphragm biases the diaphragm toward discharge position and a rod 31 connected to the diaphragm functions to pull down on the same to make a suction stroke. Within the casting 15 is a pivot pin 33 upon which rocks a lever 35. The lever is rocked in a clockwise direction by the cam 11 and the rod 13 as will be obvious upon an inspection of the drawings. The lever is biased for rocking in a counter-clockwise direction by a spring 37. Also rocking on pin 33 is a link 39 having an interlocked connection with pump rod 31. The link 39 has a part 41 adapted to be engaged by the lever 35 as it rocks in its clockwise direction. Such a rocking produces a suction stroke.

The third casting 19 clamps a diaphragm 43 between itself and the middle casting 15. The casting 19 has a pocket 45 within which a spring 47 is seated. This spring pushes upwardly on diaphragm 43 to enlarge the chamber 49 beneath the diaphragm, this chamber 49 being the chamber of the suction pump. The downward discharge stroke of the pump diaphragm is made by a link 51 interlocked with a pump stem 53, rotatable on pin 33 and adapted to be engaged by an arm 55 of lever 35. The bottom of casting 19 is closed by a cover 57 secured by fastening means 59. What may be called a horizontal wall 61 forms the bottom of the vacuum pump chamber 49. Two segmental chambers 63 and 65 are seen beneath the wall, the segmental chambers 45 being formed by radial walls in casting 19 as shown by Fig. 5. Chamber 65 is in communication with the windshield cleaner by a conduit 67. Chamber 63 communicates with the engine manifold by means of a conduit 69. Secured by fastening means 71 to the wall 61 is a plate 73. Beneath this plate an opening is made through wall 61 at 75. This opening and an aperture 77 in the plate 73 afford communication between the vacuum pump chamber 49 and segmental cham-

ber 65. In this passage is secured a valve seat 79. Engaging the seat is a disc valve 81 held in position by a spring 83, the spring being in abutment with an apertured member 85. The spring yieldably permits the flow of air from the chamber 65 to the chamber 49. Plate 73 has another opening 87, about which seats a disc valve 89 pressed upwardly by a spring 91 seated in a recess 93 of the wall 61. Through the bottom of this recess is shown an opening communicating with chamber 63. Chamber 63 is formed with a portion circular in cross section marked 95 within which is a float 97 carrying a cone-shaped valve 99 adapted to seat in the end of the passage 101 communicating with a bore 103 extending to the conduit 69.

The lower casting 19 is formed with a horizontal passage 105 communicating with chamber 63. Externally this passage is closed by a plug 107. From passage 105 there is an upwardly extended passage 109 the latter formed of two diameters to form a shoulder. Engaging this shoulder and closing the passage is a ball valve 111, the valve being yieldingly held by a spring 113 acting against a fixed abutment 115. The diaphragm is apertured at 117 to register with the passage 109 and an aperture which is formed in the spring abutment. Above the diaphragm the intermediate casting 15 is formed with a conduit 119 which, together with conduit 109, constitutes a passage from the region 63 to the region above the diaphragm and therefore to the crank case. The flow through this passage is possible only when pressure in chamber 63 is sufficient to overcome the load impressed on valve 111. By this means, if a leak occurs through a damaged diaphragm, not only will the escaping fuel cause the float to rise and close the passage 101, 103 but the pumping action will continue to keep the windshield cleaner in operation. After the float closes the communication between the manifold and the pump and windshield cleaner the check valve serves to deliver air drawn from the windshield cleaner into the pump chamber 49 to the crank case, and the oil entering the vacuum pump chamber is then also exhausted through the check valve back to the crank case. Therefore, the pump continues to keep the windshield cleaner in operation, the discharge of oil to the manifold is checked and loss of oil from the crank case is prevented.

In the embodiment of the invention shown by Figs. 7-9 the oil trap is made as a separate part and not as a part of the vacuum pump. Numeral 151 designates the wall of the engine crank case. A combined fuel and vacuum pump 153 is secured to the engine casing at 155. It is to be understood that this pump is not provided with an oil trap as in the case of the pump shown by Fig. 1. It has a diaphragm 157 actuated in one direction as usual by a spring 159. Its outlet valve 161 communicates by means of a conduit 163 with an oil trap 165. This trap may be secured to the engine casing 151 by fastening means 167. The trap comprises a chamber closed by a cap 169. The conduit 163 communicates with the trap chamber at 171. The top of the chamber has an outlet 173 connected by a conduit 175 to the engine manifold. It also has an outlet 177 registering with an opening 179 extending through the wall 151 into the crank case. Outlet 177 is controlled by a spring-loaded valve in the form of a ball 181, its spring 183 engaged by a plug 185 and serving to hold the valve 181 in a position to normally close passage 187 communicating with the oil trap chamber proper. Within the chamber is a float 189 having at its upper end a conical valve 191

closing a bore or passage 193 leading to outlet 173. The float is guided by a stem 195 projecting from the cap as shown.

The operation is substantially the same as in the form first described. When the diaphragm 157 is intact air is drawn into the pump chamber through the inlet valve (not shown) and discharged through valve 161. The air passes through conduit 163 into the trap chamber and out through passage 193, outlet 173, and conduit 175 to the engine manifold. In the event of oil leakage through the diaphragm, oil passes through valve 161, conduit 163, and collects in the trap chamber 165. The float then rises and closes the valve 191. The oil and air from the continuously operating pump then lift the spring-loaded valve 181 and the discharge occurs into the crank case through the wall opening 179. The pump is no longer a booster pump. It performs then the whole duty of exhausting the windshield cleaner motor and delivers the air to the engine crank case instead of to the engine manifold.

I claim:

1. In combination, a vacuum booster pump having a pump chamber, a plurality of conduit means adapted to connect said chamber with an engine manifold and a windshield cleaner, respectively, said pump having a flexible diaphragm, means extending into the engine crank case and adapted to flex said diaphragm, a trap between the pump chamber and the manifold conduit to collect oil escaping through a defective diaphragm into the pump chamber, a valve carrying float in said trap movable in response to collecting oil to close the communication between the manifold and the windshield cleaner and pump, and a check valve controlled discharge passage between said pump and crank case whereby the pump may continue to operate the windshield cleaner unassisted by engine vacuum and whereby escaping oil may be returned to the crank case.

2. In a suction booster pump for operating the windshield cleaner of a motor vehicle, the combination of a casing member, a movable diaphragm operable to constitute in cooperation with a part of said casing a variable volume pump chamber, means to reciprocate said diaphragm, said casing also formed with an additional post-pump chamber, a valve between said variable volume chamber and said additional chamber, a conduit connected to said variable volume chamber for communication with a windshield cleaner, a conduit connected to said additional chamber for communication with the engine manifold, a trapping chamber constituting a part of said additional chamber, a valve carrying float in said trapping chamber movable to close the conduit to the manifold, a valve-controlled outlet passage from the additional chamber whereby the windshield cleaner is kept in action by the pump unassisted by the manifold when the float valve closes the communication with the manifold.

3. The invention defined by claim 2, said outlet passage communicating with the engine crank case to permit the restoration of oil entering the pump chamber of the booster pump.

4. In combination, a vacuum booster pump the chamber of which is adapted to be connected to a windshield cleaner and the manifold of the motor vehicle, a trap to collect oil entering the chamber of the pump, means whereby said collected oil closes the communication with the manifold and means whereby the pump may discharge air and liquid subsequent to the closure of said

communication to the end that the operation of the windshield cleaner may be continued.

5 5. In combination, an engine casing, a vacuum pump, an oil trap separate from said pump and adapted to trap oil delivered by said pump to said trap, said trap having a plurality of discharge outlets, the first one of said outlets being normally open and communicating with the engine manifold, and the second of said outlets being nor-
10 mally closed and adapted to be opened and provide communication with the engine casing when the first outlet is closed.

15 6. The invention defined by claim 5 together with a valve carrying float in said trap operable under the influence of liquid collecting in said trap to close said first-named outlet.

20 7. The invention defined by claim 5 together with a valve carrying float in said trap operable under the influence of liquid collecting in said trap to close said first outlet and a spring-loaded valve controlling the second outlet.

25 8. In combination, a vacuum pump having a pump chamber, first conduit means adapted to connect said chamber with a windshield cleaner, said chamber having an outlet valve, second conduit means adapted to connect the discharge side of said outlet valve to an engine manifold, said

second conduit means including a trap, a float in said trap movable in response to the collection of liquid therein to close the communication through said second conduit means.

9. In combination, a vacuum pump having a pump chamber, first conduit means adapted to connect said chamber to a windshield cleaner, said chamber having an outlet valve, second conduit means adapted to connect the discharge side of said outlet valve with an engine manifold, said second conduit means including a trap, a float in said trap, means carried by said float and movable therewith in response to the collection of liquid in said trap to close said second conduit means, third conduit means leading from said trap, a normally closed valve adapted under pressure to open and permit escape of liquid from said trap through said third conduit means whereby the windshield cleaner may be operated by the pump unassisted by manifold suction and where-
20 by liquid leaking into the pump chamber and trap may be discharged.

10. The invention defined by claim 9, said third conduit means being in communication with the engine crank case.

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