

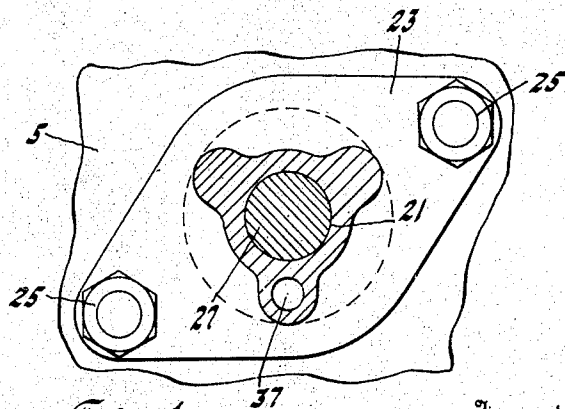
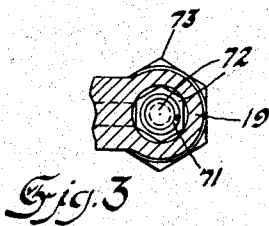
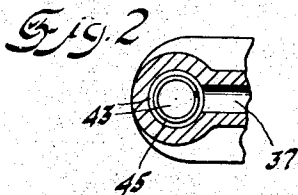
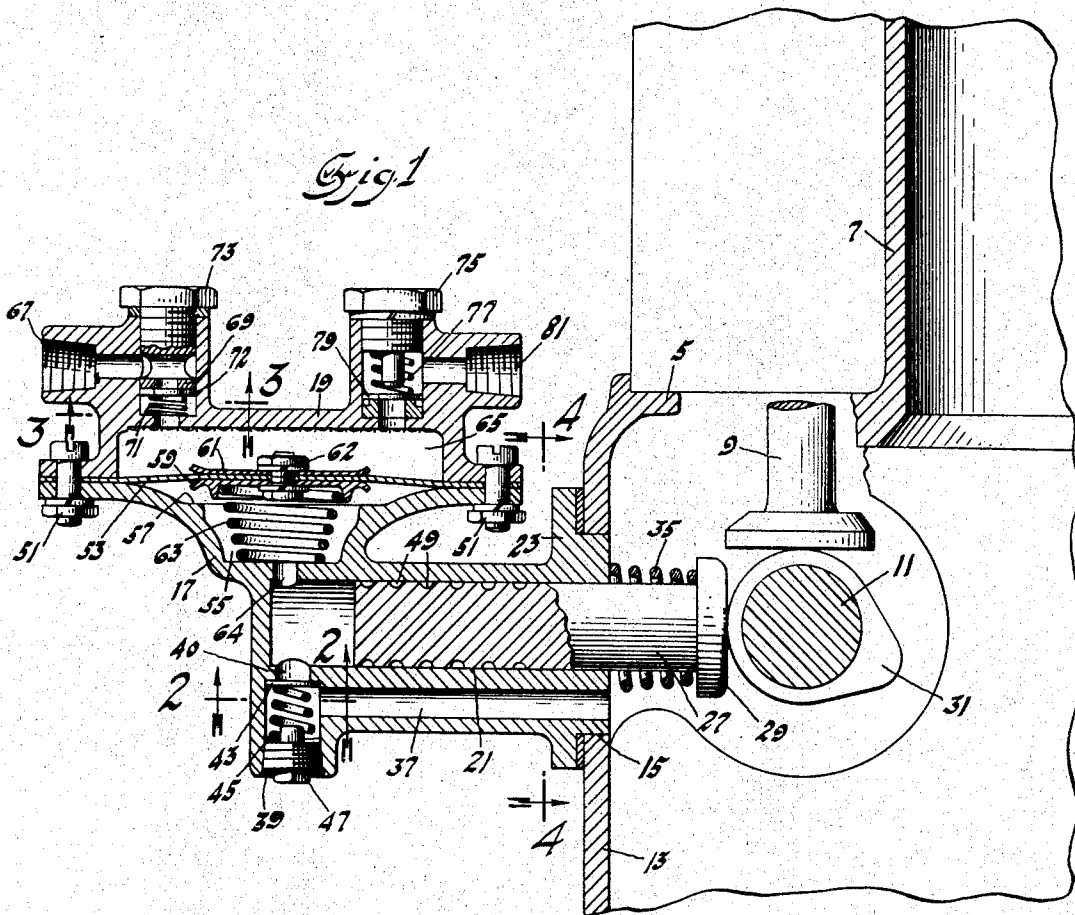
Jan. 13, 1931.

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1,788,886

FUEL PUMP

Filed May 7, 1928



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FUEL PUMP

Application filed May 7, 1928. Serial No. 275,752.

This invention relates to pumps and more specifically to an improvement in low pressure pumps useful in supplying fuel to the carburetors of internal combustion engines.

The invention has for its object a pump with an improved mechanism for providing the suction and discharge strokes. Another object is to produce the suction stroke by a reduction of gaseous pressure to thereby overcome a spring tending at all times to provide a discharge stroke. Other objects and advantages, such as efficiency in operation, quietness in action and long life, will be appreciated from a reading of the specification and an examination of the accompanying drawing.

In the drawing:

Figure 1 is a section through a part of the motor block of an internal combustion engine and of the fuel pump used therewith;

Figures 2, 3 and 4 are sections on lines 2—2, 3—3 and 4—4 respectively of Figure 1.

Referring to the drawing by reference characters, numeral 5 represents a part of an internal combustion engine. There is shown a cylinder 7, a valve tappet 9, the latter actuated by camshaft 11. The crankcase wall 13 has an opening 15 which is to be closed by a fuel pump constituting the subject matter of this application. No further description is given of the internal combustion engine for the reason that the invention relates only to the pump by which fuel is supplied and not to the engine itself.

The pump is composed of two parts, a pump body 17 and a cover 19. The pump body 17 is formed with a horizontal portion which is bored out to form a cylinder 21. This part has a flange 23 engaging the crankcase wall and is secured thereto by suitable fastening means 25, as shown in Figure 4. The extreme end of pump member 17 extends beyond the flange 23 within the opening 15 and aids in positioning the pump body. The cylinder 21 extends through this extreme end, and within the cylinder is slidably mounted a piston 27. The inner end of the piston is enlarged as at 29 and the enlarged end is engaged by a cam 31 carried by the shaft 11. As shown

in the drawing, the pump is positioned so that the end 29 of the piston is located in the vicinity of the cam 31 on the camshaft 11. It will be understood that the pump may be otherwise located. The pump may be positioned, for example, so that the piston may be in the path of movement of a cam on the water pump shaft, or on the forwardly projecting end of the crankshaft.

The drawing illustrates what is now believed to be a very desirable arrangement wherein the pump piston 27 is engaged by a cam on the camshaft, which shaft is used to actuate the valves of the engine. The piston is normally urged against the camshaft by a coil spring 35 surrounding the piston and in abutment with wall 13 and with the enlarged end 29 of the piston.

In parallel relation with the cylinder is the passage 37 of smaller diameter than the piston. The passage 37 also communicates with the crankcase, and at 39 the pump body is bored to provide an opening to passage 37 and a reduced opening 40 to the cylinder 21. A circular disc valve 43 normally closes the communication between cylinder 21 and the passage 37 being held against the shoulder between the passages 39 and 40 by a spring 45. This spring engages the valve 43 and an abutment 47 which is threaded into the opening 39. The valve 43 is circular in shape and when moved downwardly (Figure 1) opens the angular passage between the cylinder 21 and the passage 37. For the purpose of providing lubrication, the piston 27 is provided with circumferential grooves 49. Oil will be drawn from the crankcase into these grooves and lubricate the cylinder wall. The excess lubricant will be returned to the crankcase through the valve 43 and the passage 37.

The substantially circular cover member of the pump 19 is secure to the pump body 17 by fastening means 51. Between the body and the cover is clamped the diaphragm 53 which is preferably of flexible fabric. The body portion of the pump 17 above the closed end of cylinder 21 is flared out, as illustrated, to form a chamber 55. The walls of the cham-

ber have an abutment 57. This abutment is intended to engage at times a metal disc 59 secured together with another metal disc 61 on the other side of the diaphragm by fastening means 62. The downward movement of the diaphragm producing the suction stroke is stopped by the engagement of the lower disc 59 with the abutment 57. Between the cylinder 21 and the chamber 55 is a passage 64. A spring 63 engages the bottom of the chamber and the lower disc 59. This spring is constantly exerting a resilient force tending to push the diaphragm upwardly and produce a discharge stroke.

The upper cover member 19 is recessed to form a pump chamber 65 defined by the diaphragm and the top wall of the recess in the cover 19. The cover is provided with a horizontal inlet opening at 67 communicating with a valve control passage 69 leading to the pump chamber 65. A spring 71 normally holds a disc valve member 72, preferably hexagonal in shape as shown in Figure 3, against a threaded plug 73. This spring is capable of being overcome by reduced pressure within the pump chamber, thereby permitting the valve 72 to move downwardly and admit fuel from the opening 67 into the pump chamber 65. A discharge valve is formed by a plug 75, a spring 77, an hexagonal valve disc 79 and an opening 81. It will be understood that the opening 81 is to be connected to the float chamber of the carburetor and that for that purpose, a suitable conduit will connect the opening 81 with the carburetor.

In operation, let it be assumed that the parts are in the position shown by Figure 1. The movement of the piston 27 to the right, which movement has been produced by spring 35, has tended to increase the volume and decrease the atmospheric pressure within the chamber 55 and the closed end of cylinder 21 beyond the piston 27. Spring 63 has resisted the downward movement of the diaphragm as the diaphragm tended to move down in its attempt to prevent the development of vacuum in chamber 55. At the end of the stroke of the piston 27 to the right, a balanced condition exists in which the unbalance between the atmospheric pressure above the diaphragm and the sub-atmospheric pressure below the diaphragm is balanced by the tension of spring 63. In its downward movement, the diaphragm has executed a suction stroke and drawn fuel into the pump chamber 65 through the valve 72. Thereafter, the cam pushes piston 27 to the left. This movement disturbs the balance whereby the sub-atmospheric condition in the chamber 55 is holding spring 63 in restraint. As the piston 27 moves to the left, the reduced pressure in chamber 55 is relieved and spring 63 is released and is free to execute a discharge of fuel through opening 81 and deliver the fuel to the carburetor. The delivery

of fuel to the carburetor will be controlled by the carburetor float valve and by the feeding pressure determined by the calibrated spring 63. If in any two successive strokes (one of suction and one of discharge as described above) the fuel demands of the carburetor are such that more fuel is drawn into the pump chamber than can be discharged by the action of spring 63, spring 63 then has a built-up pressure. The added air pressure in chamber 55 occasioned by the movement of piston 27 to the left and the failure of the diaphragm to move upwardly to an extent commensurate with the movement of piston 27 is relieved by passing valve 43 and the passage 37, which communicates with the crankcase. It will therefore be seen that under certain conditions of operation, spring 63 may assume a degree of pressure such that the diaphragm disc 59 will engage abutment 57 after which piston 27 may reciprocate to and fro without causing any pump action. Use of fuel by the carburetor will at once reduce pressure in the pump chamber and will, in an obvious manner, again start the pump action. The grooves of the piston will serve to carry oil from the crankcase, lubricate the cylinder wall, and excess oil will be restored to the crankcase through the valve 43 and the passage 37.

A fuel pump constructed as described will provide fuel to the extent demanded by the carburetor. It is noiseless, spring 35 holding the piston 27 at all times on the cam and there being no mechanical connection between the diaphragm and the piston 27. It will have long life since the diaphragm is moving only when active to supply fuel and its movements are then limited in proportion to the fuel demanded.

I claim:

1. A fuel pump for gas engines comprising a body having inlet and exhaust valves, a movable pump member serving with said body to form a first variable volume pump chamber, a second member movable independently of the movable pump member, means associated with said movable pump member and said second member forming therewith a second variable volume chamber, resilient means to move said movable pump member to make a discharge stroke, means to move said second movable member to increase the volume of said second chamber, and independent engine operated means to move said second member in a direction to decrease the volume of the said second chamber.

2. The invention defined by claim 1, said resilient means and the variable pressures in said second chamber resulting from movements of said second movable member both operating upon one and the same side of said movable pump member.

3. The invention set forth in claim 1,

said second movable member being a reciprocating piston.

4. The invention set forth in claim 1, said means to move the second movable member in a direction to increase the volume of the second chamber being a resilient spring.

5. A pump for fluids comprising a flexible pumping element, means associated therewith forming closed chambers, one on each side thereof, inlet and discharge valves communicating with one of said chambers, means movable independently of said flexible pumping element and reciprocable in the second of said chambers, a spring operable upon said flexible element to produce a discharge stroke, mechanism to move said reciprocable means in opposite directions whereby the said spring and the varying pressures in the second chamber resulting from movements of the reciprocable means produce pumping action, said mechanism including a resilient element to increase the volume of the second chamber, and opposed power-operated means to decrease the volume of the second chamber.

6. In combination with an engine having a crank case, a cam shaft therein, a cam on said shaft, a pump positioned adjacent said crank case, said pump comprising a body, a vibratory member dividing said body in a first pump chamber and a second chamber, inlet and exhaust valves in said pump chamber, a plunger reciprocable in said second chamber, yielding means in said second-chamber operable upon said vibratory member, said cam operable upon said plunger to reduce the volume of the second chamber, and a spring operable upon said plunger to increase the volume of said second chamber.

7. The invention defined by claim 6, said body having a passage therein communicating with said crank case, and a relief valve opening from said second chamber to said passage.

In testimony whereof I affix my signature.

FRANK N. NUTT.