Nov. 10, 1953 J. W. F. HOLL 2,658,732

FUEL CARBURETION SYSTEM

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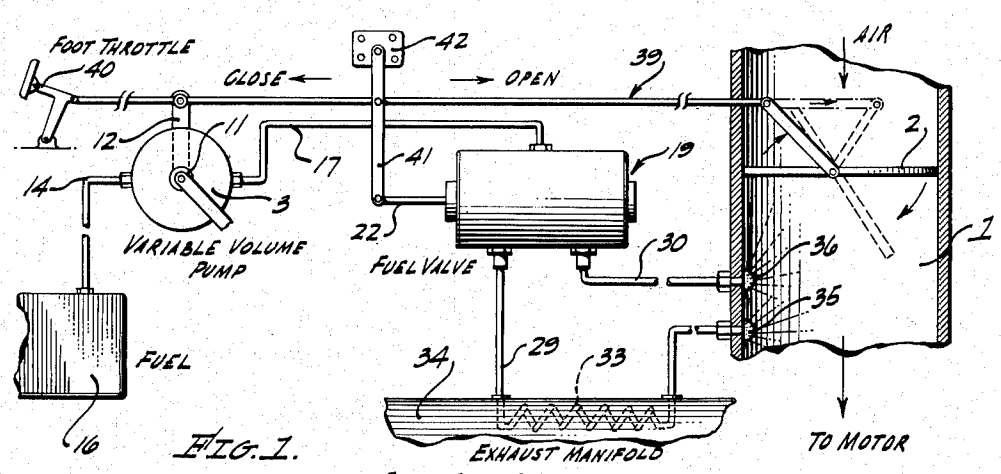


FIG. 1.

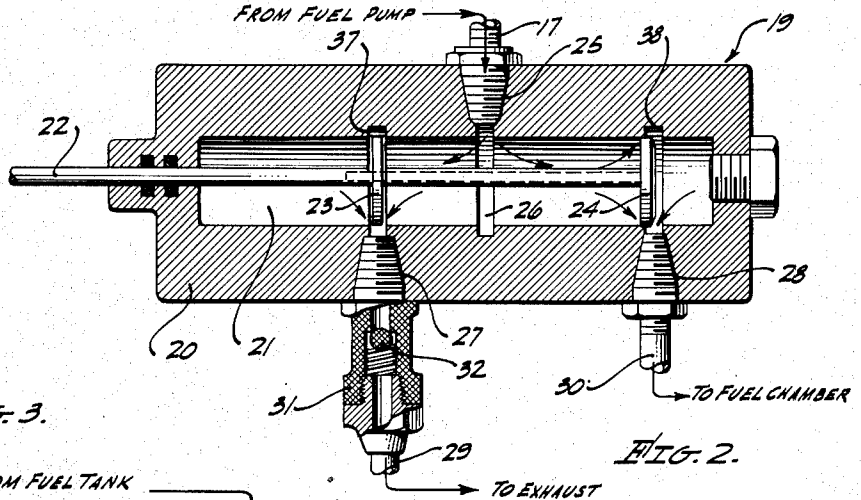
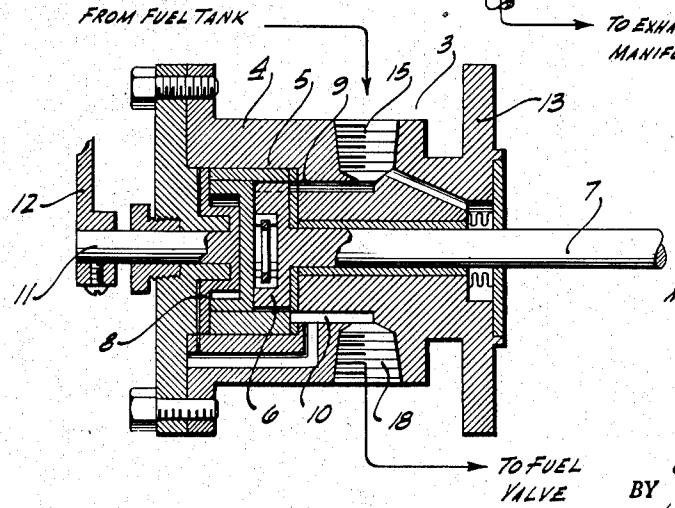


FIG. 3.

FIG. 2.



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FUEL CARBURETION SYSTEM

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8 Claims. (Cl. 261—15)

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This invention relates to a carburetion system in which the fuel is injected under substantially constant pressure into the intake manifold of the engine or the intake throat of that manifold. The volume of the fuel, however, is variable by the operator of the machine.

A feature of my invention is to provide a carburetion system in which there is no venturi in the manifold adjacent the throttle valve. The fuel is injected adjacent to the throttle and into a straight walled passage, that is, the intake throat or conduit of the intake manifold has a straight wall particularly in the area adjacent to the throttle valve.

Still another object of my invention is to provide a carburetion system in which the fuel can be either preheated prior to injection into the intake manifold, or it can be fed directly into the manifold without preheating.

Another feature of my construction is that a relatively large intake manifold can be used as well as large intake valves in the engine since velocity is not necessary to break up the fuel.

All of this produces an engine in which there is a less restricted passage for the fuel mixture than in conventional carburetion, that is, there is better breathing of the engine. This advantage results in better fuel economy due to accurate metering of the fuel by a variable volume pump. This pump is directly driven by the engine in the same manner as is common in diesel engine practice.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing:

Figure 1 is a side elevation diagrammatically representing of the various units of my carburetion system.

Figure 2 is a longitudinal sectional view of the push-pull type of valve.

Figure 3 is a longitudinal sectional view of the variable volume rotary pump employed in my carburetion system.

Referring more particularly to the drawing, the numeral 1 indicates the intake manifold or the intake throat of this manifold. It is to be noted that the intake passage 1 does not include a venturi but the walls thereof are straight. Also, this manifold is substantially larger in diameter than is usually employed by engines heretofore in use. A throttle or butterfly valve 2 is rotatably mounted in the manifold 1 and this throttle is controlled manually or by means of

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the usual foot throttle, all of which will be subsequently described.

A variable volume pump 3 is driven preferably by the engine itself through suitable gearing or drive means, which will be further described. The variable volume pump 3 may be of the type shown in my Patent Number 2,359,553, issued October 3, 1944 for Variable Volume Rotary Pump. Other variable volume rotary pumps may also be employed if desired.

While the volumetric output of the pump is varied to suit different engine speeds and loads, the pressure of the fuel is substantially constant, although even this pressure may vary slightly. The rotary pump 3 consists of a housing 4 in which a chamber or cylinder 5 is formed. A rotor 6 is mounted in the chamber 5 and this rotor is a part of or is fixedly attached to the shaft 7, which projects from the housing 4 and is driven by the engine through suitable gearing or drive means (not shown).

To vary the output of the pump, I provide ported cup 8 which rotates within the rotor 6 and controls or adjusts the opening to the intake port 9 and the outlet port 10. The cup 8 is mounted on a shaft 11 to which an arm 12 is attached. By rotating the arm 12 the shaft 11 will also be rotated thereby adjusting the cup 8 and in turn varying the volumetric output of the pump 3. The pump 3 is also fixedly mounted on or adjacent to the engine by a suitable mounting pad or flange 13.

A fuel intake line or pipe 14 extends into the intake port 15 of the pump and this pipe extends from the useful fuel tank 16 which is mounted adjacent to the engine. An outlet pipe 17 extends from the outlet port 18 of the pump and this outlet pipe extends into a control valve 19. The control valve 19 includes an elongated housing 20 in which a cylinder 21 is formed. A push rod 22 extends into the cylinder 21 and a pair of spaced pistons 23—24 are fixedly attached to the rod 22 and are slidable within the cylinder 21, substantially as shown. The intake port 25 of the valve 19 is positioned between the pistons 23—24 and the port 25 opens into an enlarged annular groove 26 which is formed in the cylinder 21. A pair of outlet ports 27 and 28 extend from the cylinder 21 and the outlet pipes 29 and 30 extend from the ports 27 and 28 respectively.

A heat insulation fitting 31 screws into the outlet port 27, and the pipe 29 screws into this fitting. The fitting also includes a spring pressed ball 32 which is seated when fuel is not flowing

through the pipe 29, thus preventing heat from being transmitted back into the cylinder 21. The pipe 29 is attached to the heating coil 33 in the exhaust manifold 34. From the coil 33 the pipe extends to a spray nozzle 35 within the intake manifold 1 and preferably adjacent the throttle valve 2. The pipe 30 extends to a second spray nozzle 36, also opening into the manifold 1 and preferably adjacent to the throttle valve 2. An annular groove 37 around the cylinder 21 opens into the outlet port 27. A similar annular groove 38 opens into the outlet port 28. The purpose of these grooves is to permit fuel to pass around the pistons 23 and 24 if the piston should be positioned exactly within these grooves, as shown by the position of the piston 23 in Figure 2.

The throttle valve 2 is rotated to control the amount of air passing through the manifold 1 in the usual manner, which includes a rod 39 connected at one end to the throttle 2 and at the other end to the foot throttle 40. The arm 12 of the pump 3 is pivotally attached to the rod 39 so that the volumetric output of the pump 3 is adjusted at the same time that the throttle 2 is opened or closed. An arm 41 is secured at one end to the push-pull rod 22 and the other end of this arm is pivotally secured to a bracket 42. The arm 41 is also pivotally secured to the rod 39 so that the arm 41 will be moved with the rod 39 as the throttle valve 2 is adjusted. Movement of the arm 41 will push or pull the rod 22, thus moving the pistons 23—24 relative to the outlet ports 27—28.

In closed position of the throttle, the piston 23 will be at or adjacent to the left end of the cylinder 21. From zero or idling position of the throttle 2 up to about three-fourths of the full movement of the throttle 2, the incoming fuel from the pump 3 and through the pipe 17 will be directed into the outlet port 27, thence through the pipe 29, and will be heated or vaporized in the coil 33. The piston 24 in the meantime, closes off the outlet port 28 and all of the fuel to the engine will, therefore, be preheated or vaporized. This condition continues until the piston 23 passes to the right of the outlet port 27 and at this point the outlet port 28 is uncovered and raw fuel is then directed from the pump 3 through the pipe 30, and is directed into the manifold 1, through the nozzle 36. This is the condition necessary for high speeds of the engine and also for heavy pulling.

The position of the foot throttle 40, therefore, will determine the adjustment of the variable volume pump 3 and the volumetric output of that pump. This same position of the foot throttle will also determine whether the fuel is directed to a heating coil and thence into the intake manifold, or if the fuel is injected directly into the intake manifold without preheating. The position of the foot throttle also, of course, determines the position of the throttle valve 2 and, therefore, the amount of admitted air through the manifold 1.

Having described my invention, I claim:

1. A fuel carburetion system including an intake manifold, a throttle valve rotatably mounted in said manifold, two spray nozzles each extending into the manifold adjacent said throttle valve, a variable volume fuel pump, means on the pump to adjust the volume of said pump, a control valve, said control valve having a piston slidably mounted therein, said valve having an intake port, a pipe extending from the fuel pump to the intake port, two outlet ports in said valve, a pipe extending from one of said ports to one of the spray nozzles, a second pipe extending from the second port to another of the spray nozzles, and means to manually adjust said piston in the valve to direct flow to either of said outlet ports.

2. A fuel carburetion system including an intake manifold, a throttle valve rotatably mounted in said manifold, two spray nozzles each extending into the manifold adjacent said throttle valve, a variable volume fuel pump, means on the pump to adjust the volume of said pump, a control valve, said control valve having a piston slidably mounted therein, said valve having an intake port, a pipe extending from the fuel pump to the intake port, two outlet ports in said valve, a pipe extending from one of said ports to one of the spray nozzles, a second pipe extending from the second port to another of the spray nozzles, and means to manually adjust said piston in the valve to direct flow to either of said outlet ports, and heating means for the fuel extending from one of said outlet ports.

3. A fuel carburetion system for engines including an intake manifold, a throttle valve rotatably mounted in the manifold, two spray nozzles extending into the manifold adjacent said throttle valve, a variable volume pump, a control valve, said control valve having a cylinder therein, a piston slidably mounted in the cylinder, a piston rod extending out of the control valve, an accelerator rod attached to the throttle valve at one end thereof, a control arm on the variable volume pump, said control arm being pivotally attached at one end to the accelerator rod, an arm attached to said piston rod and to the accelerator rod whereby the variable volume pump and the control valve are simultaneously adjusted by movement of the control rod, said control valve having an intake port therein, a pipe extending from the pump to said intake port, two outlet ports extending from the control valve, a pipe extending from each of the outlet ports to one of the spray nozzles, the piston in the control valve being adjustable to direct fuel to either of said outlet ports.

4. A fuel carburetion system for engines including an intake manifold, a throttle valve rotatably mounted in the manifold, two spray nozzles extending into the manifold adjacent said throttle valve, a variable volume pump, a control valve, said control valve having a cylinder therein, a piston slidably mounted in the cylinder, a piston rod extending out of the control valve, an accelerator rod attached to the throttle valve at one end thereof, a control arm on the variable volume pump, said control arm being pivotally attached at one end to the accelerator rod, an arm attached to said piston rod and to the accelerator rod whereby the variable volume pump and the control valve are simultaneously adjusted by movement of the control rod, said control valve having an intake port therein, a pipe extending from the pump to said intake port, two outlet ports extending from the control valve, a pipe extending from each of the outlet ports to one of the spray nozzles, the piston in the control valve being adjustable to direct fuel to either of said outlet ports, and heating means surrounding one of the pipes extending to one of said spray nozzles.

5. A fuel carburetion system for engines including an intake manifold of the engine, a throttle valve rotatably mounted in said manifold, two spray nozzles extending into the manifold

adjacent said throttle valve, a variable volume fuel pump, a control valve, said valve having a cylinder therein, a piston rod extending into said cylinder, two spaced pistons mounted on the rod within the cylinder, said control valve having an intake port extending into the cylinder between the pistons, and a pair of spaced outlet ports extending from the cylinder, said pistons selectively closing off either of the outlet ports, a pipe extending from the pump to the intake port of the valve, a pipe extending from each of the outlet ports to one of the spray nozzles.

6. A fuel carburetion system for engines including an intake manifold of the engine, a throttle valve rotatably mounted in said manifold, two spray nozzles extending into the manifold adjacent said throttle valve, a variable volume fuel pump, a control valve, said valve having a cylinder therein, a piston rod extending into said cylinder, two spaced pistons mounted on the rod within the cylinder, said control valve having an intake port extending into the cylinder between the pistons, and a pair of spaced outlet ports extending from the cylinder, said pistons selectively closing off either of the outlet ports, a pipe extending from the pump to the intake port of the valve, a pipe extending from each of the outlet ports to one of the spray nozzles, a control means, and means connecting said control means in the variable volume to adjust said pump, and another means extending from the first named means to said piston rod to adjust the pistons in said valve.

7. A fuel carburetion system for engines including an intake manifold of the engine, a throttle valve rotatably mounted in said manifold, two spray nozzles extending into the manifold adjacent said throttle valve, a variable volume fuel pump, a control valve, said valve having a cylinder therein, a piston rod extending into said cylinder, two spaced pistons mounted on the rod within the cylinder, said control valve having an intake port extending into the cylinder between

the pistons, and a pair of spaced outlet ports extending from the cylinder, said pistons selectively closing off either of the outlet ports, a pipe extending from the pump to the intake port of the valve, a pipe extending from each of the outlet ports to one of the spray nozzles, and heating means surrounding one of the pipes extending to one of said spray nozzles.

8. A fuel carburetion system for engines including an intake manifold of the engine, a throttle valve rotatably mounted in said manifold, two spray nozzles extending into the manifold adjacent said throttle valve, a variable volume fuel pump, a control valve, said valve having a cylinder therein, a piston rod extending into said cylinder, two spaced pistons mounted on the rod within the cylinder, said control valve having an intake port extending into the cylinder between the pistons, and a pair of spaced outlet ports extending from the cylinder, said pistons selectively closing off either of the outlet ports, a pipe extending from the pump to the intake port of the valve, a pipe extending from each of the outlet ports to one of the spray nozzles, a control means, and means connecting said control means in the variable volume pump to adjust said pump, and another means extending from the first named means to said piston rod to adjust the pistons in said valve, and heating means surrounding one of the pipes extending to one of said spray nozzles.

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