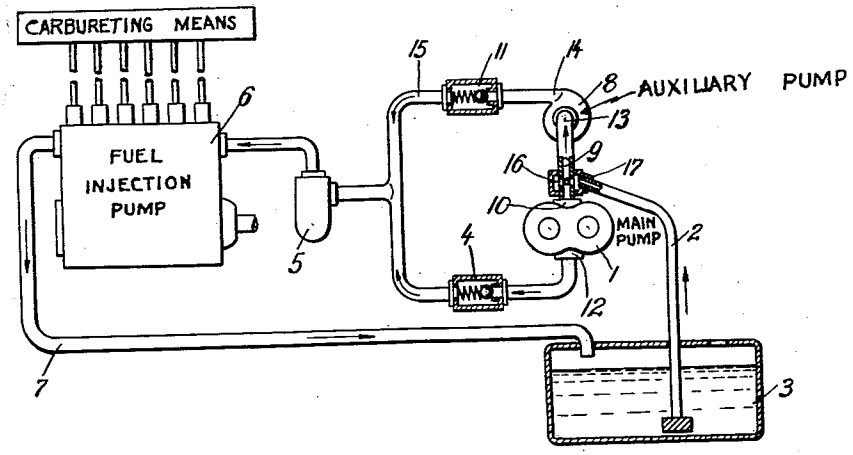
Nov. 28, 1961 H. O. SCHERENBERG 3,010,509

FUEL SUPPLY SYSTEM FOR AN INTERNAL COMBUSTION ENGINE

Filed March 19, 1956



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United States Patent Office 3,010,509 Patented Nov. 28, 1961

3,010,509

FUEL SUPPLY SYSTEM FOR AN INTERNAL COMBUSTION ENGINE

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Filed Mar. 19, 1956, Ser. No. 572,482
Claims priority, application Germany Mar. 23, 1955
6 Claims. (Cl. 158—36.3)

My invention relates to a fuel supply system for an internal combustion engine and, more particularly, for an engine of the fuel injection type having a main pump and an auxiliary pump adapted to feed the fuel from a reservoir to the means for carbureting the air charge, such as a fuel injection pump or the carburetor.

Where fuels having a low boiling point are used in machines of this type, there exists the risk that at high atmospheric temperatures vapor may form in the suction pipe of the pumps, such vapor forming bubbles interfering with the fuel feed and impairing a uniform operation of the internal combustion engine.

It is the object of my invention to avoid this disadvantage by such a disposition of the various elements as to cause any vapor bubbles that may form in the suction pipe, particularly directly in front of the suction port of the main pump, to be sucked away by the auxiliary pump in upward direction thus ensuring that the main pump will be supplied with a homogeneoous liquid fuel free from any bubbles.

Further objects of my invention will appear from the detailed description of a preferred embodiment of the invention following hereinafter with reference to the accompanying drawing. It is to be understood, however, that the terms and phrases used in such detailed description have been chosen for the purpose of illustrating the invention rather than that of restricting or limiting the same. The features of novelty for which patent protection is sought will be pointed out in the appended claims.

In the drawing my novel fuel supply system is shown in elevation, partly in section. It comprises means for carbureting an air charge, such as a fuel injection pump **6**, a reservoir **3** containing a supply of fuel, a main pump **1**, an auxiliary pump **8**, and a suitable conduit system to be described hereinafter for connecting the afore-stated elements. The engine may be of a type in which air charges are sucked into the cylinders and during their compression are carbureted by the injection of fuel for subsequent ignition by spark plugs. However, my invention is equally applicable to internal combustion engines equipped with a standard carburetor which carburets the air prior to its admission into the cylinders of the engine.

The main pump **1** which may be a gear pump driven in any suitable manner has a suction port **10** and a discharge port **12**. It sucks the fuel from the reservoir **3** through a suction pipe **2** and feeds the fuel from the discharge port **12** through a check valve **4** and a fuel filter **5** to the injection pump **6**. The excessive fuel is returned to the reservoir **3** through a pipe **7**. The auxiliary pump which preferably is of the centrifugal type has likewise a suction port **13** and a discharge port **14**. For the purpose of the present invention the suction ports **10** and **13** of the two pumps **1** and **8** are connected by a substantially vertical duct **9**. Preferably, the suction port **10** of the main pump **1** is located at the top of the pump **1**. Therefore, the duct **9** is located above the main pump **1**. The discharge port **14** of the auxiliary pump **8** communicates with the filter **5** through a pipe **15** provided with a check valve **11**. Thus, both pumps **1** and **8** are jointly operative to feed the fuel from the reservoir **3** to the filter **5**.

Any air bubbles that may form in the intake port **10** of the main pump **1** or in the lower portion of the vertical duct **9** will not get into the main pump **1**, but will automatically move upwardly in the duct **9** independently of the suction effect exerted by the main pump **1**, the duct **9** serving as a collecting chamber. The auxiliary pump **8** is preferably continuously driven, but may be turned on and off depending on the requirements of operation. If desired, control means may be provided which will start the auxiliary pump **8** whenever the pressure of the fuel fed by the main pump **1** drops or fluctuates owing to the inclosure of vapor bubbles.

In the embodiment shown, the suction pipe **2** communicates with the duct **9** between the ends of the latter. For this purpose, the duct **9** is provided with a plurality of circumferentially distributed holes **16** which are preferably farther spaced from the auxiliary pump **8** than from the main pump **1**. A housing **17** to which the suction pipe **2** is fitted surrounds the duct **9** and communicates with the interior thereof through the holes **16**. Hence, it will appear that the suction pipe **2** joins the connecting duct **9** laterally thus ensuring that any air bubbles that may rise within the duct **9** will not get into the suction pipe **2**. Alternatively, the pipe **2** may be so correlated to the duct **9** as to join the same from below. If desired, however, the suction pipe **2** may join the suction port **10** from the side or from below. In this event, the suction port **10** may be disposed at the side of the main pump **1**.

While the invention has been described in connection with a preferred embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as fall within the scope of the invention or the limits of the appended claims.

What I claim is:

1. In a supply system for an internal combustion engine having means for carbureting an air charge, and a fuel reservoir of the combination comprising a main fuel pump, an auxiliary fuel pump, each of said pumps having a suction port and a discharge port, a substantially vertical duct connecting the suction ports of said pumps, an inlet suction pipe adapted to establish communication between said duct and said reservoir, and outlet pressure conduits adapted to connect the discharge ports of said pumps with each other and to said means, the communication between said vertical duct and said suction pipe and said auxiliary pump being so constructed and arranged that substantially all vapors contained in said fuel pass through said duct with the fuel therein to said auxiliary fuel pump.

2. A supply system as defined in claim 1, wherein said suction port of said main pump is located at the top thereof.

3. A supply system as defined in claim 2, wherein said duct is located above said main pump, said suction pipe communicating with said duct at a point farther spaced from said auxiliary pump than from said main pump.

4. In a hydraulic system for supplying liquid to a utilization device; the combination comprising a main hydraulic pump, an auxiliary hydraulic pump, each of said pumps having a suction port and a discharge port, a substantially vertical duct connecting the suction ports of said pumps, an inlet suction pipe adapted to establish communication between said duct and a liquid reservoir, and outlet pressure ducts adapted to connect the discharge ports of said pumps with each other and to said utilization device, the

communication between said suction pipe and said vertical duct and said auxiliary pump being so constructed and arranged that substantially all vapors contained in said liquid pass through said duct with the liquid therein to said auxiliary pump.

5. In a fuel supply system for an internal combustion engine, means for carbureting an air charge, a fuel reservoir, and a pumping means for transferring fuel from said reservoir to said carbureting means including main and auxiliary fuel pumping means, each of the said pumping means having a suction and a discharge port, a substantially vertical duct connecting the suction ports of said pumping means, said auxiliary pumping means being located at a point above said main pumping means, a suction pipe establishing communication between said duct and said reservoir, pressure conduits connecting the discharge ports of said pumps with each other and a common pressure conduit connecting the combined pressure conduits of said pumps with said carbureting means, the communication of said vertical duct and said suction pipe being so constructed and arranged that substantially all vapors contained in said fuel pass through said duct with the fuel therein to said auxiliary pumping means.

6. A fuel supply system as defined in claim 5, wherein

the communication of said duct and said suction pipe includes a housing surrounding said duct, said suction pipe communicating with the interior of said housing, and a plurality of circumferentially distributed holes in said duct and within said housing and positioned farther from said auxiliary pumping means than said main pumping means.

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