

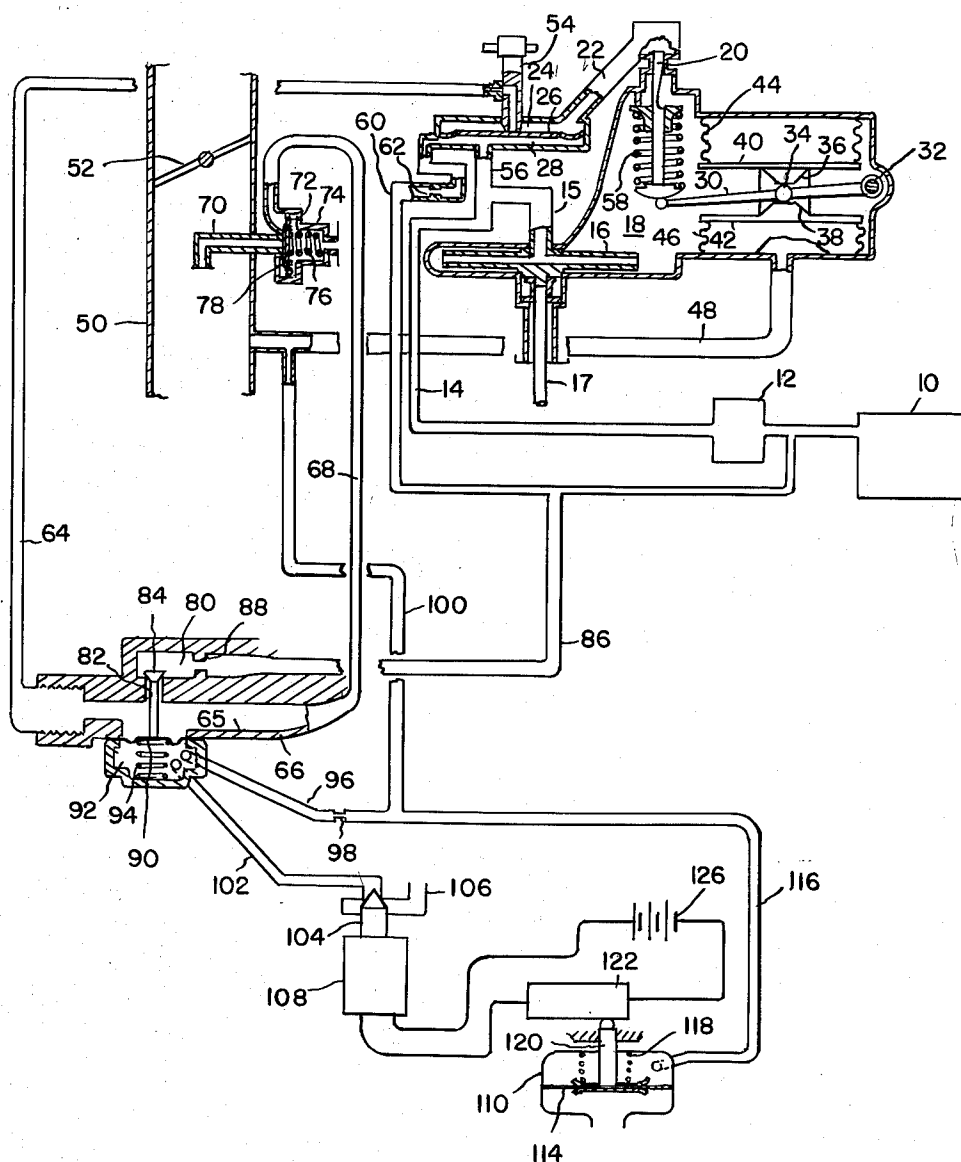
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DECELERATOR FOR FUEL INJECTION OR PRESSURE METERING SYSTEMS

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DECELERATOR FOR FUEL INJECTION OR PRESSURE METERING SYSTEMS

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The present invention relates to a decelerator for fuel injection or pressure metering systems.

It is an object of the present invention to provide means associated with fuel injection or pressure metering systems of an internal combustion engine adapted to shut off the flow of fuel thereto upon deceleration.

More specifically, it is an object of the present invention to provide a decelerator for fuel injection or pressure metering systems including means for bypassing fuel upon deceleration to prevent its supply to the engine.

More specifically, it is an object of the present invention to provide means as described in the preceding paragraph including automatic control means responsive to an engine deceleration sensitive condition.

Still more specifically, it is an object of the present invention to provide control means for a decelerator for a fuel injection or pressure metering system responsive to the substantial reduction in manifold pressure during deceleration.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawing, illustrating a preferred embodiment of the invention, wherein:

The figure is a diagrammatic view of a fuel supply system for an internal combustion engine embodying the deceleration control.

Briefly described, the fuel control system comprises a tank 10 connected to a constant pressure pump 12 adapted to supply fuel through a conduit 14 and branch 15 to the eye of an impeller pump 16 driven by a shaft 17 operated in accordance with engine speed. The centrifugal pump 16 in turn discharges fuel at an increased pressure within the interior of a chamber 18. Fuel under pressure within the chamber 18 escapes past a metering valve 20 to a passage 22 which leads to a chamber 24 the lower wall of which is formed by a flexible diaphragm 26. Below the flexible diaphragm is a second chamber 28, the upper wall of which is formed by the same flexible diaphragm 26. The escape of fuel past the metering valve 20 is controlled by a lever 30 having a fixed pivot mounting 32 and having an intermediate element 34 engaged between abutments 36 and 38 carried by movable walls 40 and 42 of collapsible bellows 44 and 46 respectively. The bellows 44 is evacuated and the interior of the bellows 46 is connected by a conduit 48 to the air intake passage 50 at a point below the throttle valve 52 so as to subject the interior of the bellows 46 to sub-atmospheric manifold pressure of the internal combustion engine to which the air induction passage 50 leads.

Outlet valve 54 extends into the chamber 24 and has a port therein which cooperates with the flexible diaphragm 28 to regulate flow of fuel out of the chamber 24. It will be observed that fuel flowing from the constant pressure pump 12 enters the chamber 28 through a branch passage 56 so that the lower chamber 28 is at all times filled with fuel under the constant pressure as supplied by the pump 12. Inasmuch as the flexible diaphragm 26

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is subjected only to the forces applied by the pressure of fuel within the chambers 24 and 28, it follows that whenever the flexible diaphragm 26 is stationary, the pressure of fuel in the chamber 24 is equal to the pressure of fuel within the chamber 28 and hence, is equal or substantially equal to the pressure of fuel as supplied by the constant pressure pump 12. On the other hand, the quantity of fuel flowing through the chamber 24 and the valve 54 is determined by the position of the metering valve 20 and this in turn is controlled by manifold pressure of the internal combustion engine. The force developed by the differential pressures within the bellows 44 and 46 acts against compression spring 58 to determine the instantaneous position of the metering valve 20. Upon an increase in flow of fuel to the chamber 24 there will be a momentary increase in pressure which will move the flexible diaphragm 26 downwardly to the proper position to cause the pressure within the chamber 24 to again assume substantial equality with the pressure in the chamber 28.

A continuous flow of fuel through the chamber 28 is provided through the return passage 60 which is provided with the restriction illustrated at 62. Fuel flowing past the valve 54 flows through the conduit 64 into a chamber 65 in a body 66 to a passage 68 leading to the nozzle 70. A flexible diaphragm 72 is provided in a chamber 74 and is urged in closing direction by a compression spring 76 to prevent injection of fuel through the nozzle 70 except under a predetermined minimum pressure sufficient to unseat a valve element 78 carried by the diaphragm 72.

The body 66 is provided with a chamber 80 which communicates with the chamber 65 through a passage 82 closed by a valve 84. The chamber 80 connects to a return passage 86 leading to the tank 10, and a restriction 88 is provided in this passage.

The valve 84 has a stem connected to a flexible diaphragm 90 forming one wall of an enclosed chamber 92 containing a compression spring 94 urging the diaphragm and valve 84 toward valve opening position. The interior of the chamber 92 communicates by a passage 96 having a restriction 98 therein with a passage 100 which communicates with the interior of the air induction passage 50 below the throttle 52 and which therefore connects the interior of the chamber 92 to sub-atmospheric manifold pressure.

A second passage 102 communicates with the interior of the chamber 92 and has a valve 104 therein adapted to control its connection to atmosphere as indicated at 106. The valve 104 is solenoid actuated, the solenoid being diagrammatically indicated at 108. A closed chamber 110 is provided one wall of which is formed by a flexible diaphragm 114 the outer portion of which is exposed to atmosphere. The interior of the chamber 110 communicates through a passage 116 with the source of manifold pressure. Located within the chamber 110 is a compression spring 118. Connected to the flexible diaphragm 114 is a valve actuator 120 adapted upon upward movement of the actuator, as shown in the Figure, to actuate a micro switch 122 so as to complete a circuit through the vehicle storage battery 126 and the solenoid 108 so as to open the valve 104. The spring 118 is selected to prevent closure of the micro switch 122 except under the extremely low manifold pressure conditions existing during deceleration of the engine. Under these conditions, however, the switch 122 closes, energizing the solenoid 108 and opening the valve 104, thus bleeding atmospheric air into the chamber 92 which permits the spring 94 to open the valve 84. Since the flow of fuel through the nozzle is prevented except above the minimum pressure as predetermined by the spring 76, opening of the bypass valve 84 provides for a bypass flow of the entire quantity of fuel flowing through the con-

duit 64 to the tank or reservoir 10 through the passage 86.

The foregoing construction permits continuous operation of the constant pressure pump 12 as is essential or at least highly desirable, and at the same time efficiently interrupts flow of fuel to the engine by bypassing the entire output of the fuel pump to the tank or reservoir.

The drawings and the foregoing specification constitute a description of the improved decelerator for fuel injection or pressure metering systems in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A fuel supply system for an internal combustion engine comprising a fuel pump, means for delivering the output of said pump to the internal combustion engine, means operable under normal operation for regulating the supply of fuel to the engine, a bypass passage operable to bypass fuel supplied by said pump to the engine, valve means normally closing said bypass passage, and automatic manifold vacuum responsive means to move said valve means from fully closed to fully open position at a predetermined manifold vacuum existing during deceleration.

2. A fuel supply system for an internal combustion engine comprising a fuel pump, means for delivering the output of said pump to the internal combustion engine, means operable under normal operation for regulating the supply of fuel to the engine, a bypass passage operable to bypass fuel supplied by said pump to the engine, valve means normally closing said bypass passage, and a manifold vacuum responsive solenoid operable to move said valve means from fully closed to fully open position at a predetermined manifold vacuum existing during deceleration.

3. A fuel supply system for an internal combustion engine comprising a constant pressure pump for supplying fuel to the engine, a fuel metering valve, engine speed responsive means between said pump and valve to increase the pressure of fuel supplied to said valve by an amount dependent on engine speed, a pressure regulating valve between said metering valve and the engine for maintaining pressure downstream from said metering valve at the pressure of fuel delivered by said pump, a minimum pressure shut-off valve between said pressure regulating valve and the engine to prevent delivery of fuel to said engine except a pressure in excess of a predetermined minimum, and means responsive solely to deceleration of said engine to bypass the entire output of said pump.

4. A fuel supply system for an internal combustion engine comprising a constant pressure pump for supplying fuel to the engine, a fuel metering valve, engine speed responsive means between said pump and valve to increase the pressure of fuel supplied to said valve by an amount dependent on engine speed, a pressure regulating valve between said metering valve and the engine for maintaining pressure downstream from said metering valve at the pressure of fuel delivered by said pump, a minimum pressure shut-off valve between said pressure regulating valve and the engine to prevent delivery of fuel to said engine except a pressure in excess of a predetermined minimum, a bypass passage connected to bypass the entire output of said pump, a normally closed bypass valve in said passage, and means responsive solely to engine deceleration to move said bypass valve abruptly from closed to full open position.

5. A fuel supply system for an internal combustion engine comprising a constant pressure pump for supplying

fuel to the engine, a fuel metering valve, engine speed responsive means between said pump and valve to increase the pressure of fuel supplied to said valve by an amount dependent on engine speed, a pressure regulating valve between said metering valve and the engine for maintaining pressure downstream from said metering valve at the pressure of fuel delivered by said pump, a minimum pressure shut-off valve between said pressure regulating valve and the engine to prevent delivery of fuel to said engine except a pressure in excess of a predetermined minimum, a bypass passage connected to bypass the entire output of said pump, a normally closed bypass valve in said passage, and solenoid valve actuating means responsive solely to engine deceleration to move said bypass valve abruptly from closed to full open position.

6. A fuel supply system for an internal combustion engine comprising a constant pressure pump for supplying fuel to the engine, a fuel metering valve, pressure regulating means to maintain a pressure drop across said metering valve which is a function of engine speed, a minimum pressure shut-off valve between said pressure regulating means and the engine to prevent delivery of fuel to said engine except a pressure in excess of a predetermined minimum, and means responsive solely to deceleration of said engine to bypass the entire output of said pump.

7. A fuel supply system for an internal combustion engine comprising a constant pressure pump for supplying fuel to the engine, a fuel metering valve, pressure regulating means to maintain a pressure drop across said metering valve which is a function of engine speed, a minimum pressure shut-off valve between said pressure regulating means and the engine to prevent delivery of fuel to said engine except a pressure in excess of a predetermined minimum, a bypass passage connected to bypass the entire output of said pump, a normally closed bypass valve in said passage, and means responsive solely to engine deceleration to move said bypass valve abruptly from closed to full open position.

8. A fuel supply system for an internal combustion engine comprising a constant pressure pump for supplying fuel to the engine, a fuel metering valve, pressure regulating means to maintain a pressure drop across said metering valve which is a function of engine speed, a minimum pressure shut-off valve between said pressure regulating means and the engine to prevent delivery of fuel to said engine except a pressure in excess of a predetermined minimum, a bypass passage connected to bypass the entire output of said pump, a normally closed bypass valve in said passage, and solenoid valve actuating means responsive solely to engine deceleration to move said bypass valve abruptly from closed to full open position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,035,775	Vander Veer	Mar. 31, 1936
2,136,959	Winfield	Nov. 15, 1938
2,419,171	Simpson et al.	Apr. 15, 1947
2,443,562	Hieger	June 15, 1948
2,470,382	Vanni	May 17, 1949
2,724,375	Schoffer	Nov. 22, 1955
2,737,165	Thorner	Mar. 6, 1956
2,744,510	Tyler	May 8, 1956
2,856,167	Cornelius	Oct. 14, 1958
2,877,997	Kane et al.	Mar. 17, 1959
2,898,899	Karpiej	Aug. 11, 1959

FOREIGN PATENTS

534,342	Great Britain	Mar. 5, 1948
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