

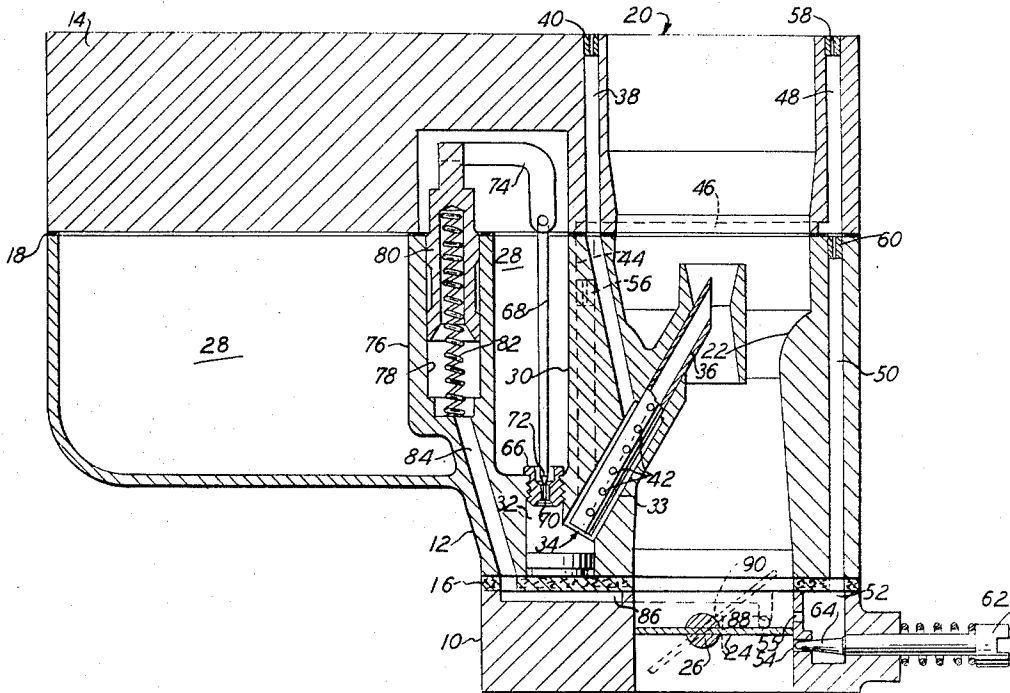
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M. A. SEIDEN

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CARBURETOR FUEL SUPPLY SYSTEM

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MYRON A. SEIDEN
INVENTOR.

BY *John A. Faulkner*
Glenn S. Anderson
ATTORNEYS

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CARBURETOR FUEL SUPPLY SYSTEM

Myron A. Seiden, Dearborn Heights, Mich., assignor to Ford Motor Company, Dearborn, Mich., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

An economizer valve in this fuel supply system is open at engine idle to supply additional fuel from the fuel bowl to a fuel well that feeds both the idling system and the main fuel delivery system. The economizer valve is positioned by the vacuum signal existing at a port having its lower edge adjacent the idling position of the throttle valve but below the road load operating position of the throttle valve. During idling, the fuel level in the fuel well is higher by virtue of the additional fuel supplied through the opened economizer valve. As the engine moves from idling through the transition zone between idling and road load, this higher fuel level improves the ability of the main fuel delivery system to shoulder its responsibility of supplying fuel to the engine. During economy road load operation, the economizer valve closes to reduce the fuel-air ratio, but when high power is demanded from the engine, the economizer valve again opens to increase the fuel-air ratio.

This invention provides a carburetor having an economizer valve system that improves the ability of the carburetor to provide proper fuel-air mixtures during the transition zone from engine idling to road load. The valve system aids in reducing undesirable engine exhaust emissions and improves fuel economy and engine performance.

Along with higher quantities of fuel and air, internal combustion engines require higher fuel-air ratios when producing maximum power. In most carburetors, the main fuel system is designed to supply an economy fuel-air ratio for normal road load operation. An economizer valve, sometimes called a power valve, increases the fuel-air ratio when maximum power is demanded by admitting additional fuel. A higher fuel-air ratio also is required for engine idling, and most carburetors contain a separate idling fuel system that gradually ceases to supply fuel as the engine traverses the transition zone from idling to road load.

In prior art carburetors, the economizer valve increased the fuel-air ratio only when maximum power was required. The valve in these earlier carburetors remained closed when the engine was idling and during road load operation and was opened mechanically by the throttle linkage or by a piston responsive to intake manifold vacuum when the power demand increased. Thus, the idling supply system received no assistance from the economizer valve in providing the higher fuel-air ratios required for idling. Furthermore, idling fuel ordinarily is supplied from a main fuel well that also supplies fuel for road load operation, and the idling fuel decreases the fuel level in

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the well, thereby impairing the ability of the main metering system to shoulder its duty of supplying fuel as engine requirements moved through the transition zone.

In the carburetor of this invention, the economizer valve performs the multiple functions of increasing the fuel-air ratio when maximum power is demanded, assisting in increasing the fuel-air ratio for idling, and increasing the ability of the main fuel system to supply proper fuel-air ratios during the transition zone. The carburetor comprises a fuel bowl, a fuel well, a main delivery means for delivering fuel from the fuel well to an induction passage upstream of the throttle valve, and an idle delivery means for delivering idling fuel from the fuel well to the induction passage downstream of the throttle valve. An economizer valve admits additional fuel from the fuel bowl to the fuel well and an operating means opens the economizer valve when the engine is idling and producing maximum power. The additional fuel admitted to the fuel well by the economizer valve during engine idling maintains a relatively high fuel level in the fuel well, thereby assisting the idling fuel-air ratio. As the engine passes through the transition zone this higher fuel level increases the ability of the main delivery means to supply fuel, thereby simplifying calibration of the carburetor in the transition zone.

The drawing shows a cross sectional elevation view of a carburetor having the economizer valve and its operating means provided by this invention.

Referring to the drawing, the carburetor comprises a base portion 10, a venturi portion 12, and a top portion 14. Portions 10, 12 and 14 are fastened together by conventional means (not shown) and have their mating surfaces sealed by gaskets 16 and 18. Base portion 10 is designed for mounting on an engine intake manifold (not shown). An induction passage 20 passes through portions 10, 12 and 14, communicating at top portion 14 with the atmosphere and at base portion 10 with conventional passages in the intake manifold. Venturi portion 12 has a conventional venturi 22 formed in induction passage 20 and base portion 10 has a conventional throttle blade 24 rotatably mounted on a shaft 26 in induction passage 20.

Venturi portion 12 contains a fuel bowl 28 located on the side of venturi 22. Bowl 28 is separated from induction passage 20 by wall 30. A conventional float (not shown) is located in fuel bowl 28 to control the level of fuel therein.

A fuel well 32 is formed in venturi portion 12 below fuel bowl 28 and adjacent wall 30. Well 32 has a portion 33 extending upward on the venturi side of wall 30. The main delivery means indicated by the numeral 34 comprises a tube 36 positioned in portion 33 and communicating at its lower end with fuel well 32 and at its upper end with induction passage 20. The portion of tube 36 positioned in portion 33 contains a plurality of small holes 42. A high speed air bleed passage 38 is formed in top portion 14 and wall 30 to communicate with the atmosphere and portion 33. A metering jet 40 is positioned in passage 38 in top portion 14.

The idle delivery means comprises a passage 44 formed in wall 30 and communicating at its lower end with fuel well 32. At its upper end passage 44 communicates with a passage 46 formed in top portion 14. Passage 46 swings around induction passage 20 to the other side of induction passage 20. There, passage 46 communicates through a T

connection with a passage 48 formed in top portion 14 and communicating with the atmosphere and with passage 50 formed in venturi portion 12.

Passage 50 passes vertically through the entire venturi portion 12 to a chamber 52 formed in base portion 10. A hole 54 communicates with chamber 52 and induction passage 20 below throttle blade 24. Appropriate metering jets 56, 58 and 60 are positioned in passages 44, 48 and 50, respectively, and an idle adjusting screw 62 having a calibrated tip 64 is threaded into base portion 10 so tip 64 controls the flow of idle fuel through hole 54. An off idle hole 55 communicates with chamber 52 and induction passage 20 above the closed position of throttle blade 24.

To form the economizer valve, a metering jet 66 is mounted in venturi portion 12 so that the passage therein communicates with fuel bowl 28 and fuel well 32. A metering rod 68 having a smaller power portion 70 and a larger economy portion 72 fits into metering jet 66 and extends upward through fuel bowl 28 where it is connected to an L-shaped lever 74. Jet 66 and rod 68 provide both main metering service and power metering service depending on whether economy portion 72 or power portion 70, respectively, is positioned in jet 68. The operating means for the economizer valve comprises a housing 76 extending from the lower part of venturi portion 12 upward through fuel bowl 28. Housing 76 has a bore 78 therein open at the top. A piston 80 is mounted slidably in bore 78 and is attached to lever 74. A compressively loaded spring 82 is mounted in bore 78 to urge piston 80 upwardly.

At the bottom of bore 78 a passage 84 extends through housing 76 and venturi portion 12 to base portion 10 where it communicates with a passage 86. Passage 86 swings part of the way around induction passage 20 and communicates with induction passage 20 through a port 88 located just above the idle position of throttle blade 24. Normally, the downstream edge of port 88 is adjacent the closed position of blade 24.

OPERATION

When the engine using the carburetor of this invention is operating at road load, throttle blade 24 assumes a position similar to that indicated by dotted line 90 where blade 24 is above port 88. Relatively high manifold vacuum is applied to port 88 and through passages 86 and 84 to piston 80. This vacuum overcomes spring 82 and pulls piston 80 and rod 68 downward to position the larger economy portion 72 in jet 66.

Fuel then metered through jet 66 from bowl 28 into fuel well 32 is pulled through tube 36 into induction passage 20 by the vacuum produced in venturi 22. Simultaneously, air is pulled through passage 38 and holes 42 to emulsify the fuel flowing through tube 36. Emulsifying the fuel in both the main metering system and the idling system provides faster fuel response to metering signals. Jets 56, 58 and 60 are selected so the vacuum applied through hole 54 to the idling fuel delivery means pulls a negligible amount of fuel, if any, through the idle delivery means.

An increase in the power demanded of the engine is initiated by opening throttle blade 24 further. The vacuum at port 88 then decreases until at the desired point spring 82 overcomes the vacuum applied to piston 80 and moves rod 68 upward to position the smaller power portion 70 into a metering position in jet 66. An increased amount of fuel then is metered through jet 66 into fuel well 32. This fuel raises the fuel level in well 32, thereby increasing the quantity of fuel supplied through tube 36 to induction passage 20. An increase in the fuel-air ratio to satisfy power requirements results.

When the engine is idling, throttle blade 24 is closed or opened only slightly. Port 88 then is above throttle blade 24. Atmospheric pressure or a low vacuum is applied through port 88, passage 86 and passage 84 to piston 80. Spring 82 moves piston 80 and rod 68 upward to

position smaller power portion 70 in a metering position in metering jet 66. The resulting increased amount of fuel establishes a relatively high fuel level in fuel well 32.

A high vacuum exists at hole 54 when the engine is idling and this vacuum is used to pull fuel through passages 44 and 46 to passages 48 and 50 where the fuel mixes with air pulled through passage 48 to form an idling emulsion. The idling emulsion is pulled through passage 50, chamber 52 and hole 54 into the induction passage 20 below throttle blade 24 where it is distributed to the engine operating cylinders by the engine intake manifold. Since there is little or no air flow through venturi 22, the vacuum produced in venturi 22 is insufficient to draw fuel up tube 36 and the engine requirements are satisfied solely by the idling delivery means. A high fuel level is maintained in fuel well 32 when idling because of the large amount of fuel metered through jet 66.

As engine operation changes from idling to road load operation, throttle blade 24 moves across port 88 to expose increasing amounts of port 88 to the high manifold vacuum existing below blade 24. This vacuum is applied to piston 80 and rod 68 to move rod 68 downward until larger economy portion 72 is in a metering position in jet 66. Between smaller power portion 70 and larger economy portion 72, rod 68 is contoured to meter calibrated amounts of fuel into fuel well 32.

Thus, this invention provides operating means for controlling the economizer valve of a carburetor that permits the valve to open when idling fuel is being supplied. Having the economizer valve open at idle raises the fuel level in the fuel well and eases the difficulties inherent in starting fuel flow through the main delivery means when the engine is operating in the transition zone between idling and road load or maximum power. The size of an accelerator pump associated with a carburetor having the economizer valve system of this invention also can be reduced. Of course, the economizer valve system of this invention also is useful in carburetors having separate main and economizer metering jets.

Considerable quantities of air can be mixed with fuel in the idling delivery means and the main delivery means of a carburetor having this power valve system because of the increased ability of the carburetor to provide fuel. The response of the delivery systems to signals from the engine is sharpened even further by such increases in the quality of the fuel emulsions.

What is claimed is:

1. In a carburetor having a fuel bowl, a fuel well, main delivery means for delivering fuel from said fuel well to an induction passage upstream of a manually operable throttle valve, and idling delivery means for delivering idling fuel from said fuel well to said induction passage downstream of said throttle valve, the improvement comprising

an economizer valve for admitting fuel from said fuel bowl to said fuel well, and

operating means for opening said economizer valve at engine idle to increase the fuel level in the fuel well at idle and improve the ability of the carburetor to supply fuel during the transition zone between engine idle and road load, said operating means comprising a piston connected to the economizer valve and passage means communicating with said piston and with the induction passage upstream of the idling position of the throttle valve and downstream of a road load operating position.

2. The carburetor of claim 1 in which the passage means communicates with the induction passage through a port having its downstream edge adjacent the closed position of the throttle valve.

3. The carburetor of claim 2 in which the operating means comprises a spring means urging the economizer valve toward an open position and manifold vacuum applied through said passage means during economy operation acts on said piston to oppose said spring means.

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4. The carburetor of claim 3 in which the idling delivery means comprises a passage means for transporting air to the idling fuel.

5. The carburetor of claim 4 in which the main delivery means comprises a passage means for transporting air to the fuel delivered by the main delivery means.

6. The carburetor of claim 1 in which the operating means comprises a spring means urging the economizer valve toward an open position.

7. The carburetor of claim 1 in which the idling delivery means comprises a passage means for transporting air to the idling fuel.

8. The carburetor of claim 1 in which the main delivery means comprises a passage means for transporting air to the fuel delivered by the main delivery means.

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TIM R. MILES, Primary Examiner