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DE-POPPER VALVE

Original Filed June 26, 1961

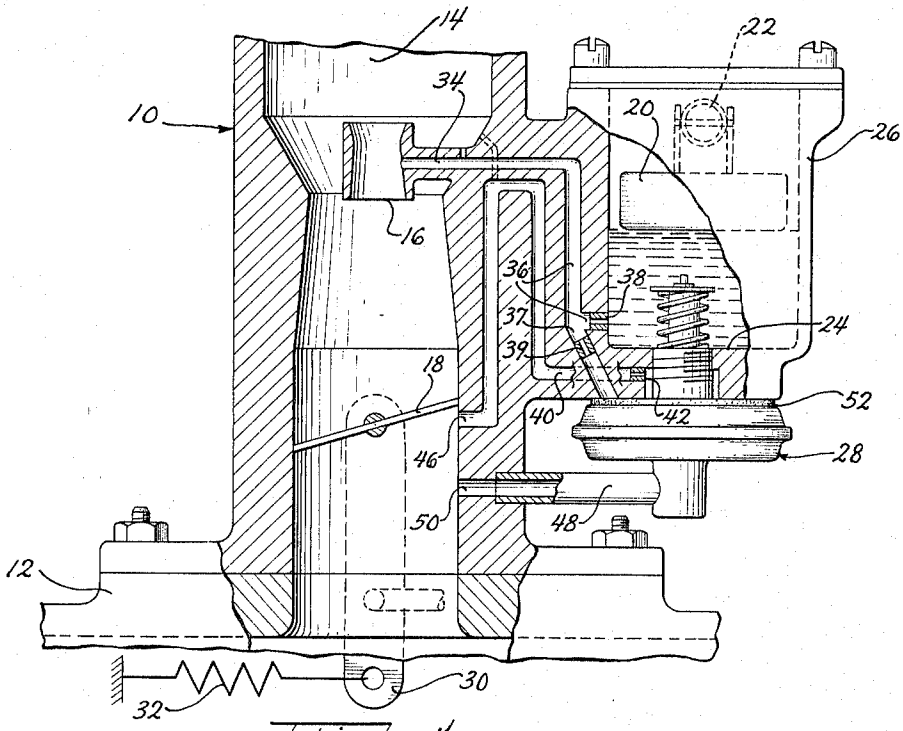


Fig. 1

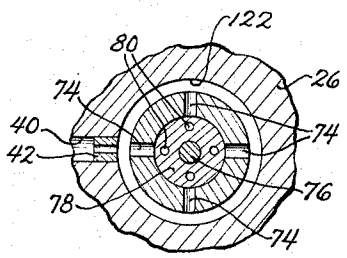


Fig. 3

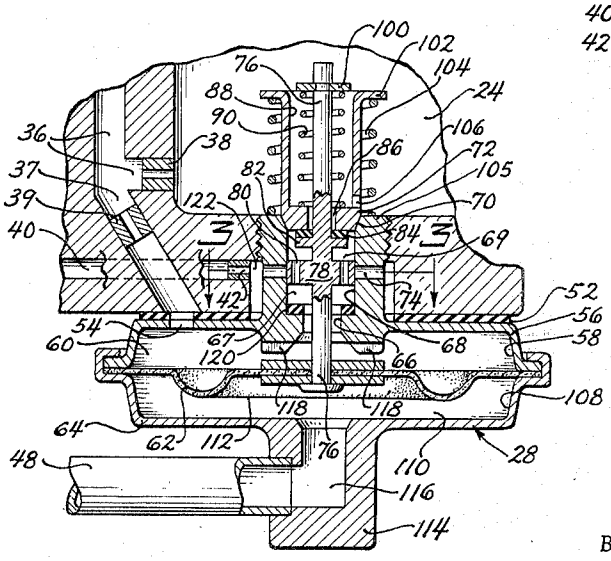


Fig. 2

INVENTORS
VINCENT Q. GOETZ &
BY THOMAS R. MEIN
Walter Patonay Jr.
ATTORNEY

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DE-POPPER VALVE

Vincent A. Goetz, Detroit, and Thomas R. Mein, Dearborn, Mich., assignors to Holley Carburetor Company, Warren, Mich., a corporation of Michigan

Continuation of application Ser. No. 119,392, June 26, 1961. This application Feb. 15, 1965, Ser. No. 436,410
2 Claims. (Cl. 261—41)

This application is a continuation of U.S. application Serial No. 119,392, now abandoned, filed on June 26, 1961 in the names of Vincent A. Goetz and Thomas R. Mein.

This invention relates to fuel systems for internal combustion engines, and more particularly to means for supplying additional fuel under certain engine operating conditions.

In the past, internal combustion engine fuel systems have usually required the use of a so-called "power valve" which was responsive to the relatively low manifold vacuum existing at high engine load when the throttle valve is open to supply fuel in addition to the normal fuel supplied through the main fuel system. Also, it was sometimes desirable to have a separate "override valve" responsive to high manifold vacuum due to a closed throttle on deceleration to supply additional fuel during deceleration so as to prevent backfiring. Although both the power valve and the override valve were desirable, the override valve was very often omitted from the fuel supply system because of its added expense.

Override, which usually occurs during down hill deceleration, is the condition where the vehicle drives the engine at a relatively high speed with the throttle closed so that the intake manifold vacuum is high, usually exceeding a value of about 21" of mercury.

Backfiring is principally caused by the formation of a mixture in the cylinders that is too lean to be ignited by the spark, and the passing of this lean mixture into the exhaust pipe and muffler where it is ignited by subsequent firing of the engine. The lean mixtures are usually produced by the return of exhaust gases from the manifold to the cylinders when the intake manifold vacuum is high. Backfiring can be eliminated by enriching the mixture during overrun so that it is combustible in the cylinders after it is leaned out by the exhaust gases.

Accordingly, it is an object of this invention to provide a means of controlling the flow of fuel at various engine vacuums in order to meet special engine fuel requirements and to prevent overrun backfiring through the exhaust system.

It is a further object of this invention to provide a single device which is relatively simple in construction and inexpensive to manufacture and which will operate both as an override valve and a power valve.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is an elevational view in partial cross-section of a carburetor embodying the invention;

FIGURE 2 is an enlarged cross-sectional view illustrating the invention in greater detail;

FIGURE 3 is a cross-sectional view taken on the plane of line 3—3 of FIGURE 2 and looking in the direction of the arrows.

With the foregoing general description of the invention in mind, reference is now made to the drawings. FIGURE 1 illustrates a carburetor **10** mounted on an engine manifold **12**, the carburetor having the usual air passage **14**, main fuel nozzle **16**, throttle plate **18**, float **20**, fuel inlet valve **22**, fuel reservoir **24**, and fuel bowl

housing **26**. The usual idle and transfer fuel systems would, of course, be present, but they are not shown.

The control lever **30** actuates throttle plate **18**, and it is held in the closed throttle position by spring **32**. Passage **34** is the main fuel supply to discharge nozzle **16**, and it communicates with passage **36** having the main metering restriction **38** through which fuel from the reservoir **24** is metered. Passage **36** communicates with a branch passage **37** having a restriction **39** and leading to the novel combination power and override valve assembly **28**. Passage **40** having a restriction **42** therein connects from assembly **28** to a discharge port **46** disposed downstream of the closed throttle **18**. Conduit **48** leads to the manifold vacuum port **50** on the engine side of the throttle valve **18**. Gasket **52** seals between assembly **28** and fuel bowl **26**.

In FIGURES 2 and 3, which illustrate on an enlarged scale the combination power and override valve assembly **28** contemplated by the invention, main housing **56** is formed to include a recess **58** so as to form a chamber **60** when the diaphragm **62** has the periphery thereof clamped in any suitable manner between the outer edges of housing **56** and cover **64**. Housing **56** has formed therein an opening **54** that connects to passage **37** and main fuel supply passages **36** and **34**. A passage **66** connects between cylinder **68** and chamber **60**. Cylinder **68** has one end formed as seat **70** for the main valve **72** which, when open, allows cylinder **68** to be in communication with the fuel reservoir **24**. Passages **74** connect cylinder **68** with the fuel conduit **40**.

Fixed to the center of diaphragm **62** in any suitable manner is one end of diaphragm rod **76** which has fixed thereto or formed therewith a piston valve **78**, which is located in cylinder **68** and which has passages **80** formed therethrough so that the chamber **67** communicates with chamber **69**. Flange portion **82** of rod **76** has fixed thereto a rubber or other suitable valve **84** which normally closes the passage **86** formed in main valve **72** through which additional fuel from reservoir **24** may flow.

Rod **76** extends through passage **86** and into recess **88** of valve **72** which contains a resilient member, such as spring **90**, compressed between the bottom wall of recess **88** and spring retainer **100** secured at the free end of rod **76**. The function of spring **90** is to keep valve **84** normally seated to close passage **86**.

Main valve **72** may have a flanged portion **102** which provides an abutment for one end of the relatively weak resilient member, such as spring **104**, having its other end abutting the end **105** of main housing **56** threaded into the bottom part of fuel bowl **26**. The force of spring **104** tends to keep the valve **72** away from its seat **70** so that fuel may flow through the openings **106**, valve **72**, chamber **69**, passages **80**, chamber **67**, passage **66**, chamber **60**, opening **54** and into conduits **37**, **36** and **34**.

Cover **64** has a recess **108** which becomes chamber **110** when it is fixed to the housing **56** with diaphragm **62** clamped therebetween so that one side **112** of diaphragm **62** becomes a wall of chamber **110**. Boss **114** of cover **64** is formed with a passage **116** which connects the chamber **110** with pipe **48** leading to manifold vacuum port **50**.

The operation of the invention is such that when the engine is operating normally at a manifold vacuum of approximately 8 to 20 inches of mercury, the elements of the assembly **28** are in the position shown in FIGURE 2. That is, chamber **110** of which the diaphragm **62** forms one wall is partially evacuated, causing rod **76** to move downwardly and position valve **78** so that it blocks off the passages **74**; at the same time, the force of spring **90** causes valve **72** to engage seat **70** so as to prevent

added fuel from flowing to the main fuel system **34** and nozzle **16**.

When the vacuum drops below some predetermined value (for example, 8 inches of mercury) as it does when the throttle **18** is opened wide upon an increase in engine load, the force of spring **90** overcomes the force of the vacuum acting on diaphragm **62** and causes rod **76** to move upwardly. This permits spring **104** to unseat valve **72** and allows fuel to flow through chamber **69**, passages **80**, chamber **67**, passage **66**, chamber **60**, opening **54**, conduits **36** and **34** and out nozzle **16**. The upward movement of rod **76** does not, however, open passages **74** because of stops **118** limiting the upward travel of diaphragm **62**; that is, passages **74** are still closed by piston valve **78** when the diaphragm travel is stopped.

During the override condition, the engine manifold vacuum acting on diaphragm **62** reaches a value of approximately 21 to 25 inches of mercury, which overcomes the force of spring **90** and causes rod **76** to move downwardly. When rod **76** moves downwardly, valve **78** is engaged with the rubber seat **120** so as to prevent fuel flow through passages **80**. However, passages **74** are opened when valve **78** is seated upon seat **120**. The downward movement of rod **76** also causes valve **84** to move downwardly and open passage **86** so that additional fuel from reservoir **24** may flow through chamber **69**, passages **74**, annular chamber **122**, and conduit **40** leading to the discharge port **46**.

It is apparent that the valve construction disclosed herein is very inexpensive and that it is constructed so as to perform the same functions as previously used separate power and override valves; that is, when the engine vacuum is relatively low at wide open throttle, the combination valve assembly of this invention supplies the additional fuel required by the engine. During normal engine operation at intermediate engine vacuums, the combination valve cuts off all extra fuel, and the engine operates on the normal idle, transfer and main fuel metering systems. On down hill deceleration or overrun, the engine vacuum is abnormally high, and engine backfiring is likely to result due to a leaned out mixture being supplied to the engine; at this time, the combination valve again supplies the additional fuel required to enrich the mixture and prevent backfiring.

It is also apparent that the amounts of extra fuel supplied and the vacuums required to operate the combination valve are dependent upon the specific design of the various elements thereof. Furthermore, such a valve could be employed to control the air, rather than the fuel, supplied under various conditions of engine operation.

While but one embodiment of the invention has been disclosed, it is apparent that other embodiments are possible within the scope of the appended claims.

What we claim as our invention is:

1. A pressure responsive valve assembly comprising first and second housing members secured together with a movable member therebetween so as to form adjacent first and second chambers, respectively, having said movable member as a common wall, said first housing member having a conduit through which pressure may be transmitted to said first chamber, said second housing member including an outlet opening formed therein and an outwardly-extending element, a passage extending outwardly through the wall of said element, a stem having one end thereof secured to said diaphragm and extending

with clearance axially through said element, the surface of said element adjacent said second housing member being formed as a first valve seat, a portion of said stem positioned within said element being formed with an annular valve member thereon adapted to at times engage said first seat and to at times close said passage extending outwardly through said wall of said element, said stem being formed adjacent said annular valve member to provide a second valve member, the inner surface of said element being formed at the free end thereof to provide a second valve seat, a separate valve member positioned over said stem member with clearance, said separate member being held against said second valve member on said stem by a resilient means positioned within said separate member and retained by a shoulder formed on the free end of said stem, and said separate member being urged away from said second seat by a second resilient means disposed between said free end of said element and a shoulder formed on the outside of said separate member.

2. A pressure responsive valve assembly comprising first and second dish-shaped housing members secured together with a movable member therebetween so as to form adjacent first and second chambers, respectively, having said movable member as a common wall, said first housing member having a conduit through which pressure may be transmitted to said first chamber, said second housing member having an outlet opening formed therein and an axially-disposed outwardly-extending cylindrical portion, the free end of which is externally threaded, a plurality of passages extending outwardly through the wall of said cylindrical portion, a stem having one end thereof secured to the center of said diaphragm and extending with clearance axially through said cylindrical portion, the inner surface of said cylindrical portion adjacent said second housing member being formed as a first valve seat, a portion of said stem positioned within said cylindrical portion being formed with an annular valve member thereon adapted to at times engage said first seat and to at times close said passages extending outwardly through said wall of said cylindrical portion, said stem being formed adjacent said annular valve member to provide a second valve member, the inner surface of said cylindrical portion being formed at the free end thereof to provide a second valve seat, a separate hollow valve member positioned over said stem member with clearance, said hollow valve member being held against said second valve member on said stem by a spring positioned within said hollow valve member and retained by a shoulder on the free end of said stem, and said hollow valve member being urged away from said second seat by a spring disposed between said free end of said cylindrical portion and a shoulder formed on the outside of said hollow valve member.

References Cited by the Examiner

UNITED STATES PATENTS

2,345,547	3/1944	Roth et al.	137—493.6 X
2,621,911	12/1952	Lindsteadt.	
2,623,535	12/1952	Morgan	251—322
2,631,832	3/1953	Heiger.	

FOREIGN PATENTS

855,182	11/1952	Germany.

HARRY B. THORNTON, *Primary Examiner.*