United States Patent

Goodwin

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[54] GAS CARBURETOR VALVE

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[51] **Int. Cl.**.....**F02m 21/02,** C10j 1/00

[58] **Field of Search**.....123/120; 137/604; 261/64 B, 261/64 C, 65, 61, 62

[56] **References Cited**

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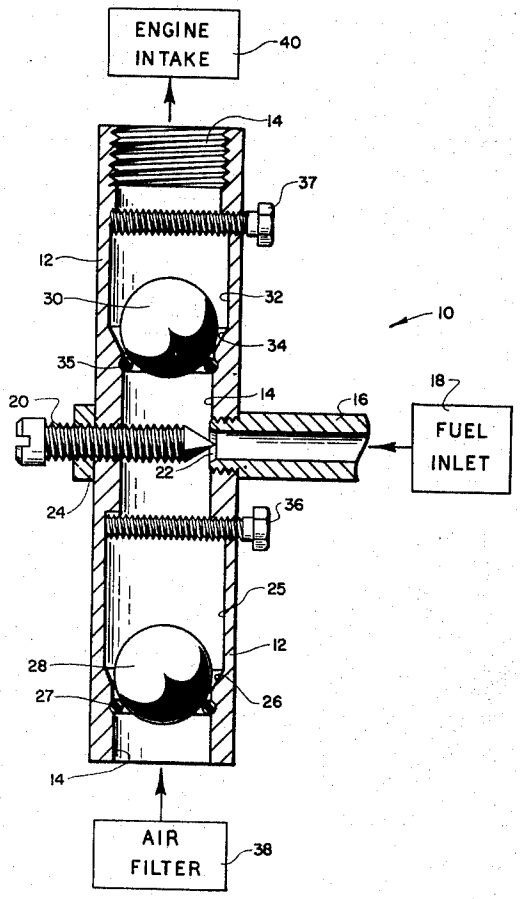
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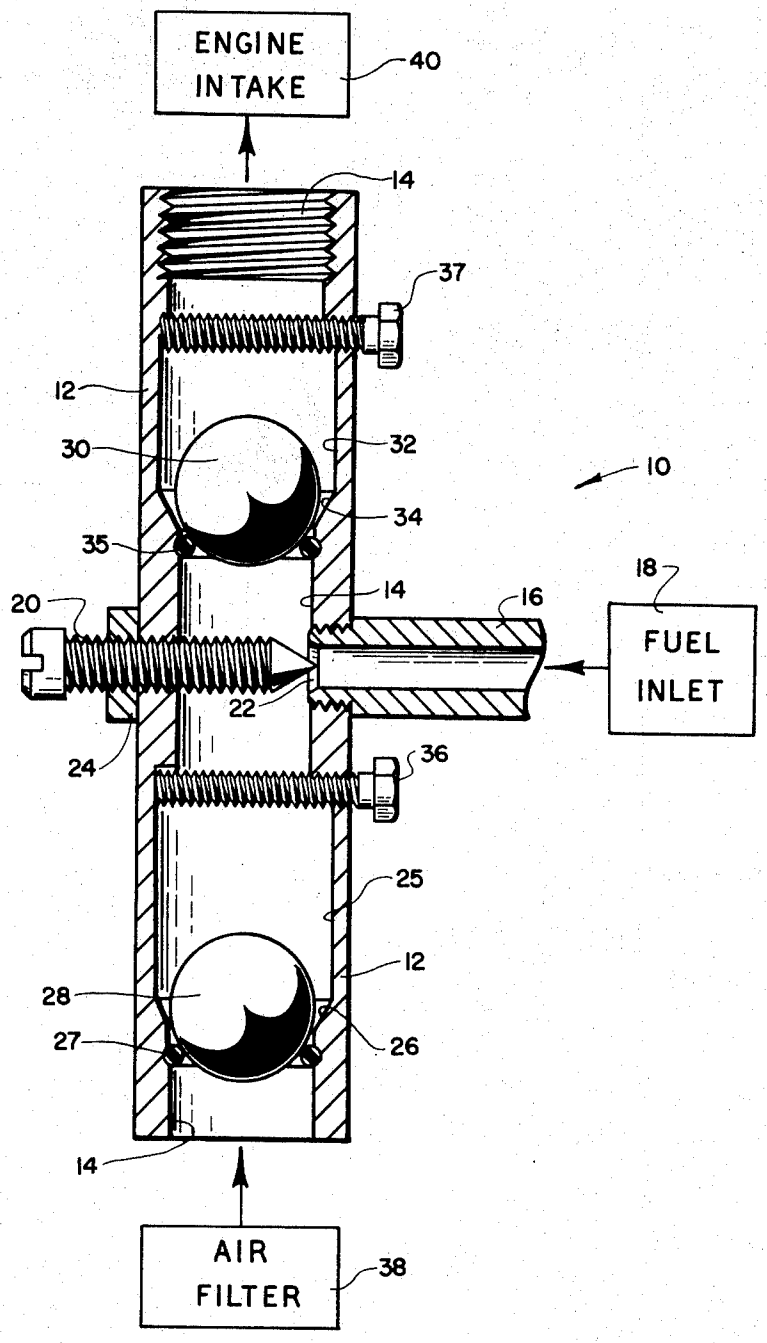
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[57] **ABSTRACT**

A gaseous fuel carburetion device utilized with a reciprocating piston engine fueled with low pressure gas; the valve having a first check valve connecting to atmosphere allowing outside air to be sucked in but preventing the low pressure gas from flowing into the atmosphere, and a second check valve connecting with the intake of the engine allowing air and gas to flow into the engine only on the suction stroke, and a needle valve controlling the maximum rate of gas flow from the source.

9 Claims, 1 Drawing Figure





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GAS CARBURETOR VALVE

BACKGROUND OF THE INVENTION

In the oil field numerous one and two cylinder engines used to pump wells have been converted from liquid fuels to gaseous type fuels such as LPG, casing head gas or any other available gas. The gas supplied to the engine is under a positive pressure and constantly flowing into the intake manifold. These engines, with a relative low speed and long stroke, have a substantial time interval between power strokes thereby creating an erratic manifold pressure. When the manifold pressure drops off some of the supply gas escapes out of the air intake pipe between suction strokes. This loss of gas to the atmosphere creates a very inefficient usage of fuel, especially when it must be purchased. In the case of marginal production wells, the cost of gas to run the well becomes a substantial factor.

SUMMARY OF THE INVENTION

With the present invention, there is no escape of gas into the atmosphere, and the fuel and air mixture can be accurately controlled, thereby providing a much greater combustion efficiency. Between the suction strokes of the engine, a check valve prevents any of the low pressure gas from passing into the atmosphere. A second check valve prevents the gas from prematurely flowing into the engine intake manifold until the manifold suction is great enough to raise the ball. The present invention also allows an engine to operate on casing head gas at much reduced pressures than previously required. This allows the well to be run for a considerably longer time at a much reduced cost before bottle gas or other types of gas are brought to the well site. The present valve also provides a very accurate fuel-to-air mixture control for providing most efficient combustion.

It is therefore the primary object of the present invention to provide a gas saving carburetion valve on single and multi-piston engines.

Another object of the present invention is to provide a gas carburetion valve which accurately controls the fuel-air mixture.

Another object of the present invention is to provide a valve which prevents any wasting of gas when the engine stops running.

Further objects and advantages will be in part apparent and in part pointed out specifically hereinafter in connection with the description of the drawing that follows and in which:

The FIGURE is a longitudinal sectional view of the gas carburetion valve with related portions of the engine illustrated in block diagram.

Referring now to the FIGURE of the drawing, the overall valve is generally identified by reference numeral **10**. The valve **10** comprises a tubular body portion **12** with a main passage **14** passing therethrough. Intersecting the body **12** and main passage **14** is a fuel inlet conduit **16** which is in turn connected to a source of low pressure gas **18**, indicated in block form. If the fuel is bottled gas, a conventional regulator, not shown, provides a constant low pressure in the conduit **16**. At the entry of conduit **16** into the main passage is a needle valve **20**, which works in conjunction with seat **22**. The needle valve **20** is varied to achieve the proper gas flow into the main passage **14** and then locked in place by nut **24**. In the downstream portion of the main passage **14** is an enlarged bore **25**. Bore **25** is formed with a tapered portion **26** at its lower end. Immediately below the tapered portion is an O-ring **27** seated in a groove. The O-ring **27** provides a valve seat for check valve ball **28** positioned in enlarged bore **25**. Located in the upstream portion of the main passage is a second check valve ball **30** located in a similar enlarged bore **32** with a tapered lower portion **34** terminating at the edge of an O-ring **30** seated in a groove. The balls **28** and **30** can be made of steel or other lighter materials depending upon the desired cracking pressure that is necessary. When using bottled gas, the upper ball is steel and the lower ball is a lightweight plastic. Intersecting the main passage above each of the balls **28** and **30** are a pair of removable bolts **36** and **37** which limit the upper movement of the balls. The downstream end of main passage **14** is connected to atmospheric air, passing through an air filter **38**, indicated by block diagram. The upstream end of main passage **14** is connected to the engine intake manifold **40**, indicated by block diagram.

OPERATION

While the gas carburetion valve **10** can be used on multi-cylinder engines, its greatest fuel saving is achieved when used on the one cylinder engines. These engines, due to their low speed and long stroke, have a substantial time interval between suction strokes, allowing a greater amount of gas to pass out through the air intake between strokes. With valve **10** mounted on an engine, the source of gaseous fuel **18** maintains in conduit **16** a pressure between 1 and 3 ounces per square inch. When the engine is not running, the gas is confined in the valve **10** because the downstream ball check **28** prevents flow to the atmosphere, and the upper ball check **30** requires at least 4 ounces of pressure to lift the ball **30** off its O-ring seat **35**. The cracking pressure of ball check **30** can be varied by increasing or decreasing the weight of the ball **30** or the inside diameter of the O-ring **35**.

Prior to the use of the present valve, gas pressures of from 6 to 12 ounces were required to operate an engine. With the present valve **10**, pressures of only 1 to 3 ounces are required, thereby allowing many wells to use low pressure casing head gas at the well, rather than expensive bottled or piped in gas. Practically any burnable gas such as methane, propane, butane, LPG, natural gas or casing head gas can be used, with the latter being the most practical. If a very low pressure casing head gas is being used, the downstream ball check **28** should be a heavy steel so that a greater manifold suction is applied to the gas supply conduit **16**. Under this arrangement, casing head gas pressures approximating zero can be utilized to fuel an engine. When piped or bottled gas is being utilized, the downstream ball **28** should be a lightweight nylon. Since different engines run at different speeds and different loads, the gas flow must be individually adjusted on each specific engine by the positioning of needle valve **20** and the usage of the proper weight balls.

Having described the invention with sufficient clarity to enable those familiar with the art to construct and use it, I claim:

1. A gaseous fuel carburetion valve connecting a low pressure gas supply to the intake manifold of a reciprocating engine comprising:

a body member having a main passage connecting the intake manifold to atmospheric air;

a gas supply passage intersecting the main passage;

a first check valve positioned in the main passage so as to prevent any of the low pressure gas from flowing from the main passage to atmospheric air and an opening to allow atmospheric air to be sucked into the engine through the main passage; and

a second check valve in the main passage between the gas supply passage and the intake manifold allowing gas to flow into the intake manifold.

2. A carburetion valve as set forth in claim 1, wherein the two check valves are of the ball type requiring a minimum back pressure to open.

3. A carburetion valve as set forth in claim 1, including a flow restricting valve in the supply passage, the second check valve being a ball type and having a weight sufficient to prevent opening of the check valve by the low pressure gas supply.

4. A carburetion valve as set forth in claim 1, wherein the second check valve is a ball type having sufficient weight not to open under the low pressure gas supply and the first check valve is of the ball type having a lightweight ball which will open under a minimum pressure differential.

5. A carburetion valve as set forth in claim 1, the first and second check valves being of the ball type with balls having sufficient weight not to open under pressures less than 4 ounces per square inch.

6. A carburetion valve as set forth in claim 1, including a flow restricting valve in the supply passage, the first and second check valves being of the ball type having an O-ring seat, the portions of the main passage immediately upstream of the O-ring seats having an outward taper whereby the opening of the check valve becomes greater as the ball moves away from its respective seat.

7. A carburetion valve as set forth in claim 1, including a flow restricting valve in the supply passage, the first and second check valves being of the ball type having an O-ring seat, the portions of the main passage immediately upstream of the O-ring seats having an outward taper whereby the opening of the check valve becomes greater as the ball moves away from its respective seat, and removable stop means in the main passage limiting the upward movement of the check valve balls.

8. A carburetion valve as set forth in claim 1, including a needle valve positioned in the supply passage, the first and second check valves being steel balls of at least 1 inch in diameter resting on O-ring seats.

9. A carburetion valve as set forth in claim 1, including a flow restricting valve in the supply passage, the second check valve having a cracking pressure of at least 4 ounces per square inch, and the first check valve having a cracking pressure of less than 4 ounces per square inch.

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