Oct. 18, 1966 D. D. STOLTMAN 3,279,767

CARBURETOR HAVING FUEL AND AIR FLOW CONTROL MEANS

Filed June 17, 1965 2 Sheets-Sheet 1

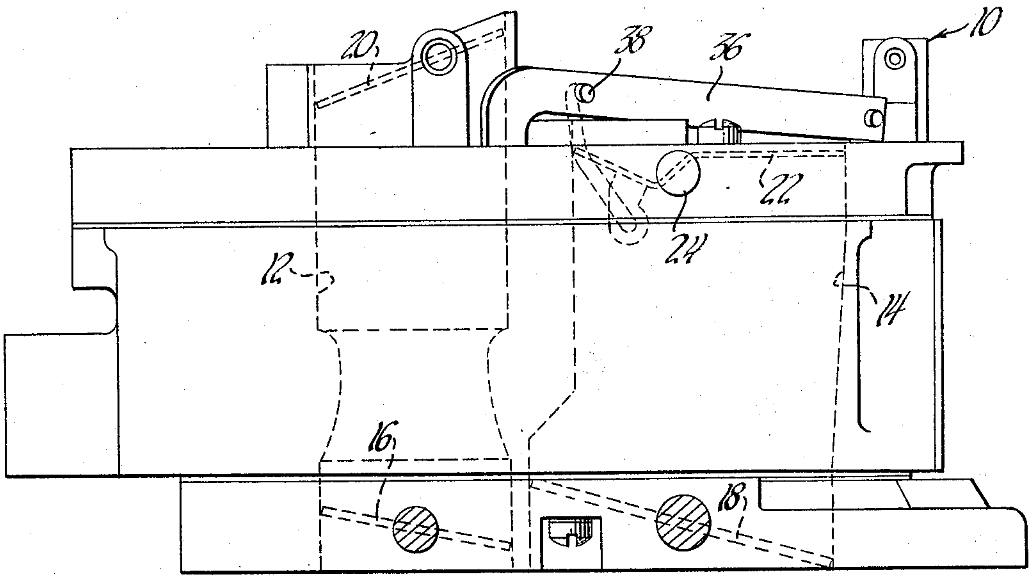

Fig. 1

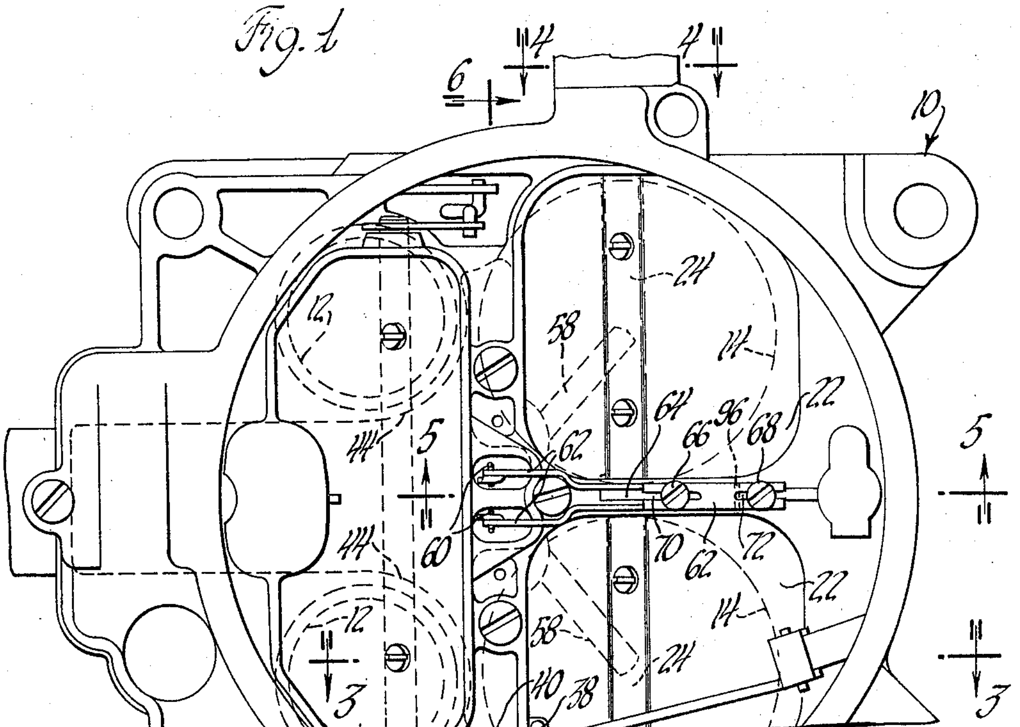

Fig. 2

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Filed June 17, 1965 2 Sheets-Sheet 2

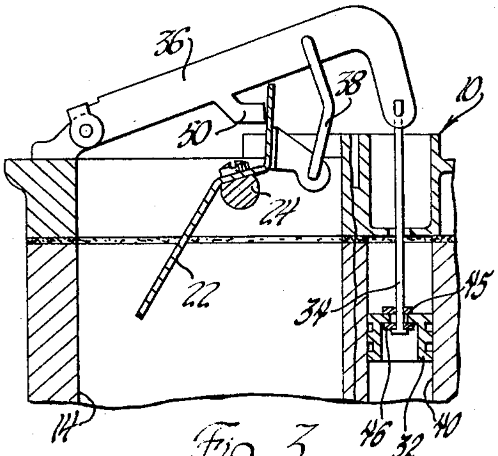

Fig. 3

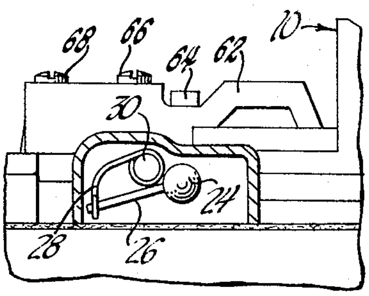

Fig. 4

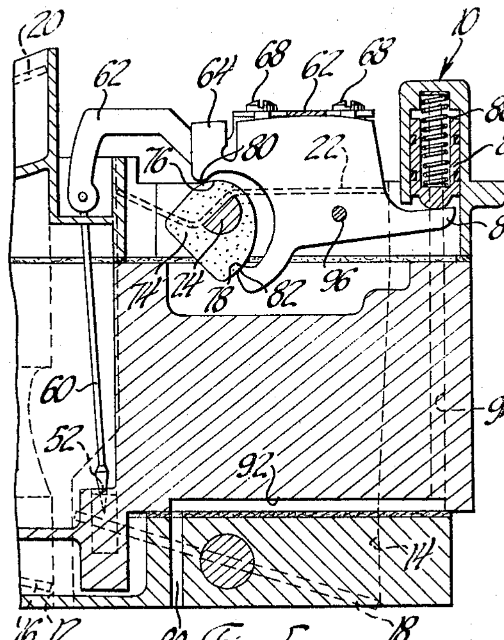

Fig. 5

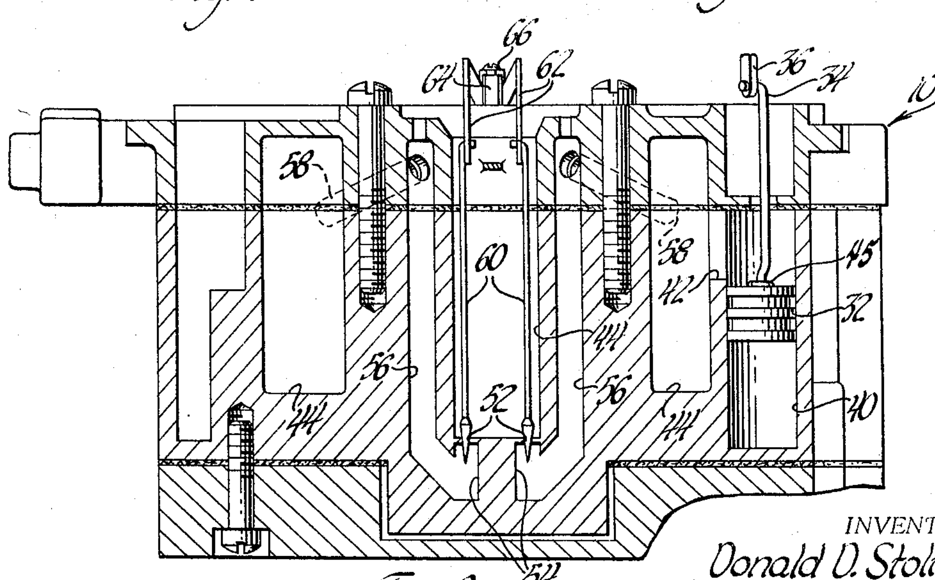

Fig. 6

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3,279,767
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CARBURETOR HAVING FUEL AND AIR FLOW CONTROL MEANS

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This invention relates to internal combustion engine fuel systems and more particularly relates to means in such systems for measuring the rate of air flow to the engine and for controlling fuel flow in accordance therewith.

Although air valve controlled fuel systems are not in common use at the present time, it is well-known that air flow may be measured by an air valve which is responsive to the volume of air flowing through the air inlet to the engine. The air valve may be connected to a fuel metering valve whereby fuel flow to the engine will be regulated in accordance with air flow and thus a proper mixture of air and fuel may be delivered to the engine. This invention, directed to such an air valve controlled engine fuel system, provides improved operating mechanism through which an air valve controls a fuel metering valve.

This improved mechanism permits an air valve to control fuel metering for both economy and power operation of an engine. To accomplish this, a metering cam has been developed which is positioned by the air valve and which has both economy and power scheduling portions. Fuel metering rods are controlled by a cam follower biased against the power scheduling portion of the cam so that air-fuel mixtures suitable for power operation is obtained. To obtain air-fuel mixtures for economy operation, means responsive to engine vacuum overcome the bias on the cam follower. The follower is then positioned by the economy scheduling portion of the cam, and lean air-fuel mixtures are delivered to the engine.

The details as well as other objects and advantages of this invention appear in the following description as well as in the drawings in which:

FIGURE 1 is a side elevational view of a carburetor showing by hidden lines the mixture conduits and the choke, throttle, and air valves which control the conduits;

FIGURE 2 is a top plan view of the carburetor of FIGURE 1 additionally illustrating by hidden lines the fuel bowl outline;

FIGURE 3 is a sectional view through one of the carburetor mixture conduits, along line 3—3 of FIGURE 2, illustrating the connection of the air valves to a damping mechanism;

FIGURE 4 is a sectional view along line 4—4 of FIGURE 2 illustrating the return spring which biases the air valves to a closed position;

FIGURE 5 is a sectional view along line 5—5 of FIGURE 2 illustrating the metering cam and operating linkage which control the fuel inlet valves; and

FIGURE 6 is a sectional view along line 6—6 of FIGURE 2 illustrating the air valve damping piston, the fuel metering valves, and the fuel passages from the fuel bowl to the secondary mixture conduits.

Referring now to FIGURES 1 and 2, a four-barrel carburetor **10** includes a pair of primary mixture conduits **12** and a pair of secondary mixture conduits **14**. The outlets from the mixture conduits are controlled in the customary manner by pairs of primary and secondary throttle valves **16** and **18**, respectively. A choke valve **20** in the inlet to the primary mixture conduits **12** is con-

trolled by a conventional automatic choke mechanism (not shown).

A pair of air valves **22** are secured in the inlets to the secondary mixture conduits **14** upon an air valve shaft **24** which extends through both conduits **14**. Air valves **22** are unbalanced so as to be opened by air flow through mixture conduits **14**. As shown in FIGURE 4, one end of shaft **24** carries a pin **26** around which is looped a spring **28**. Spring **28** is secured about a pin **30** attached to the carburetor **10** and thus biases air valve shaft **24** in a clockwise direction as viewed in FIGURE 4. As air valves **22** are opened by air flow and shaft **24** rotates in a counterclockwise direction, the loop in the spring **28** slides along pin **26** to tailor the return force upon the air valve shaft **24** and air valves **22** in a desired manner.

As shown in FIGURE 3, a damping piston **32** is connected through a plunger **34** to a lever **36** which is pivotally secured to the carburetor **10**. A link **38** connects one of the air valves **22** with lever **36** so that as air valves **22** open, damping piston **32** is raised. Damping piston **32** is located in a cylinder **40** which, as shown in FIGURE 6, connects through a slot **42** with the carburetor fuel bowl **44**. As damping piston **32** is pulled upwardly, the opening movement of air valves **22** will be retarded to prevent undue leaning of the air-fuel mixture.

A shoulder **45** on plunger **34** engages the top of piston **32** during closing movement of air valves **22** to force piston **32** down into cylinder **40**. When damping piston **32** is lowered a valve **46** located within piston **32** is opened by plunger **34** so that fuel within cylinder **40** may pass upwardly through piston **32** to allow rapid closing movement of air valve **22**. Piston **32** will then be ready to damp subsequent opening movement of the air valves.

A stop member **50** on lever **36** is located in the path of the one air valve **22** to prevent movement of air valves **22** beyond a wide open position.

Referring now to FIGURES 2 and 6, fuel from fuel bowl **44** passes through the secondary metering orifices **52** into passages **54** which in turn lead to the secondary main wells **56**. Each well **56** discharges through a nozzle **58** into the secondary mixture conduits **14**. Metering orifices **52** are controlled by a pair of metering rods **60** positioned by a fuel metering control which includes a metering rod carrier **62** and a cam follower **64**.

As shown in FIGURE 6, metering rod carrier **62** has an inverted U-shape configuration to fit over a cam follower member **64** and be secured thereto by screws **66** and **68**. As viewed in FIGURE 5, member **64** has an arcuate configuration at the top so that the metering rod carrier **62** may be rocked relative to member **64** to vertically position the metering rods **60** within the metering orifices **52**.

As viewed in FIGURE 2, adjusting screws **66** and **68** extend through slots **70** and **72** in metering rod carrier **62** so that the carrier **62** may be adjusted longitudinally with respect to member **64** to angularly position metering rods **60** within metering orifices **52**.

As shown in FIGURE 5, a metering cam **74** is secured to the air valve shaft **24** between the secondary mixture conduits **14**. An economy scheduling portion **76** and a power scheduling portion **78** are located on diametrically opposed portions of cam **74**. Cam follower member **64** is bifurcated about cam **74** and has an economy follower **80** and a power follower **82**. Cam follower member **64** has an arm **84** extending to a piston **86** biased by a spring **88**. Piston **86** is subjected through passages **90**, **92** and **94** to intake manifold vacuum which exists in mixture conduits **14** downstream of throttle valves **18**.

Operation

When the engine is running, manifold vacuum will pull piston **86** upwardly and cam follower member **64** will be rotated by its own weight about a pivot **96** so that the economy follower **80** contacts the economy scheduling portion **76** of metering cam **74**. As throttle **18** is opened, vacuum will be communicated to the underside of air valves **22** to cause them to open. Return spring **28** is calibrated so that a substantially constant pressure drop exists across air valves **22** whenever they are opened.

As air valves **22** open, valve shaft **24** and metering cam **74** rotate to raise cam follower member **64** and metering rod carrier **62**. Metering rods **60** will be withdrawn from metering orifices **52**. Fuel will flow from fuel bowl **44** through metering orifices **52**, passages **54**, main wells **56**, nozzles **58** to the secondary mixture conduits **14**. The rate of fuel flow to the mixture conduits **14** is determined by the position of metering rods **60** within metering orifices **52**.

An enriched air-fuel mixture is required when the manifold vacuum downstream of throttles **18** drops to a predetermined point. Spring **88** is calibrated so that at this time, it will overcome the slight vacuum force on piston **86** and push piston **86** downwardly to rotate cam member **64** clockwise about pivot **96**. Cam follower **82** will contact power scheduling portion **78** of metering cam **74** to raise metering rods **60** an additional amount and provide additional fuel to the secondary mixture conduits **14**.

It will be appreciated that, although this air and fuel metering mechanism has been described and illustrated as used in a carburetor, the mechanism can be easily adapted for use in other types of fuel systems. This invention is advantageous in all these systems because it allows fuel metering control through a single mechanism operated by an air valve during engine operation in both the economy and power ranges.

I claim:

1. A carburetor comprising a pair of mixture conduits, a rotatable shaft extending through said conduits, an air valve in each conduit secured to said shaft, means controlling said air valves whereby their rotative position is determined by and is a measure of air flow through said conduits, a throttle valve in each conduit downstream of said air valve, a fuel bowl, a pair of fuel passages extending from the bottom of said bowl to said conduits, fuel metering orifices in said fuel passages at the juncture with the bottom of said bowl, a vertically reciprocable metering rod in each of said orifices, a cam secured to and rotatable with said shaft between said conduits, said

cam having diametrically opposed economy and power scheduling portions, the rotative position of said cam being a measure of the rate of air flow through said mixture conduits, and a fuel metering control including a cam follower portion bifurcated into economy and power following arms respectively disposed on diametrically opposite sides of said cam adjacent said economy and power scheduling portions of said cam, a carrier portion supported by said cam follower portion, said metering rods being suspended from said carrier portion, means mounting said fuel metering control for pivotal movement in a vertical plane, said economy follower arm of said cam follower portion being biased into contact with said economy scheduling portion of said cam, and means responsive to low vacuum in said conduits downstream of said throttle valves and adapted to bias said power follower arm of said cam follower portion against said power scheduling portion of said cam whereby rotation of said cam in accordance with a change in the rate of air flow through said conduits pivots said fuel metering control to reciprocate said metering rods within said orifices and provide the desired economy and power air-fuel mixture ratios.

2. The carburetor of claim **1** which further includes means for adjusting said carrier portion both longitudinally and vertically with respect to said cam follower portion whereby said metering rods may be properly positioned within said orifices.

3. The carburetor of claim **1** wherein said mixture conduits are secondary mixture conduits and wherein said carburetor further includes a pair of primary mixture conduits.

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