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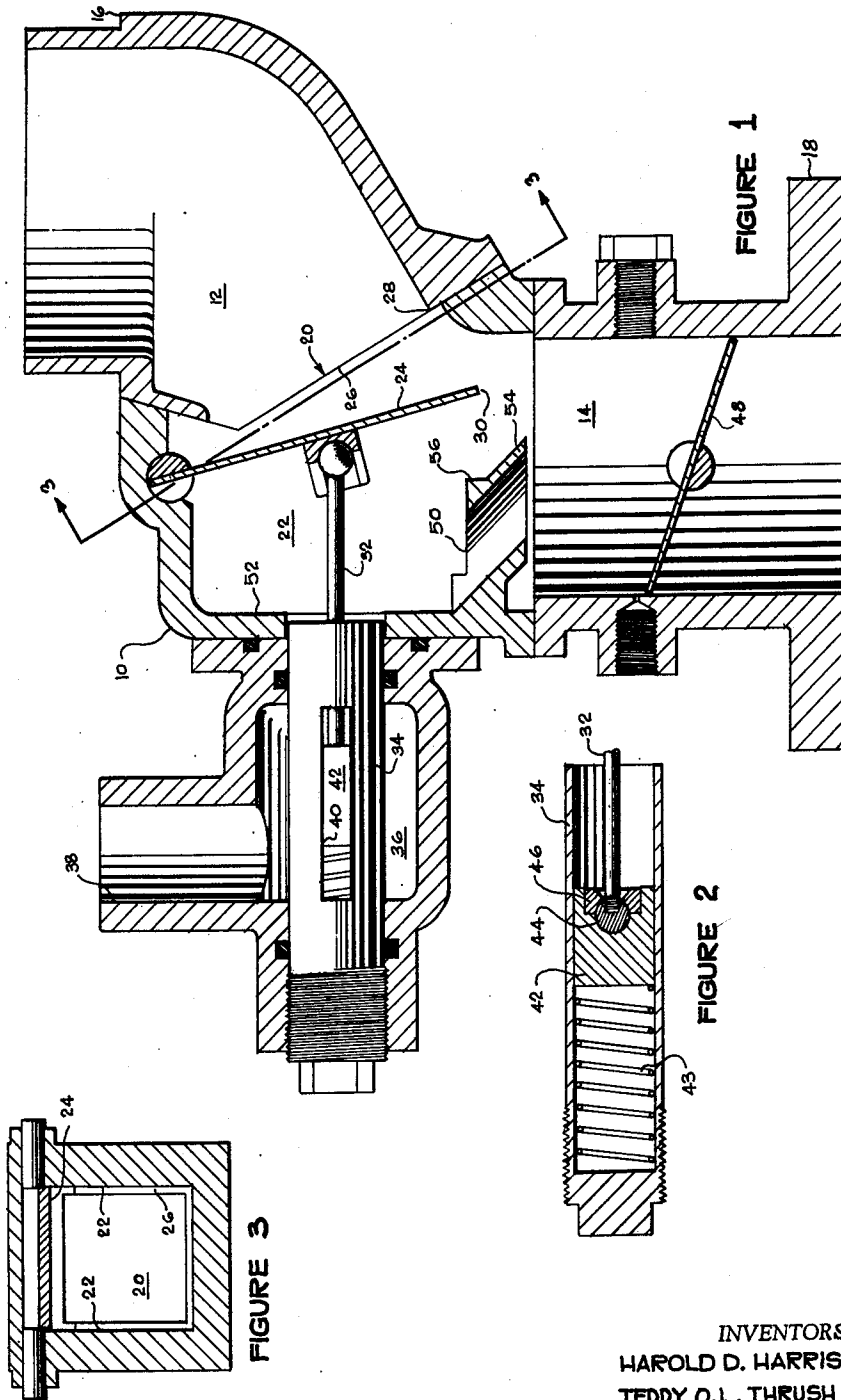
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3,073,686

GAS CARBURETOR

Filed Aug. 27, 1958

2 Sheets-Sheet 1



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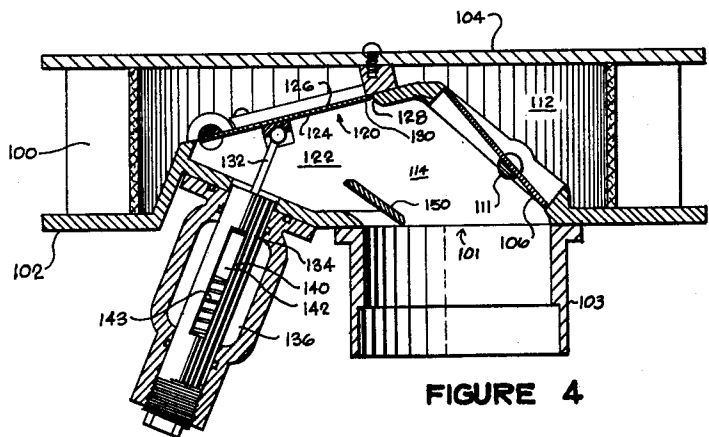


FIGURE 4

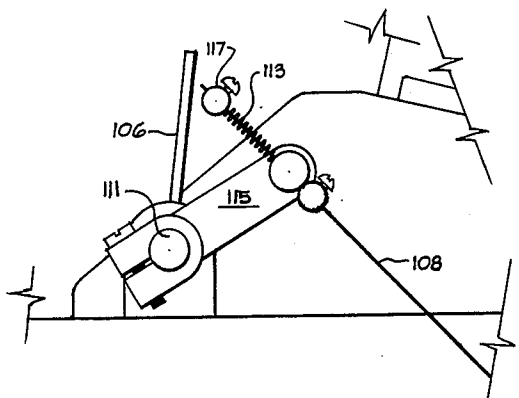


FIGURE 5

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GAS CARBURETOR

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4 Claims. (Cl. 48—180)

This invention pertains to carburetors for internal combustion engines and more particularly to carburetors for gaseous fuels.

An object of this invention is to provide a carburetor for gaseous fuels which will permit easy starting of the engine, without choking.

Another object is to provide a carburetor which will maintain the same fuel-air ratio regardless of the amount of air flowing through the carburetor.

Another object is to provide a carburetor with a positive metering system for both air and fuel.

Another object is to provide a gas carburetor which may be attached to a liquid fuel carburetor so that the engine may be quickly switched from operation on one fuel to the other.

A further object is to provide for foreign matter within the fuel or air.

A further object is to provide a carburetor with a minimum restriction to the flow of air at full open throttle.

A further object is to provide good mixing of fuel and air.

Still further objects are to achieve the above with a device that is sturdy, compact, simple, and reliable, yet cheap and easy to manufacture.

The specific nature of the invention as well as other objects, uses, and advantages thereof will clearly appear from the following description and from the accompanying drawings, in which:

FIG. 1 is an axial section of a carburetor according to this invention.

FIG. 2 is an axial section of the fuel metering tube and piston.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 1.

FIG. 4 is a sectional view of a modified form of the invention particularly adapted to operate in conjunction with a liquid carburetor.

FIG. 5 is a detail of the butterfly valve arm of the modification.

As may be seen in the accompanying drawings FIGS. 1-3, one embodiment of this invention has a body 10 with an air intake chamber 12 and a mixing chamber 14.

The intake chamber has a circular mouth with a shoulder 16 for the attachment of a conventional air filter. The outlet of the mixing chamber has flange 18 with bolt holes for connection to an intake manifold of an associated internal combustion engine. A rectangular opening 20 connects the intake chamber and mixing chamber.

The mixing chamber is bounded by two parallel side walls 22 lying in planes normal to the plane of the opening 20. A flap valve 24 is pivoted or mounted for rotation about an axis at the top edge or side of the opening 20. The valve is a rectangular plate slightly less in width than the distance between the walls 22. When closed it abuts surface 26 on the mixing side of the opening substantially closing it. It is not necessary for it to form a close fit for reasons explained later. The valve opens by swinging into the mixing chamber so that the passage from the intake to mixing chambers is a rectangle defined by lower lip 28 of the opening, lower edge 30 of the valve, and the two side walls.

Pitman 32 is pivotably attached near the center of the valve and extends into metering tube 34. The metering

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tube is closed at the outside end and opens at the other end into the mixing chamber. The tube is located within fuel chamber or annulus 36 which is within the body. Fuel inlet pipe 38 connects into the fuel chamber to supply the gaseous fuel. The metering tube is threaded into the body so that it may be adjusted. The tube has an elongated, axially aligned, rectangular, metering, slot or port 40 therein. As seen in FIG. 1, the slot provides communications from annulus 36 outside the tube to within the tube which is open to the mixing chamber.

Metering piston or valve 42 is mounted for axial movement within the tube. Helical compression spring 43 extends from the piston to the closed end of the metering tube. The piston is generally cup shaped with a cylindrical outer surface and a spherical concave surface at the end of the inner bore. Ball 44 on the pitman mates with the concave surface and is held in place by bushing 46 which is held in place by crimping the end of the piston.

Butterfly throttle 48 is located in the bottom portion of the mixing chamber. This portion is of circular cross section. Of course the body may be cast in several sections with gaskets and O-rings between the various sections and parts. The gaskets and bolts have not been shown or described as it is felt these are within the skill of ordinary mechanics.

Below the entrance of the metering in back wall 52 and about halfway across the mixing chamber is partition or baffle 50 which extends to both side walls 22. Vent pipe 54 extends through the partition and is angled toward that side of the mixing chamber wherein the rectangular opening is located. The outer edge 56 of the partition forms a stop for the flap valve when it is full open. It may be seen that at full open throttle there will be a minimum restriction to the flow of air.

Operation

With the carburetor attached to the intake manifold of an internal combustion engine, and the engine turning over, there will be a partial vacuum within the mixing chamber depending to some extent on the throttle setting. The atmospheric pressure will push the flap valve open. The amount of incoming air will be measured by the size of the rectangular passage or the movement of the flap valve. The movement of the flap valve will cause a proportional movement of the metering piston provided the pitman is normal to the valve which it approximately is. As the metering piston moves back it will uncover an increasing portion of the meter slot. The size of the rectangular passage and the uncovered metering slot will be substantially proportional. The fuel is supplied to the fuel chamber at atmospheric pressure. The pressure differential across the passage will be the same as through the slot. Therefore the amount of fuel flow will be proportional to the amount of air flow and the fuel-air ratio will remain constant.

The fuel flow is from pipe 38 to chamber 36, through slot 40 into tube 34 and thus into mixing chamber 14; the fuel flow from tube 34 to chamber 14 is through pipe 54 if the flap 24 is full open and against edge 56.

The width of the slot will depend upon the fuel used. If a liquified petroleum gas (e.g. butane) is used the slot will be narrower than if natural gas (methane) is used. The same spring is used for either. The pressure the spring exerts is not critical. The spring is strong enough to insure a partial vacuum within the mixing chamber at all times. When starting this is particularly important. With the throttle open and the engine turning over slowly, there is sufficient reduction of pressure to suck in adequate fuel with the air. Good starting is obtained without special choking. Yet using quite a strong spring, no difficulty is experienced with lack of

air force to open the flap valve completely, thus resulting in a minimum restriction to the flow.

As mentioned, the flap valve does not have to form a tight seal with the surface of the opening 20. This provides for idling operation. If a tight fit occurs, a small hole may be made in the flap valve. The sole carburetor adjustment is the adjustment of the slot relative to the piston at idling speed. The rotation of the tube will move the tube in or out and determine the slot opening at this mode of operation.

Any foreign matter in the fuel will drop out in the fuel chamber. It is made sufficiently large so that there will not be a rapid, turbulent flow through it. The flap valve directs the air flow directly into the lower portion of the mixing chamber and shields the working parts of the carburetor from contamination.

The fuel flows into the air stream through the vent pipe. The location prevents stratification, i.e. fuel on one side and air on the other. Therefore good mixing of fuel and air is obtained.

The speed of the engine is controlled by the throttle setting as is customary.

Modification

FIGS. 4 and 5 illustrate a modified form of the invention adapted to fit above a conventional liquid fuel carburetor. It is integral with an air filter of the type using accordion pleated filter paper or material 100. Upper plate 104 is attached in parallel relationship to base plate 102 by a bolt. These plates with the filter material extending around the perimeter of the space between them form the body of the carburetor.

The interior of the filter is divided by walls 122 and other walls into an intake chamber 112 in communication with the filter material and mixing chamber 114 in communication with outlet opening 101 in the base plate. The mixing chamber is lengthened by translational piece 103 which also provides means for connecting the outlet opening to the inlet of a conventional liquid carburetor.

Opening 120, walls 122, flap valve 124, surface 125, lower lip 128, lower edge 130, pitman 132, metering slot 140, piston 142, spring 143, ball (not shown), and bushing (not shown) are all the same and arranged the same (although oriented differently) as described above with similar numbers. The liquid carburetor throttle provides the speed control. The partition 150 is slightly different shape but serves the same purpose.

A dividing wall contains a bypass butterfly valve 106 which may be opened by control wire 108 when liquid fuel is used. This provides a direct passage from the air filter to the liquid carburetor, bypassing the gas carburetor.

To change from liquid fuel to gas fuel, all that is necessary is to close the liquid fuel supply, open the gas fuel supply, and close bypass valve 106. Reversing these steps will change from gas to liquid.

It will be noted that valve 106 is offset on its shaft 111, i.e. the shaft is not diametrical of the valve. Also there is a helical compression spring 113 between arm 115 on the shaft and atop 117 on the end of the control wire. Therefore if the engine backfires the pressure on the larger side of the bypass valve will force it open against the compression of the spring. As soon as the pressure in the mixing chamber is less than the pressure in the intake chamber the valve will be closed by spring 113.

It will be apparent that the embodiments shown are

only exemplary and that various modifications can be made in construction, materials, and arrangement within the scope of the invention as defined in the appended claims.

We claim as our invention:

1. A carburetor comprising: a body having an air intake chamber and a mixing chamber; the mixing chamber containing a throttle and adapted to connect to a manifold; a rectangular opening connecting the two chambers; a measuring valve mounted for rotation about one of the sides of the rectangular opening, the valve substantially closing the opening and abutting the mixing side of the opening when closed, so that the valve moves open into the mixing chamber; a pitman connected near the center of the valve on the mixing side; said body having a fuel chamber; a tube in the fuel chamber, said tube having one closed end and the other end opening into the mixing chamber; the tube having an elongated axial rectangular slot; a piston in the tube; the piston connected to the pitman; and means for biasing the valve closed; so arranged and constructed that as incoming air pushes the measuring valve open, the piston opens the slot a proportional amount.

2. The invention as defined in claim 1 wherein a portion of the mixing chamber has parallel walls lying in a plane normal to said opening and the valve has substantially the same width so that as the valve opens the passage between the intake and mixing chamber is a rectangular one defined by the lower lip of the rectangular opening, the lower edge of the flap valve, and the side walls.

3. The invention as defined in claim 1 wherein said tube is threaded into said body so that it may be adjusted by screwing it in or out.

4. In an air filter having a base plate, a parallel cover plate, a filtering material extending around the perimeter of the space between the base plate and cover plate, an outlet opening in the base plate, and means for connecting the outlet opening to the inlet of a conventional liquid carburetor, the improvement comprising: walls within the confines of the air filter dividing the space into an inlet chamber and a mixing chamber, the inlet chamber in communication with the filtering material and the mixing chamber with the outlet opening, an opening in one of said walls, a measuring valve mounted for rotation along one side of said wall opening so that it swings into the mixing chamber, a member having a fuel chamber attached to the base plate, a port connecting the fuel chamber and the mixing chamber, metering valve means responsive to the measuring valve for opening said port, means for biasing said measuring valve closed, and a by-pass valve within said walls forming a by-pass passage when the by-pass valve is open between the inlet chamber and mixing chamber, said by-pass valve of the butterfly type with the shaft off-set from the diameter; so arranged and constructed that if the pressure is greater in the mixing chamber than in the inlet chamber, this pressure differential will tend to open the by-pass valve.

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