

[54] **CARBURETOR FUEL METERING VALVE**

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[51] **Int. Cl.**.....F02m 9/08

[58] **Field of Search** 261/41 B, 44 A

[56] **References Cited**

UNITED STATES PATENTS

2,995,349	8/1961	Kennedy, Sr.	261/44 A
3,132,191	5/1964	Kennedy, Sr.	261/44 A
1,178,960	4/1916	Smith	261/44 A
1,305,744	6/1919	Rhoads.....	261/44 A

FOREIGN PATENTS OR APPLICATIONS

4,321 3/1915 Great Britain.....261/44 A

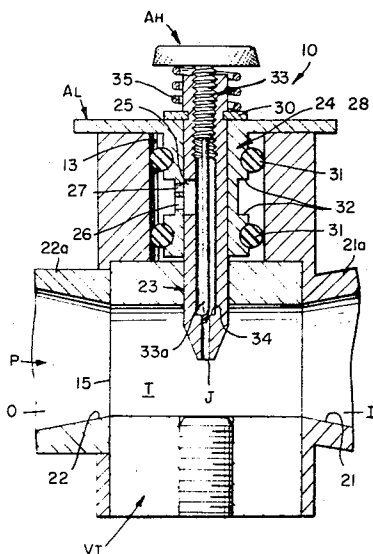
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[57] **ABSTRACT**

A carburetor fuel metering valve having slidably inter-fitting relatively rotatable valve sleeves with a pair of circumferentially overlapping primary fuel metering ports whose overlap area is progressively increased to increase fuel flow through the valve upon relative rotation of the valve sleeves from idling to high speed positions and a pair of high speed fuel metering ports which enter into overlapping relation upon relative rotation of the valve sleeves to high speed position to increase high speed fuel flow through the valve, and a high speed fuel adjustment valve for adjusting the fuel flow through the metering valve independently of the fuel metering ports in the high speed setting of the valve sleeves and without altering the metering port areas.

4 Claims, 4 Drawing Figures



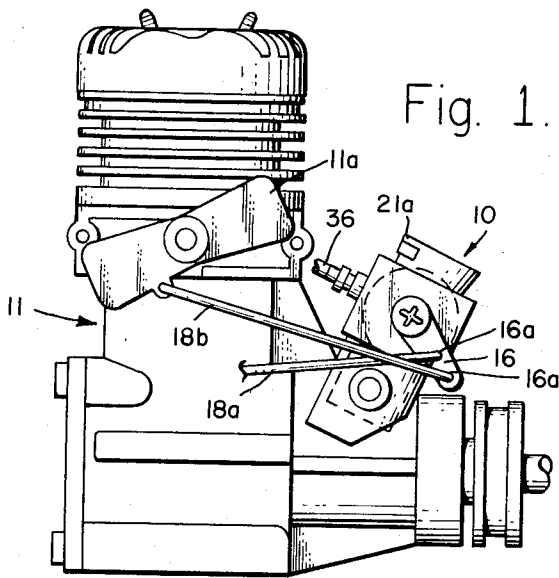


Fig. 1.

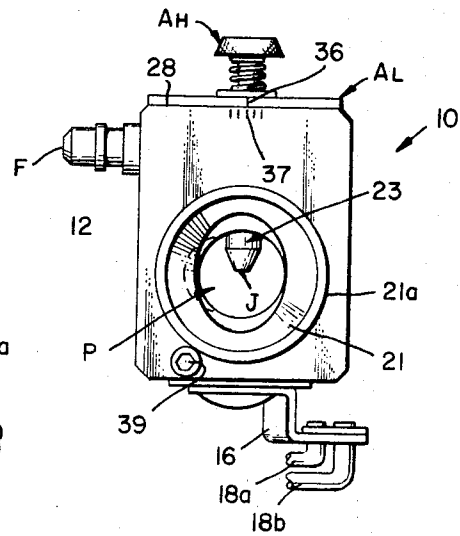


Fig. 2.

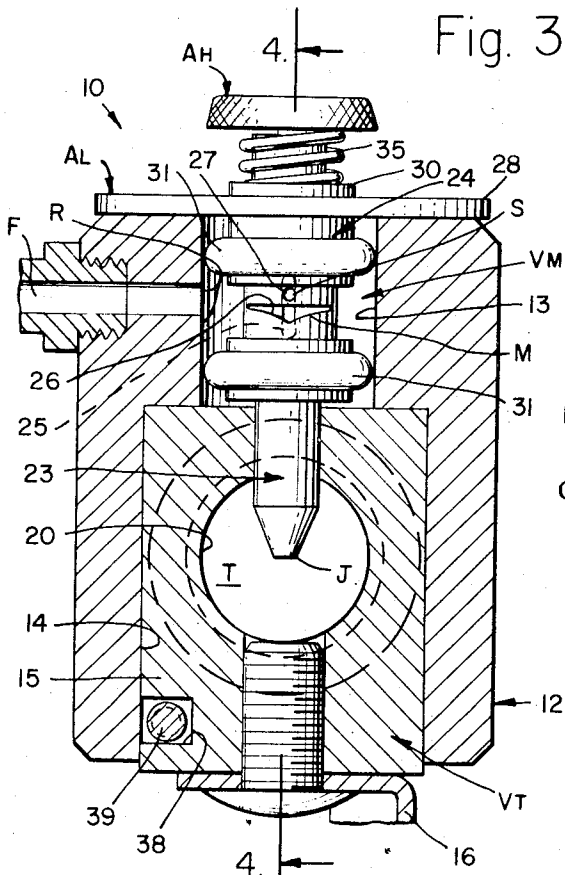


Fig. 3.

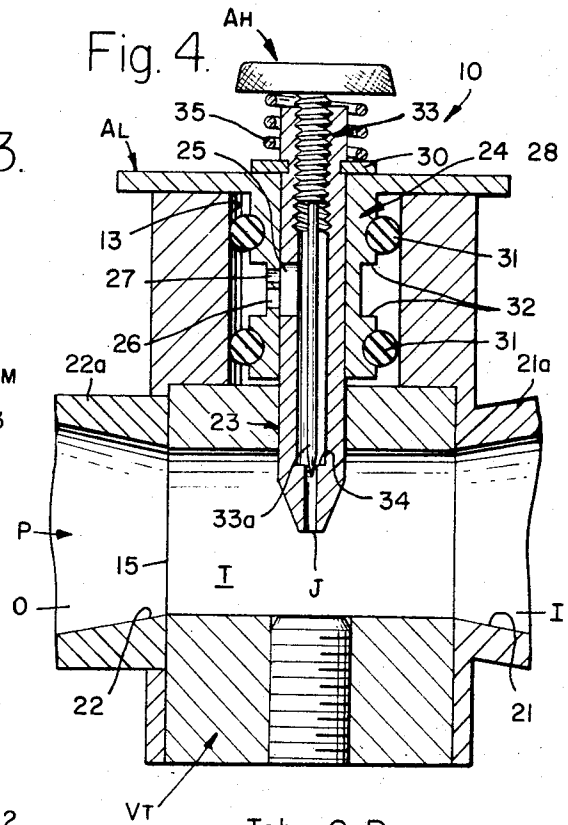


Fig. 4.

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CARBURETOR FUEL METERING VALVE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to the field of carburetors for gasoline powered engines and more particularly to a novel carburetor fuel metering valve.

2. Discussion of the Prior Art

As will become evident from the ensuing description, the fuel metering valve of this invention may be used to advantage in a variety of gasoline carburetors. However, the valve is designed primarily for use in my earlier mentioned copending application. For this reason, the valve will be disclosed in connection with the latter carburetor.

The carburetor of the copending application has a body containing a rotary valve barrel with a transverse passage which defines the throat of an induction air Venturi having an inlet in the body at one end and an outlet in the body at the other end of the barrel passage. Rotation of the valve barrel between idling and high speed positions regulates air flow through the Venturi and hence the vacuum in the Venturi throat.

Extending axially through one end of the valve barrel and the adjacent end of the carburetor body is a bore containing a pair of slidably interfitting valve sleeves. The inner end of the inner sleeve projects into the Venturi throat passage in the valve barrel to form a fuel jet opening to the passage and is fixed to the barrel for unified rotation of the barrel and inner sleeve. The outer end of the outer sleeve mounts a knob accessible externally of the body for rotating the outer sleeve relative to the inner sleeve. The diameter of the body bore is larger than the diameter of the outer sleeve and the outer sleeve is surrounded by axially spaced seal rings which engage the bore wall to form an annular fuel reservoir about the outer sleeve. A fuel inlet on the body communicates with this reservoir.

Rotation of the valve barrel between its idling and high speed positions rotates the inner valve sleeve relative to the outer valve sleeve between idling and high speed positions. Opening through the sleeve walls are a pair of circumferentially overlapping fuel metering ports whose overlap area varies progressively to regulate fuel flow to the Venturi fuel jet upon rotation of the inner valve sleeve between its idling and high speed positions with the valve barrel relative to the outer valve sleeve. Rotation of the inner sleeve from idling to high speed position progressively increases the overlap area of the metering ports and hence fuel flow to the fuel jet.

The carburetor is provided with idling and high speed fuel adjustments for regulating fuel flow to the fuel jet independently of the valve barrel setting. The idling adjustment involves rotation of the outer valve sleeve by its external knob to vary the overlap area of the valve sleeve fuel metering ports in the idling position of the inner sleeve. The high speed adjustment is furnished by a valve screw threaded in and accessible externally of the inner valve sleeve. Rotation of this valve screw extends and retracts the inner end of the screw across the fuel metering port in the inner valve sleeve to regulate the effective area of the port and thereby the effective overlap area of both sleeve ports in the high speed setting of the inner valve sleeve relative to the outer valve sleeve. Thus rotation of the inner

sleeve with the valve barrel provides a fuel metering action over the full range of carburetor settings, the idling fuel adjustment regulates idling fuel flow, and the high speed fuel adjustment regulates high speed fuel flow.

The present invention is concerned primarily with the high speed fuel adjustment. It is evident from the foregoing discussion that the high speed fuel adjustment of my prior carburetor has the inherent disadvantage of the high speed fuel adjustment valve screw, in any given setting and reduces the effective overlap area of the valve sleeve metering ports throughout at least a large portion of the angle of relative valve sleeve rotation between idling and high speed settings. In other words, the high speed adjustment, while regulating high speed fuel flow, also affects fuel flow over a relatively wide range of intermediate settings of the valve sleeves.

SUMMARY OF THE INVENTION

The present invention overcomes the above disadvantage of my prior carburetor fuel metering valve. To this end the present metering valve employs slidably interfitting relatively rotatable valve sleeves with a pair of primary circumferentially overlapping fuel metering ports, a pair of high speed fuel ports, and a high speed fuel adjustment valve which regulates fuel flow only in the high speed setting of the valve sleeves. The inner sleeve has a fuel jet at one end and a central fuel passage communicating the jet and the fuel ports in the inner sleeve. Surrounding the outer sleeve are a pair of seal rings located at either side of the sleeve ports.

The present metering valve is installed in the carburetor of my copending application in place of the metering valve disclosed in the application. Thus, when the present valve is installed in the carburetor, the valve sleeves extend through the metering valve bore in the carburetor body, and the fuel jet end of the inner sleeve extends axially through one end of the rotary valve barrel into the Venturi throat passage in the barrel. The inner sleeve is fixed to the barrel for rotation with the barrel. The seal rings about the outer valve sleeve engage the wall of the body bore to form an annular fuel reservoir about the valve sleeves communicating with the outer sleeve ports and a fuel inlet in the carburetor body. During carburetor operation fuel flow occurs from the fuel inlet, through the valve sleeve ports, fuel passage and fuel jet into the valve barrel Venturi throat passage for mixing with the induction air flowing through the passage to the engine.

Rotation of the carburetor valve barrel between idling and high speed positions rotates the inner fuel metering valve sleeve between idling and high speed positions relative to the outer valve sleeve. This relative rotation of the sleeves causes relative rotation of the primary fuel metering ports in the sleeves to vary the effective overlap area of the ports. These primary metering ports are so shaped that their overlap area is progressively increased to progressively increase fuel flow to the metering valve fuel jet by relative valve sleeve rotation from idling to high speed position. The high speed fuel ports in the valve sleeves, on the other hand, are displaced circumferentially of the valve and hence closed throughout a major portion of the angle of relative sleeve rotation from idling to high speed position. These high speed ports enter into overlapping relation only upon final relative sleeve rotation to high

speed position. Accordingly, the high speed ports increase the total effective valve sleeve fuel port area and hence maximum fuel flow rate in the high speed setting of the fuel metering valve. Rotation of the valve sleeves from their high speed position closes off the high speed fuel ports to return exclusive fuel metering action to the primary fuel metering ports.

The high speed fuel adjustment valve regulates the effective flow area of the fuel passage in the inner valve sleeve between the fuel ports and fuel jet. This high speed valve is adjustable between a wide open maximum flow position and a minimum flow position. In maximum flow position, the effective flow area of the fuel passage equals or slightly exceeds the combined overlap area of the primary metering and high speed fuel ports in the high speed setting of the metering valve sleeves. In the minimum flow position of the high speed valve, the effective fuel passage flow area approximates the overlap area of the primary fuel metering ports in the high speed setting of the metering valve sleeves. Thus, the high speed fuel adjustment valve is effective to regulate fuel flow through the metering valve only in the high speed setting of the metering valve. Rotation of the metering valve sleeves from high speed position reduces the sleeve fuel port area below the fuel passage flow area in the minimum flow setting of the high speed valve, thereby effectively eliminating the fuel controlling action of the high speed valve. Idling adjustment of the fuel metering valve is accomplished by rotating the outer valve sleeve, as in my earlier metering valve.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of a carburetor embodying a fuel metering valve according to the invention and installed on a model gasoline engine;

FIG. 2 is an enlarged end view of the carburetor looking in the direction of the arrows on line 2—2 in FIG. 1;

FIG. 3 is an enlarged section through the carburetor; and

FIG. 4 is an enlarged section taken on line 4—4 in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to these drawings, there is illustrated a carburetor 10 which is identical, except for the present fuel metering valve, to the carburetor of my copending application. Carburetor 10 is shown mounted on a gasoline engine 11. In this instance, the engine is a small two-cycle gasoline engine of the type used on radio controlled model airplanes, boats, and the like. Carburetor 10 has a body 12 through which extends an induction air passage P defining a Venturi having an inlet I, an outlet O, and an intervening throat T. Mounted within the passage P is a throttle valve V_t which is movable between idling and high speed positions to regulate induction air flow through the passage. Also mounted on the carburetor body 12 is a fuel jet J which projects into the carburetor Venturi throat T. Fuel jet J communicates to a fuel inlet F on the body through the present improved fuel metering valve V_m . This valve has a variable area primary fuel metering orifice M through which fuel flows from the inlet to the

jet in all speed settings of the valve and, in the high speed setting, an additional high speed fuel orifice S for providing additional fuel to the jet at high speed. The throttle valve V_t and the metering valve V_m are interconnected for adjustment of these valves in unison to regulate the effective area of the metering orifice M and to open and close the high speed fuel orifice S concurrently with regulation of induction air flow through the carburetor Venturi. Embodied in the metering valve V_m is a low speed adjustment A_L and a high speed adjustment A_H . These adjustments regulate fuel flow to the fuel jet J independently of the throttle valve V_t and, as will be explained presently, are set with the throttle valve in its idling and high speed positions, respectively, to attain optimum fuel air mixtures at these settings. About the fuel metering valve V_m is an annular fuel reservoir R. This reservoir communicates the fuel inlet F to the valve orifice M.

The carburetor 10 is installed on the engine 11 by coupling the carburetor outlet O to the engine air intake. During engine operation, induction air flow to the engine occurs through the carburetor Venturi. Fuel flow occurs from the carburetor fuel inlet F, through the metering valve V_m , to the fuel jet J from which the fuel is discharged into the Venturi throat T to mix with the induction air. The throttle V_t and the valve V_m are adjustable in unison to concurrently regulate induction air flow and fuel flow through the carburetor. The low speed adjustment A_L and high speed adjustment A_H are set with the throttle valve V_t in its idling position and its high speed position, respectively, to attain optimum fuel air mixtures at these throttle settings.

Referring now in greater detail to the drawings, the body 12 of the carburetor 10 has a generally blocklike configuration and may be machined or injection molded from plastic or metal. Extending centrally through the body is a bore 13, one end of which is counterbored at 14. Rotatably fitted within the counterbore 14 is a valve barrel 15 which constitutes the throttle valve V_t . Valve barrel 15 has an outer end face substantially flush with the adjacent end face of the carburetor housing 12. Seating against this end face of the valve barrel is a throttle arm 16. Throttle arm 16 is firmly clamped to the valve barrel 15 by a screw 17, whereby the barrel may be rotated by the application of a force to the outer end of the arm. Extending through the outer end of the throttle arm 16 are a pair of holes 16a for receiving operating links 18a, 18b. These links will be referred to again presently.

Extending diametrically through the throttle valve barrel 15 is a bore 20 communicating a pair of diametrically opposed openings 21 and 22 at opposite sides of the carburetor body 12. Bore 20 and openings 21, 22 collectively define the carburetor Venturi and individually define, respectively, the Venturi throat T, inlet I, and exit O. The inlet and exit openings 21, 22 have inwardly convergent tapers and diameters at their inner ends which are substantially equal to the diameter of the valve barrel throat bore 20. In the particular embodiment of the invention illustrated, the carburetor body 12 is injection molded in one piece, preferably from plastic, and the inlet opening 21 has a conically tapered wall 21a which is molded integrally with the body. The exit opening 22 has an externally cylindrical wall 22a formed by a sleeve which is fabricated

separately from the carburetor body and is pressed fitted in or otherwise secured to the body.

Fuel metering valve V_m has a pair of slidably inter-fitting metering valve sleeves 23, 24. Inner sleeve 23 extends concentrically through and is firmly secured at one end to the inner end of the throttle valve barrel 15. This sleeve end projects into the to the approximate center of the valve barrel bore 20 to form the fuel jet J.

The opposite end of the valve sleeve 23 extends centrally through the carburetor body bore 13. Opening through the wall of this latter sleeve end is a narrow fuel metering port or slot 25 which is elongated in the axial direction of the sleeve. Outer valve sleeve 24 contains a fuel metering port or slot 26 which is elongated and tapered circumferentially of the sleeve. Slots constitute primary fuel metering ports and are disposed in intersecting or circumferentially overlapping relation in such a way that their region of intersection or overlap area defines the mixing valve orifice M. As will be explained presently, metering valve sleeves 23, 24 are relatively rotatable between idling and high speed positions or settings. The outer sleeve 24 has a small fuel port 27 which overlies the inner sleeve port or slot 25 only in the high speed setting of the valve sleeves. Ports 25, 27 thus constitute high speed fuel ports.

The low speed adjustment A_L of the valve V_m comprises a peripherally serrated disc 28 which is rigidly secured to the outer end of the outer metering valve sleeve 24. This disc projects edgewise beyond two opposite side faces of the carburetor body 12, as shown in FIG. 5, to permit rotation of the disc by hand to turn the outer valve sleeve relative to the inner valve sleeve 23. The inner face of the disc seats slidably against the adjacent end face of the carburetor body. The outer end of the inner valve sleeve 23 projects a small distance beyond the outer face of the disc and is externally circumferentially grooved to receive a snap ring 30.

It will now be understood that the throttle valve barrel 15, metering valve sleeves 23, 24, and the low speed adjustment disc 28 are positioned axially relative to the carburetor body 12 by virtue of seating contact of the inner end of the barrel with the annular shoulder at the juncture of the carburetor body bore 13 and counter-bore 14 and seating contact of the adjustment disc with the adjacent end face of the body. While these parts are restrained against axial movement relative to the carburetor body, the parts are free to turn relative to the body.

Surrounding the outer valve sleeve 24 of the metering valve V_m are a pair of O rings 31. These O rings are contained within circumferential grooves in a pair of radially enlarged axially spaced shoulders 32 which are integrally formed on the outer valve sleeve. O rings 31 are located at opposite sides of both metering valve orifices M and S and the fuel inlet F and bear against the wall of the carburetor body bore 13 to define with this wall and the outer valve sleeve the annular fuel reservoir R.

The high speed adjustment A_h of the fuel metering valve V_m comprises a needle valve 33 which is threaded in the outer end of the inner valve sleeve 23. The inner end of this needle valve is reduced in diameter to provide the valve needle 33a proper and an annular space about the needle. Valve needle 33a extends past the

metering orifices M, S into the opening through an annular valve seat 34 adjacent the fuel jet J. Surrounding the needle valve between its knurled knob and the low speed adjustment disc 28 is a compression spring 35. This spring exerts axial pressure on the knob to effect frictional retention of the needle valve in its current setting.

Referring now to FIG. 1, it will be observed that the present carburetor 10 is mounted on the engine 11 in the same way as the conventional model engine carburetor. Thus, the carburetor outlet sleeve 22a is coupled to the engine air intake so that induction air flow to the engine occurs through the carburetor Venturi passage P. The carburetor throttle arm 16 is connected to a throttle actuator, such as a servo actuator, through the link 18a. Link 18b connects the throttle arm to the usual pivoted exhaust shutter 11a on the engine 11 for adjustment of the shutter and the carburetor throttle valve V_t in unison. The carburetor fuel inlet F is connected to a fuel tank (not shown) through a fuel line 36.

From the description thus far, it is evident that the throttle valve barrel 15 and the inner valve sleeve 23 rotate in unison. During such unified rotation of the valve barrel and inner valve sleeve, the outer valve sleeve 24 remains stationary because of the frictional contact between its O rings 31 and the wall of the carburetor body bore 13. As a consequence, rotation of the valve barrel 15 rotates the fuel metering port or slot 25 in the inner valve sleeve 23 laterally along the fuel metering port or slot 26 in the outer valve sleeve 24. The outer metering slot 26 is longitudinally tapered so that lateral movement of the inner metering slot 25 along the outer slot varies the effective overlap area, that is, the area of the intersection region, of these slots. As already noted, this region defines the valve orifice M. Accordingly, rotation of the throttle valve barrel regulates the effective area of the valve orifice M.

The effective area of the metering valve orifice M can also be regulated, independently of the throttle valve V_t , by rotating the low speed adjustment disc 28. This disc rotation rotates the outer valve sleeve 24 relative to the inner valve sleeve 23 and thereby rotates the outer metering slot 26 lengthwise relative to the inner metering slot 25.

As clearly shown in the drawings, the metering valve orifice M is a simple, single boundary edge orifice. An orifice of this type is characterized by relatively high immunity to obstruction and clogging by foreign particles in the fuel. The metering slot 26 in the outer mixing valve sleeve 24 is longitudinally tapered in a manner which yields the proper fuel air mixture in every setting of the throttle barrel 15. In the case of a model engine, the ideal mixture is at least closely approximated by maintaining a constant ratio between the effective area of the mixing valve orifice and the throttle valve opening. The metering slot 27 is tapered in a manner which maintains such a constant area ratio. In this regard, it is evident that the effective throttle valve opening is equal to the overlap area of throttle barrel bore 20 and carburetor body openings 21, 22 and that this effective valve opening varies according to a non-linear function of throttle barrel position or rotation. For this reason, the metering slot 26 is tapered to

provide a selected non-linear relationship between the mixing orifice area and the angular position of the throttle barrel 15. Thus, the lower edge of each half of the metering slot 26 curves away from the upper slot edge as these edges approach the center of the slot in such a way that the increase in orifice area occasioned by given incremental rotation of the slots increases along the tapered slot according to a non-linear function of valve sleeve rotation. This function is selected to yield a substantially constant ratio between orifice area and throttle opening. It should be noted at this point that the metering action of the valve V_m utilized only one-half of the outer tapered metering slot 27. The double ended configuration of the illustrated metering slot is merely for manufacturing convenience.

The throttle valve V_t is arranged in such a way that in its full open or high speed setting, the throttle valve barrel 15 occupies a position wherein the Venturi throat bore 20 in the barrel and the Venturi inlet and outlet openings 21, 22 in the carburetor body 12 are coaxially aligned. The valve V_m is arranged so that in this high speed setting of the throttle valve, the metering slot 25 in the inner valve sleeve 23 registers with the wide portion of the tapered metering slot 26 in the outer valve sleeve 24. Under these conditions, the metering slots 25, 26 have maximum overlap area and the fuel metering orifice maximum effective area.

Rotation of the throttle valve barrel 15 from its high speed position to its idling position rotates the Venturi throat bore 20 in the barrel out of alignment with the Venturi inlet and outlet openings 21, 22 and thereby reduces the effective areas of these openings. This reduction of the Venturi inlet and outlet areas reduces induction air flow through the Venturi passage P. Rotation of the valve barrel 15 from its high speed position also rotates the inner valve sleeve 23 relative to the outer valve sleeve 24 in a direction to reduce the overlap area of the fuel metering slots 25, 26 and hence the effective area of the metering valve orifice M. In idling position, the inner fuel metering slot 25 registers with the small end of the outer fuel metering slot 26.

Threaded in the carburetor body 12 and projecting into a slot 38 in the wall of the throttle valve barrel 15 is an adjustable stop screw 39. This stop screw limits rotation of the valve barrel and is adjustable to regulate and fix the effective throttle valve opening in idling position.

As noted earlier, the metering valve V_m has a pair of high speed fuel ports 25, 27. Throughout the major portion of the angle of rotation of the inner valve sleeve 23 from idling to high speed position, ports 25, 27 are displaced circumferentially of the valve sleeves, and the high speed fuel orifice S is thus closed. The high speed ports enter into overlapping relation only upon final rotation of the inner sleeve to high speed position. In this high speed setting of the fuel metering valve V_m , then, the combined fuel port area of the metering valve, i.e., the summation of the maximum effective areas of the primary fuel metering orifice M and the high speed fuel orifice S, is substantially increased to increase high speed or full throttle fuel flow to the fuel jet J. Rotation of the inner valve sleeve 23 from high speed position closes off the high speed fuel orifice S and returns exclusive fuel metering control to the primary fuel metering orifice M.

It will be recalled that the metering valve V_m has high and low speed adjustments A_h , A_L . The low speed adjustment A_L is made with the throttle valve barrel 15, and hence inner valve sleeve 23, in idling position by rotating the low speed adjustment disc 28. Rotation of this disc rotates the outer valve sleeve 24 relative to the inner valve sleeve 23 to regulate the effective area of the primary fuel metering orifice M. This adjustment is set to obtain the optimum fuel air mixture at idling. A reference mark 36 on the low speed adjustment disc 28 cooperates with scale markings 37 on the carburetor body 12, to indicate the normal range of the low speed adjustment. This greatly facilitates proper setting of the adjustment.

The high speed adjustment A_h is made with the throttle valve barrel 15 and hence inner valve sleeve 23 in full open or high speed setting by rotating the needle valve 33 to advance the valve needle 33a toward or retract the needle from its valve seat 34 to vary the effective flow area of the fuel passage in the inner valve sleeve 23. The needle valve is thus adjustable between full open maximum fuel flow and partially closed minimum fuel flow positions. In maximum flow position, the valve needle 33a is spaced from the valve seat 34 to define therebetween a flow area at least equal to the combined effective maximum or high speed flow or overlap areas of the fuel metering ports 25, 26 and 25, 27. In minimum flow position the valve needle and valve seat are spaced to define a flow area approximately equal to the maximum flow or overlap area of the primary fuel metering ports 25, 26.

From the foregoing, it will be understood that the high speed adjustment A_h is effective to regulate high speed or full throttle fuel flow to the fuel jet J by a total amount equal to the maximum fuel flow through the high speed fuel metering orifice S. It is further evident that closure of the high speed fuel orifice S by rotation of the inner valve sleeve 23 from its high speed position reduces the total effective fuel port area of the metering valve V_m to a valve less than the minimum flow area between the valve needle 33a and valve seat 34, whereby the high speed adjustment A_h affects fuel flow only in the high speed setting of the fuel metering valve V_m .

The high speed adjustment is set to obtain the optimum fuel air mixture at full throttle position. As noted earlier, the spring 35 aids retention of the high speed adjustment needle valve 33 in its adjusted setting.

The operation of the present carburetor 10 is now obvious. Thus, with the carburetor mounted on the engine 11 in the manner illustrated in FIG. 1 and with the throttle valve V_t in its full open position, induction air flow to the engine occurs through the carburetor Venturi passage P. This induction air flow creates a Venturi suction force which draws fuel into the carburetor through the fuel jet J to mix with the induction air. The high speed adjustment A_h is set to obtain the optimum fuel air mixture at this full throttle position.

Rotation of the throttle valve V_t from its high speed or full open position to its idling position progressively reduces the effective areas of the Venturi inlet I and exit O. This adjustment of the throttle valve also adjusts the metering valve V_m to progressively reduce the area of the valve orifice M and thereby progressively reduce

fuel flow to the engine. The low speed adjustment A_L is set to obtain the optimum fuel air mixture with the throttle valve in its idling position. The reverse action occurs when the throttle valve is rotated from idling position to full open or high speed position. The valve V_m is effective to regulate or meter fuel flow through the carburetor in accordance with a non-linear function of throttle valve setting which yields an optimum fuel air mixture at every throttle valve setting.

What is claimed as new in support of Letters Patent is:

1. A fuel metering valve for a carburetor comprising: a pair of slidably interfitted relatively rotatable valve sleeves;
means on said sleeves for relatively rotating said sleeves between idling and high speed positions;
said sleeves having a pair of primary circumferentially overlapping fuel metering ports whose overlap area is progressively increased by relative rotation of said sleeves from said idling position to said high speed position;
said sleeves having a pair of high speed fuel metering ports which are displaced circumferentially of said sleeves and hence closed throughout the major portion of the relative rotation angle of said sleeves from idling to high speed position and enter into overlapping relation only as said sleeves approach said high speed position;
the inner sleeve having a fuel passage communicating with the fuel ports in said inner sleeve and opening through one end of said inner sleeve; and
valve means for regulating the effective flow area of said passage including an annular valve seat about said passage between said inner sleeve fuel ports and said one end of said inner valve sleeve, a needle valve extending centrally through said passage in radially spaced relation to the inner sleeve wall so as to provide an annular flow space about said needle valve and having a stem threaded in and extending beyond said opposite end of said inner sleeve, whereby said needle valve may be rotated to adjust the same toward and away from said valve seat, means on the outer end of said needle valve stem for rotating said needle valve, and means on the adjacent end of the outer sleeve for rotating the latter sleeve relative to the inner sleeve.

2. A fuel metering valve according to claim 1 wherein:

said carburetor includes a body containing a bore for

axially receiving said metering valve sleeves to a position wherein said fuel ports are situated within a given longitudinal portion of said bore having a diameter greater than the outer valve sleeve to provide an annular space about the outer sleeve, and a fuel inlet opening through the wall of said bore portion;

said metering valve includes seal rings surrounding said outer sleeve at either side of said sleeve ports for engaging said bore wall to define an annular fuel reservoir about and communicating with the ports in said outer sleeve; and

said open fuel passage end comprises a fuel jet.

3. A fuel metering valve for a carburetor including a body containing a bore and a fuel inlet opening through the wall of said bore, comprising:

a pair of slidably interfitted relatively rotatable valve sleeves to be positioned axially in said body bore;
means on said sleeves for relatively rotating said sleeves between idling and high speed positions;
said sleeves having a pair of primary circumferentially overlapping fuel metering ports whose overlap area is progressively increased by relative rotation of said sleeves from said idling position to said high speed position;

said sleeves having a pair of high speed fuel metering ports which are displaced circumferentially of said sleeves and hence closed throughout the major portion of the relative rotation angle of said sleeves from idling to high speed position and enter into overlapping relation only as said sleeves approach said high speed position;

seal rings surrounding said outer sleeve at either side of said sleeve ports for engaging said body bore wall to define an annular fuel reservoir about and communicating with the ports in said outer sleeve;
the inner sleeve having a fuel passage communicating with the fuel ports in said inner sleeve and opening at one end to the exterior of said inner sleeve to form a fuel jet; and

valve means for regulating the effective flow area of said passage at a position between said inner sleeve fuel ports and the open end of said passage.

4. A fuel metering valve according to claim 3 wherein:

said primary ports comprise a longitudinal slot in said inner sleeve and a circumferential longitudinally tapered slot in said outer sleeve; and

said high speed ports comprise said inner sleeve slot and a small hole in said outer sleeve.

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