United States Patent

Tucker

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[54] CARBURETOR

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[58] **Field of Search**.....55/234, 255; 261/96, 56, 79 R

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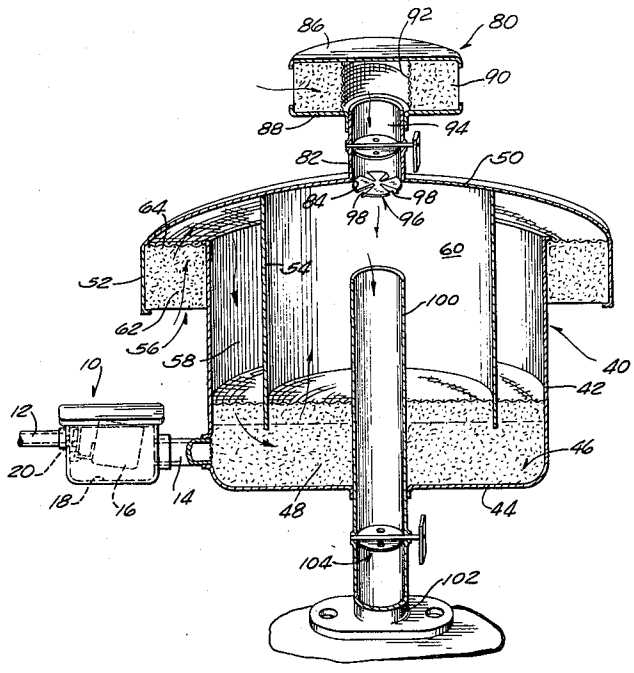
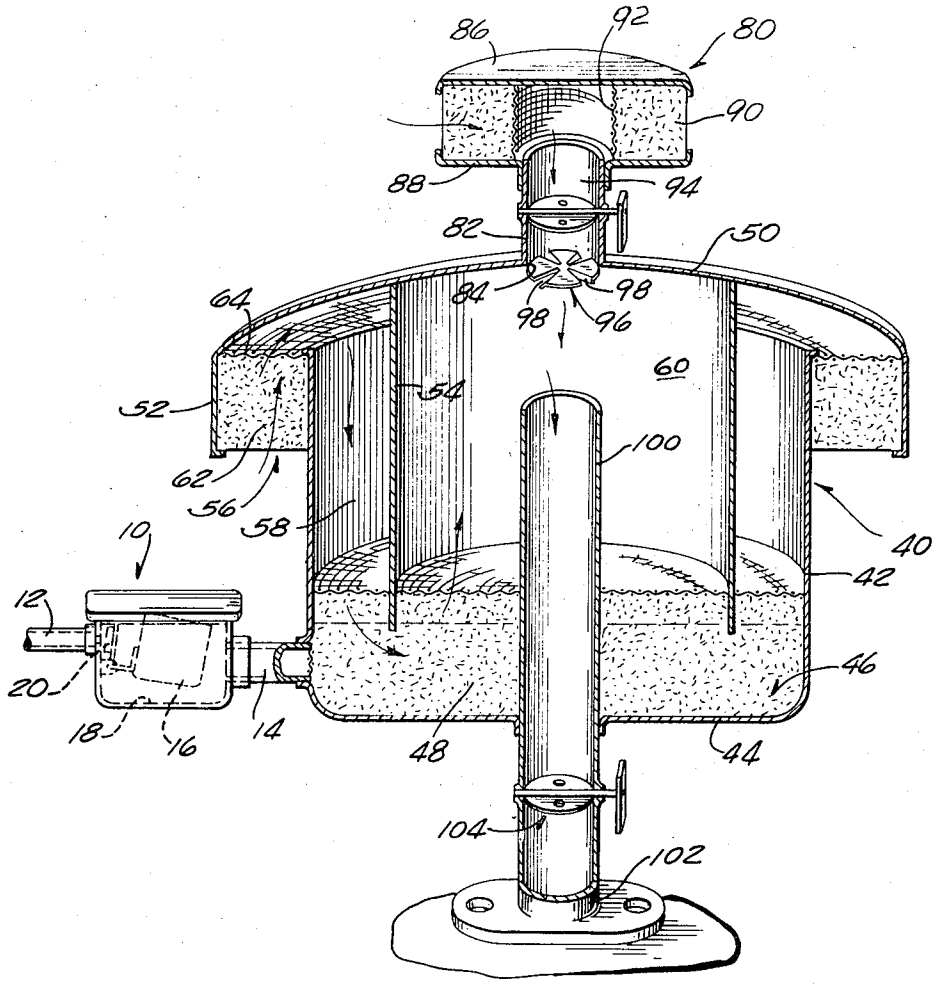
[57] **ABSTRACT**

A carburetor including a housing having a fluid fuel reservoir in the bottom, an air inlet at the top of the housing, a delivery pipe coaxially mounted within the housing and terminating short of the top of the housing, and a porous vaporizing filter substantially filling the reservoir. A baffle is concentrically mounted within said housing and extends partially into the vaporizing filter in the reservoir to deflect the incoming air through the vaporizing filter. The level of liquid fuel in the reservoir is kept above the bottom of the baffle, so that air entering the carburetor through the inlet must pass through the liquid fuel and vaporizing filter in the reservoir before discharge through the outlet. A secondary air inlet is provided in the top of the housing for controlling the fuel air ratio of the vaporized fuel passing into the delivery pipe.

6 Claims, 1 Drawing Figure





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CARBURETOR

BACKGROUND OF THE INVENTION

It is generally well known that liquid fuel must be vaporized in order to obtain complete combustion. Incomplete combustion of fuel in internal combustion engines is a major cause of air pollution. In a typical automotive carburetor, the liquid fuel is atomized and injected into the air stream in a manifold of approximately 3.14 sq. in. cross section. In an 8 cylinder 283 cu. in. engine running at approximately 50 miles per hour, the engine operates at approximately 2,400 r.p.m. and requires approximately 340,000 cu. in. of air per minute. The air velocity at this speed in the intake manifold will be approximately 150 feet per second and it will therefore take approximately 0.070 of a second for a particle of fuel to move from the carburetor to the combustion chamber. The fuel will remain in the combustion chamber for approximately 0.0025 seconds when operating at 2,400 r.p.m.

It is conceivable that in this short period of time complete vaporization of the fuel is not achieved and as a consequence, incomplete combustion occurs resulting in further air pollution. The liquid fuel particles if not vaporized can deposit on the cylinder walls and dilute the lubricating oil or oil film on the walls of the cylinders promoting partial burning of the lubricating oil and adding further to the pollution problem. Destruction of the film of lubricating oil by combustion can also increase mechanical wear between the piston and cylinder.

SUMMARY OF THE INVENTION

The carburetor of this invention provides for the complete combustion of liquid fuel in an internal combustion engine with a corresponding decrease of air pollutant in the exhaust. This is achieved by supplying a completely vaporized or dry gas to the combustion chamber. The primary air is initially filtered prior to passing through a vaporizing filter which is immersed in liquid fuel provided in a reservoir in the carburetor. The vaporizing filter continuously breaks the primary air up into small bubbles thereby increasing the surface area available for evaporation of the liquid fuel. Secondary air is added to the enriched fuel-air mixture through a secondary air filter prior to admission of the fuel-air mixture into the combustion chamber of the engine. Initial filtration of both the primary and secondary air removes any foreign particles which may be present in the air which could cause increased wear within the engine. The carburetor also assures delivery of a clean dry gas to the engine due to the gravity separation of any liquid or dirt particles from the fuel enriched primary air.

Other objects and advantages will become apparent from the following detailed description when read in connection with the accompanying drawing, in which the single figure shows a perspective cross sectional view of the carburetor of this invention.

DESCRIPTION OF THE INVENTION

The carburetor **40** disclosed herein is adapted for use in an internal combustion engine wherein air is drawn through the carburetor to vaporize the fuel in the carburetor prior to admission to the combustion chamber.

In this regard, the flow of liquid fuel, gas or oil, to the carburetor **40** is controlled by means of a float valve assembly **10** connected to a source of liquid fuel by a liquid fuel line **12** and to the carburetor **40** by a connecting tube **14**. The flow of liquid fuel through the float valve assembly **10** is controlled by a float **16** pivotally mounted within a float chamber **18** and operatively connected to a float valve **20**.

In accordance with the invention, the liquid fuel admitted to the carburetor **40** through tube **14** is completely evaporated by the primary air for the engine within the carburetor **40** and mixed with secondary air prior to admission into a delivery tube **100** which is connected to the manifold **102** of the engine. More specifically the carburetor **40** includes a cylindrical housing or pan **42** having a bottom wall **44** which forms a

liquid fuel and filter reservoir **46**. A vaporizing filter **48** is positioned within the reservoir **46** and extends upward a distance from the bottom wall **44** of the housing **42**. The vaporizing filter **48** is used to continuously break up the primary air into a large number of small bubbles as the primary air passes through the liquid fuel in the reservoir **46**. This increases the surface area per volume of air available for evaporation of the liquid fuel, as more particularly described hereinafter. This filter **48** is formed of a three-dimensional skeletal material that is washable and is not subject to break-down under the operating conditions of the carburetor. A foamed cellular plastic polyurethane filter having approximately 10 to 20 pores per inch has been used successfully in the carburetor **40**.

The housing **42** is closed at the top by a hood or cover **50** which can be secured thereto by an appropriate means. The hood **50** has a larger diameter than the diameter of the housing **42** and includes a depending flange **52** and a depending baffle **54**. The flange **52** is concentrically arranged and spaced outwardly from the outer surface of the housing **42** to form a primary air inlet **56**. The baffle **54** is concentrically arranged within the housing **42** to define a primary air chamber **58** and a central mixing chamber **60** within the housing **42**.

Primary air is drawn into the housing **42** through the air inlet **56** and is filtered by means of a primary air filter **62** which is removably mounted in the space between the flange **52** and the wall of the housing **42**. The primary air filter **62** is prevented from being drawn into the housing **42** by means of a screen **64**. The primary air filter **62** can be made of the same filtering material as the vaporizing filter **48**.

The primary air as it enters the primary air chamber **58** is deflected through the liquid fuel in the reservoir **46** by means of the cylindrical baffle **54**. The baffle **54** extends downwardly from the hood **50** far enough to penetrate the upper portion of the vaporizing filter **48**. The primary air must pass around the bottom of the baffle **54** and through both the liquid fuel and the vaporizing filter **48** prior to entering the mixing chamber **60**.

The level of the liquid fuel in the reservoir **46** is maintained above the bottom edge of the baffle **54** by means of the float valve assembly **10**. The operation of the float valve assembly **10** is well known. The float chamber **18** is located at approximately the same elevation as the reservoir **46** and the float **16** pivots in response to a change in the level of the liquid fuel in the float chamber to open the float valve **20**.

One of the important features of the present invention is the efficiency of evaporation of the liquid fuel by the flow of the large number of bubbles through the reservoir. This is believed to be caused by the continual break up of the bubbles as they pass through the vaporizing filter **48**. It is well known that the rate of evaporation by a bubble of air passing through a liquid unmolested is relatively slow due to the surface tension of the bubble. However, if the bubble is continuously broken, the surface tension of the bubble is reduced and a continual evaporating process occurs. This phenomenon is believed to be the cause of the high evaporation rate of the liquid fuel in the carburetor of this invention.

Another feature of the carburetor of this invention is the ability of the carburetor to supply dry gas to the central mixing chamber **60** in the housing **42**. Since the flow of primary air in the central mixing chamber **60** is vertically upward, the force of gravity will prevent any droplets of liquid fuel from rising high enough in the carburetor to enter the delivery tube **100**. The delivery of dry gas to the delivery tube increases the efficiency of combustion and thereby reduces the amount of unburned gases or pollutants that are exhausted from the engine into the air.

Means are provided for admitting secondary air into the central mixing chamber **60** to achieve the proper fuel-air ratio required for complete combustion. Such means is in the form of a secondary air filter assembly **80** mounted on an inlet tube **82** provided in an opening **84** in the hood **50**. The secondary air filter assembly **80** includes an upper plate **86**, a lower plate **88**, and a secondary air filter **90** positioned between the plates

86 and 88. The secondary air filter 90 is prevented from being drawn into the inlet tube 82 by means of a cylindrical screen 92 which forms a continuation of the tube 82. The secondary air passes through the outer periphery of the secondary air filter 90 through the screen 92 and into the tube 82. The flow of secondary air through the tube 82 is controlled by means of a butterfly valve 94 as is generally understood in the art.

Complete mixing of the dry gas enriched primary air with the incoming secondary air within the housing 42 is achieved by means of a turbulator or deflector 96 positioned at the end of the tube 82. The turbulator 96 includes a number of vanes 98 which are twisted to provide an outwardly directed circular air flow into the central mixing chamber 60 and thereby creating an increase in the turbulence of the secondary air as it combines with the fuel enriched primary air. The turbulator prevents cavitation from occurring at the upper end of the outlet or delivery tube 100.

The flow of fuel-air mixture to the engine is controlled by means of a throttle valve 104 provided in the outlet or delivery tube 100. The operation of the throttle valve 104 and butterfly valve 94 are both controlled in a conventional manner.

THE OPERATION OF THE CARBURETOR

Primary air is drawn into the housing 42 through the primary air inlet 56 and passes upwardly through the primary air filter 62 where substantially all foreign particles are removed from the primary air. The filtered primary air flows downward through the primary air chamber 58, under the baffle 54, through the fuel filter reservoir 46, and upward into the central mixing chamber 60. All of the primary air passes through the vaporizing filter 48 provided in the reservoir 46. The vaporizing filter 48 continuously breaks the primary air stream into thousands of small bubbles reducing surface tension and increasing the air surface area available for evaporization of the liquid fuel. Since the outside surface of each bubble is being continuously broken up by the vaporizing filter 48 and is in constant contact with the liquid fuel as the bubble passes through the vaporizing filter 48, there is a greater opportunity for evaporization of the fuel prior to entering the central mixing chamber 60 in the housing 42. The vertical upward flow of the fuel enriched primary air in the central mixing chamber assures that no liquid fuel droplets will be carried into the delivery tube 100.

The fuel enriched primary air is thoroughly mixed with the secondary air entering through tube 82 by means of the turbulator 96 which increases the turbulence of the primary and secondary air within the central mixing chamber and prevents cavitation from occurring in the delivery tube 100. The completely mixed fuel enriched primary air and the secondary air then passes through the delivery tube 100 into the combustion chamber of the engine.

I claim:

1. A carburetor for an internal combustion engine, said carburetor comprising:
- a housing having a liquid fuel reservoir, a vaporized fuel outlet projecting upwardly above said reservoir, and a primary inlet around said outlet,
- an open cell plastic vaporizing filter immersed in said reservoir,
- baffle means extending downwardly into said filter for deflecting the primary air downwardly through said filter prior to flowing upwardly toward said outlet,
- means for maintaining a static fuel level above the lower end of said baffle means,
- a secondary air inlet connected to the top of said housing to admit air to said housing prior to the flow of vaporized fuel into said outlet,
- means for controlling the flow of secondary air into said housing, and
- means for deflecting the secondary air away from the vaporized fuel outlet.

2. The carburetor according to claim 1 including a primary air filter in said primary air inlet.

3. The carburetor according to claim 1 wherein said baffle means comprises a cylindrical baffle positioned between said primary air inlet and said vaporized fuel outlet.

4. A carburetor which is adapted to be mounted on the manifold of an internal combustion engine, said carburetor comprising:
- a cylindrical housing having a bottom wall defining a reservoir in the bottom of said housing,
- a porous cellular vaporizing filter in said reservoir,
- a delivery tube mounted in said bottom wall and extending partially upward within said housing through said vaporizing filter,
- a hood mounted on said housing and spaced therefrom to define an annular primary air inlet around the outside of said housing,
- a secondary air inlet in said hood, means mounted on said hood for deflecting secondary air away from said delivery tube,
- a cylindrical baffle depending downwardly from said hood and penetrating said vaporizing filter, and
- means for maintaining the level of liquid fuel in said reservoir above the bottom of said baffle whereby air entering said housing must pass through said vaporizing filter and liquid prior to entering said delivery tube.

5. The carburetor according to claim 4 including a primary air filter in said primary air inlet.

6. The carburetor according to claim 4 wherein said delivery tube extends upwardly from said vaporizing filter a distance sufficient to prevent liquid fuel droplets from rising far enough to enter said delivery tube.

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