United States Patent [19]

Linn

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[54] **MEANS FOR AIDING FUEL ATOMIZATION**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 85,652, Oct. 30, 1970, abandoned.

[52] **U.S. Cl.** ....**48/180 R,** 48/180 C, 48/180 H

[51] **Int. Cl.** **F02m 15/04,** F02m 31/12

[58] **Field of Search** .48/180 R, 180 M, 180 S, 180 C, 48/180 P, 180 H; 123/119 R

[56] **References Cited**

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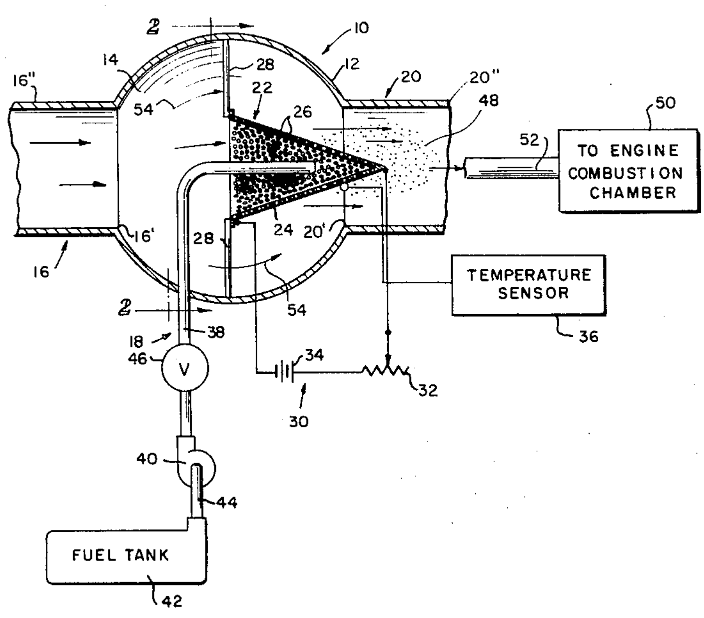
[57] **ABSTRACT**

A microporous sheet of material is disposed between the fuel and air inlets and the outlet of a carburetor.

16 Claims, 5 Drawing Figures



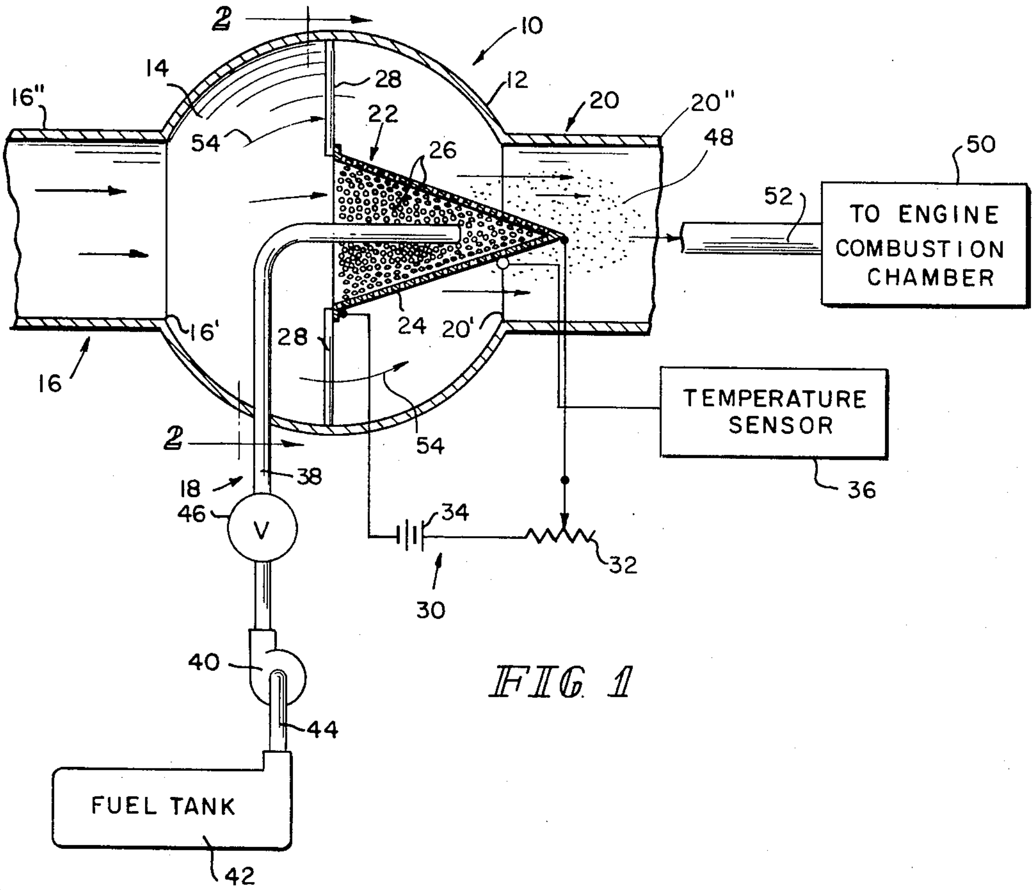


FIG. 1

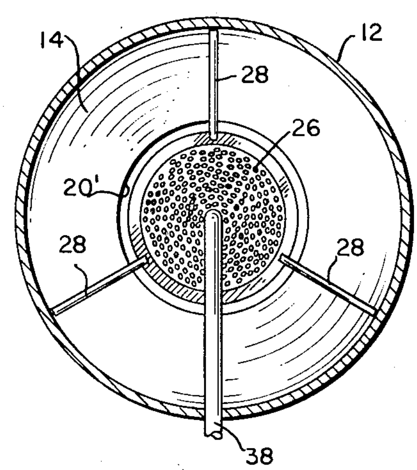


FIG. 2

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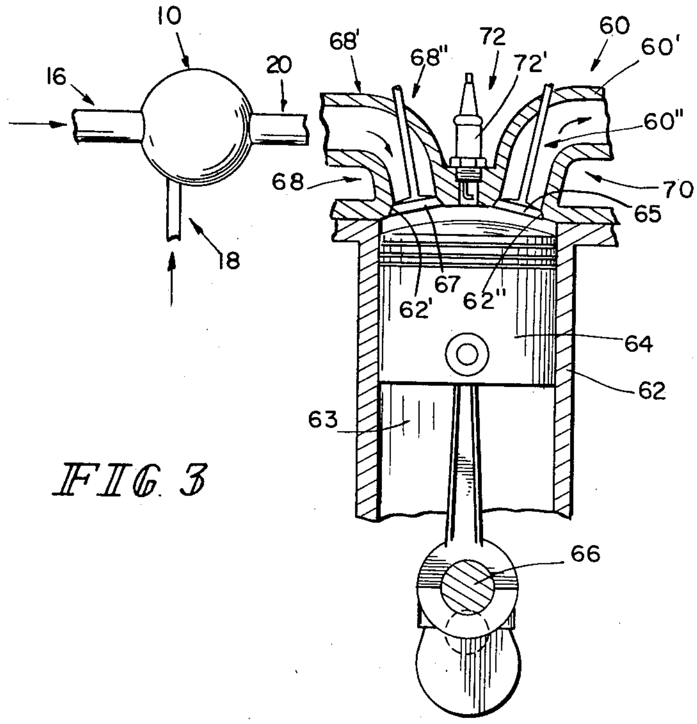

FIG. 3

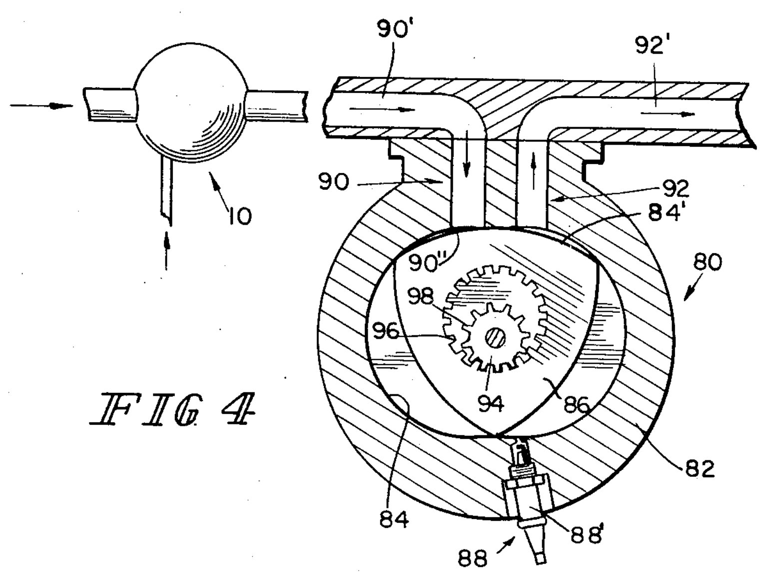

FIG. 4

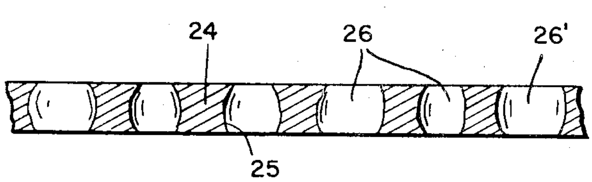

FIG. 5

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MEANS FOR AIDING FUEL ATOMIZATION

This is a Continuation-in-Part of Application Ser. No. 85,652, filed Oct. 30, 1970 in the name of Wallace L. Linn now abandoned.

This invention relates to a means for aiding fuel atomization; more particularly, it relates to a carburetor employing such means and to the combination of such carburetor with engines.

Engine manufacturers are constantly seeking new fuel-air induction systems which will improve on performance characteristics of engines. This is true whether it be for large automobile engines or smaller engines such as used in power lawnmowers. For the most part, improvements in fuel-air induction systems are aimed at increasing the overall efficiency of the engine, and reducing the amount of pollutants being ejected from the engine's exhaust system. It is fairly well recognized that better atomization of the fuel mixture would result in higher efficiency and less air pollution.

The present invention is directed towards a carburetor and has as one of its objects the provision of a carburetor having a means for aiding atomization of the combustible mixture.

Another object of the invention is the provision of a carburetor having a fuel and air inlet, an outlet for the combustible mixture, and a sheet of metal having microperforations covering substantially its entire area disposed between the inlets and the outlets.

Still another object of the invention is to provide a carburetor having an inlet and an outlet with a sheet of metal taken from the group consisting of stainless steel, titanium, aluminum, chromium, nickel, cobalt and alloys thereof and having microperforations covering substantially its entire area disposed between the inlets and outlets.

Another object of the invention is the provision of a carburetor having a fuel and air inlet and an outlet and a sheet of metal having microperforations covering substantially its entire area, the microperforations including holes, the walls of which are concave.

Yet another object of the invention is to provide a carburetor for an engine which improves the engine's efficiency.

Still another object of the invention is to provide a carburetor for an engine which reduces the amount of pollutants being emitted from the engine's exhaust system.

Another object of the invention is the provision of the combination of an engine with a carburetor, the carburetor employing a sheet of metal having microperforations for better fuel atomization.

These and other objects of the invention will become apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG 1 is a sectional view in elevation schematically showing the principals of the invention;

FIG. 2 is a view taken along the line 2—2 of FIG. 1,

FIG. 3 is a sectional view of a portion of a piston engine utilizing the carburetor of FIGS. 1 and 2;

FIG. 4 is a sectional view of a portion of a rotary engine utilizing the carburetor of FIGS. 1 and 2; and

FIG. 5 is a sectional view of a portion of the microperforated metal sheet.

generally speaking, there is provided a carburetor wherein a fuel and a gas are mixed together to form a combustible mixture, a chamber, gas inlet means to the chamber and fuel inlet means supplying a fuel to the chamber under pressure to form a combustible mixture, a sheet of metal having microperforations covering substantially its entire area disposed in the chamber in an interference path with the flow of the combustible mixture and an outlet means permitting the combustible mixture to pass out of the chamber. The combustible mixture, a portion of which is substantially atomized, passes to an engine where the mixture is fired, the energy released being used to drive a drive shaft.

Referring to the drawings, there is shown a carburetor **10** employing the principals of the invention. Carburetor **10** includes a shell **12** forming a chamber **14**, gas inlet means **16**, fuel inlet means **18** and outlet means **20**, and a means **22** for aiding fuel atomization. As shown, gas inlet means **16** and fuel outlet means **20** includes ports **16'** and **20'**, respectively, communicating with conduits **16''** and **20''** respectively.

The means **22** aiding fuel atomization, includes a sheet of material **24** having microperforations **26** covering substantially its entire area. The sheet **24** includes a metal taken from the group consisting of stainless steel, titanium, aluminum, chromium, nickel, cobalt and alloys thereof. As shown, the sheet of material **24** is conical in shape with its apex at least pointed towards the direction of outlet means **20** or, as shown, extending into the outlet means. The sheet of material is carried by a plurality of struts **28** carried by the shell **12** and extending into the chamber **24**. Thus only a portion of the fuel is fed through the sheet of material, the balance of the fuel passing around the sheet in a turbulent mode. The sheet of material is preferably heated through electrical heating means **30** which includes a rheostat **32** connected to a suitable power source such as a battery **34**. The temperature of the sheet is indicated through a temperature sensor **36**.

Fuel inlet means **18** includes a conduit **38** extending into the conical sheet **24** to an area near its apex, and a pump **40** connected to a fuel supply **42** through conduit **44**. A flow regulating valve **46** controls the amount of fluid being fed to the chamber **14** under pressure.

In operation, a gas such as air is fed into the chamber **14** through inlet means **16** and simultaneously fuel under pressure is fed to the chamber, and generally into the conical sheet **24** through fuel inlet means **18**. The mixing of the fuel and the gas forms a combustible mixture, a portion of which passes through the microperforations **26** to form a substantially atomized effluent **48** which then passes to an engine combustion chamber **50** by way of a suitable coupling means **52**. To further aid in atomizing the combustible mixture, the sheet is heated through electrical heating means **30**, the amount of current flow and thus the desired temperature being set by rheostat **32** in accordance with a predetermined temperature, the temperature being indicated by temperature sensor **36**. It is to be understood that temperature sensor **36** could be coupled to the electrical heating means **30** such that the temperature of the sheets **24** can be automatically controlled. The passage of the combustible mixture through the microperforations **26** substantially breaks up the mixture into minute particles or a very fine spray. The resulting atomized effluent **48** is carried to the engine combustion chamber **50** with the effluent **48** being substantially surrounded in an envelope of an unatomized, turbulent mixture coming from around atomization means **22** is indicated by the arrows **54**.

Referring to FIG. **3**, carburetor **10** is shown being used in combination with a piston engine **60**, a portion of which is shown. As previously described, gas and fuel are fed to the carburetor through inlets **16** and **18** respectively to form a combustible mixture, a portion of which has been substantially atomized through the use of the sheet with microperforations, which is fed to piston engine **60** through outlet means **20**. Piston engine **60** includes cylinder **62** providing a combustion chamber **63** and carrying a piston means **64** which is coupled to crank shaft **66**, fuel inlet means **68**, exhaust means **70** and ignition means **72**. Fuel inlet means **68** includes conduit means **68'**, communicating with outlet means **20**, and valve means **68''** which includes valve seat **67** cooperating with port **62'** of cylinder **62**. Exhaust means **60** includes conduit means **60'** and valve means **60''** which includes valve seat **65** cooperating with port **62''** of cylinder **62**. Ignition means **72** includes spark plug **72'** which is exposed to chamber **63**.

Assuming that piston **64** has just completed its exhaust stroke, piston **64** will move to the other end of the cylinder, valve means **68''** will open to allow fuel from carburetor **10** to enter the cylinder. The next stroke of the piston will compress the fuel, the fuel being ignited by spark plug **72**. The next stroke of the piston is the power cycle, the last stroke being the exhaust with valve means **60''** allowing exhaust gases to escape as the piston returns to its original position.

Referring to FIG. **4**, a portion of a rotary type engine **80** is shown. Rotary engine **80** includes a shell **82** forming a substantially spherical combustion chamber **84** in which a rotary piston means **86** rotates, ignition means **88**, fuel inlet means **90** and exhaust means **92**. Rotary piston means **86** drives a shaft means **94** through teeth **96** meshing with teeth **98** as the piston rotates. Fuel inlet means includes conduit **90'** communicating with chamber **84**, while exhaust means **92** includes a similar conduit **92'**. Ignition means **88** includes spark plug **88'**. Carburetor **10** is of the type shown and described with reference to FIGS. **1** and **2**.

In operation, fuel is fed to the engine **80** from carburetor **10**, a portion of the fuel being substantially atomized through the use of the microperforated sheets. Starting from the position shown, as rotary piston **86** rotates, fuel enters the chamber from carburetor **10** through conduit **90'**. Further rotation causes the fuel inlet to be shut off through engagement of surface **84'** of rotary piston **86** with port **90''** of conduit **90'**. Continued rotation causes compression of the fuel and combustion through spark plug **88'**. Following combustion, further rotation permits expansion of the gas (power) and subsequent exhaust of the gases through outlet means **92**. With this type of engine, there is a continuous flow of fuel and hence a continuous cycling of the engine. The microperforated sheet **24** is particularly useful in this type of engine where the flow of fuel is continuous. More specifically, with the continuous flow the fuel to the carburetor may be kept under a constant pressure of a predetermined level.

The microperforations **26** in sheets **24** may be formed by any suitable process. A particularly useful process would be an electrolytic process such as disclosed in U. S. Pat. No. 3,352,769. As there described, the sheet is connected as an anode in an electrolytic cell containing a non-polarizing electrolyte and then direct current is charged through the cell to produce a multiplicity of light transmitting microperforations throughout the sheet, the perforations being primarily due to electrochemical action. As further described in the above-noted patent, one of the basic factors in the operation of the process is the non-polarizing character of the electrolyte. The specific electrolyte would depend upon the material being perforated. For titanium, aluminum, chromium, nickel, cobalt and alloys thereof, solutions of chlorides, fluorides, and bromides would be suitable. For stainless steel, a particularly useful electrolyte would be hydrochloric acid, the concentration of which would be dependent to a great degree upon the type of stainless steel being perforated. The number of perforations may vary considerably with current, time and alloy composition. In general, however, as noted in the above-referenced patent, for stainless steel they may average in the order of 10 to 40 microns, the number being approximately 15,000 per square inch as measured on microphotographs against a standard scale. The particular process described produces a sheet having microperforations substantially as shown in FIG. **5**.

Referring to FIG. **5**, there is shown a sheet of metal **24** having a multiplicity of microperforations **26** formed therein by the above-noted process. The microperforations, in general, includes holes **26'** of varying diameter having concave walls **25**.

In an experiment with a 4HP, 4 cycle stationary engine using a carburetor of the type generally shown in FIG. **1**, with a stainless steel microperforated sheet generally shown in FIG. **5**, the engine seemed to start more easily, and for a given amount of fuel, the power output showed as increase. There also seemed to be a reduction in visible exhaust emissions.

What is claimed is:

1. In a carburetor wherein a fuel and a gas are mixed together to form a combustible mixture:

a. a chamber,

b. gas inlet means to said chamber and fuel inlet means supplying a fuel to said chamber under pressure to form a combustible mixture,

c. a sheet of metal having microperforations covering substantially its entire area disposed in said chamber in an interference path with the flow of said combustible mixture, and

d. outlet means permitting said combustible mixture to pass out of said chamber.

2. In a carburetor according to claim **1** wherein said microperforations include holes having concave walls.

3. In a carburetor according to claim **1** wherein said sheet of metal is taken from the group consisting of stainless steel, titanium, aluminum, chromium, nickel, cobalt, and alloys thereof.

4. In a carburetor according to claim **1** wherein said sheet is heated.

5. In a carburetor according to claim **1** wherein said sheet is a cone, the apex of which is directed toward said outlet means.

6. In a carburetor according to claim **1** wherein said fuel inlet means includes conduit means extending into said cone.

7. In a carburetor according to claim **3** wherein said sheet is stainless steel and said microperforations are of a size and number in the order of 10 to 40 microns.

8. In a carburetor according to claim **7** wherein said stainless steel sheet has a thickness of from about 0.0005 to about 0.005 inch.

9. A carburetor comprising:

a. a spherical shell providing a chamber,

b. a gas inlet port in said shell,

c. an outlet port in said shell in substantial axial alignment with said inlet port,

d. a plurality of struts carried by said shell and extending into said chamber,

e. a conical sheet carried by said struts between said gas inlet port and said outlet port and having its apex directed toward said outlet port, said sheet including microperforations covering substantially its entire area,

f. fuel inlet means supplying fuel to said chamber under pressure, said fuel inlet means including conduit means extending into said conical sheet and pointing toward said apex, and

g. means electrically coupled to said conical sheet supplying electrical current to said sheet at a predetermined magnitude.

10. A method of aiding fuel atomization comprising:

a. providing a carburetor having fuel-gas inlets and an outlet substantially aligned therewith,

b. providing a sheet of metal between said inlets and outlet and having microporous perforations covering substantially its entire area,

c. supplying a gas through said gas inlet, and a fuel under pressure through said fuel inlet to form a combustible mixture, and

d. passing at least a portion of said combustible mixture through said metal sheet and out said outlet.

11. A method according to claim **10** wherein said metal taken from the group consisting essentially of stainless steel, titanium, aluminum, chromium, nickel, cobalt and alloys thereof.

12. A method according to claim **10** wherein said metal is stainless steel and said microperforations are of a size and number in the order of 10 to 40 microns.

13. A method according to claim **12** wherein said stainless steel sheet has a thickness of from about 0.0005 to about 0.005 inch.

14. In combination, an engine and a carburetor means supplying fuel to said engine, said carburetor means including a sheet of metal having microperforations covering substantially its entire area disposed between the gas-fuel inlets and the outlet of said carburetor, and means connecting said carburetor outlet to the combustion chamber of said engine.

15. The combination according to claim **14** wherein said engine includes a cylinder providing said combustion chamber, piston means carried by said cylinder, ignition means communicating with said combustion chamber, and exhaust outlet means communicating with said combustion chamber.

16. The combination according to claim **14** wherein said engine includes a substantially spherical combustion chamber, rotatable piston means carried by said combustion chamber, ignition means communicating with said combustion chamber, and exhaust outlet means communicating with said combustion chamber.

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