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Freismuth

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[54] **CARBURETOR CHOKE ALTITUDE COMPENSATION**

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[52] **U.S. Cl.** ..... **261/39 A**, 261/63, 261/46, 48/180 A, 123/119 F, 123/124 A

[51] **Int. Cl.** **F02m 1/10**

[58] **Field of Search** ..... 48/144, 160, 180 A, 180 C, 48/180 R, 180 M, 180 P; 261/63, 39 A, DIG. 1, DIG. 2, 46; 123/124 R, 124 A, 119 D, 119 F, 120

[56] **References Cited**

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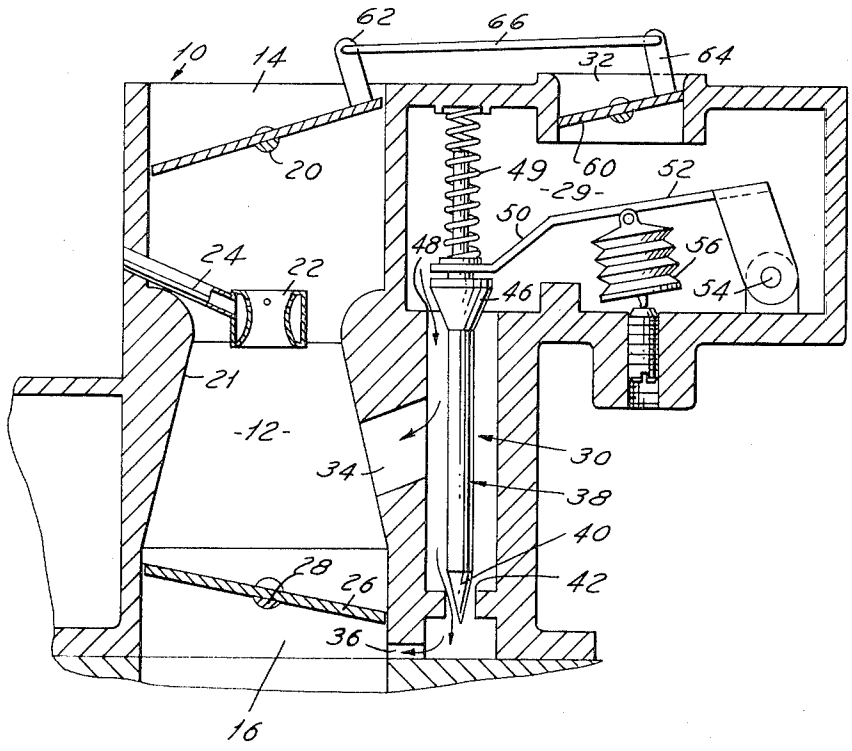
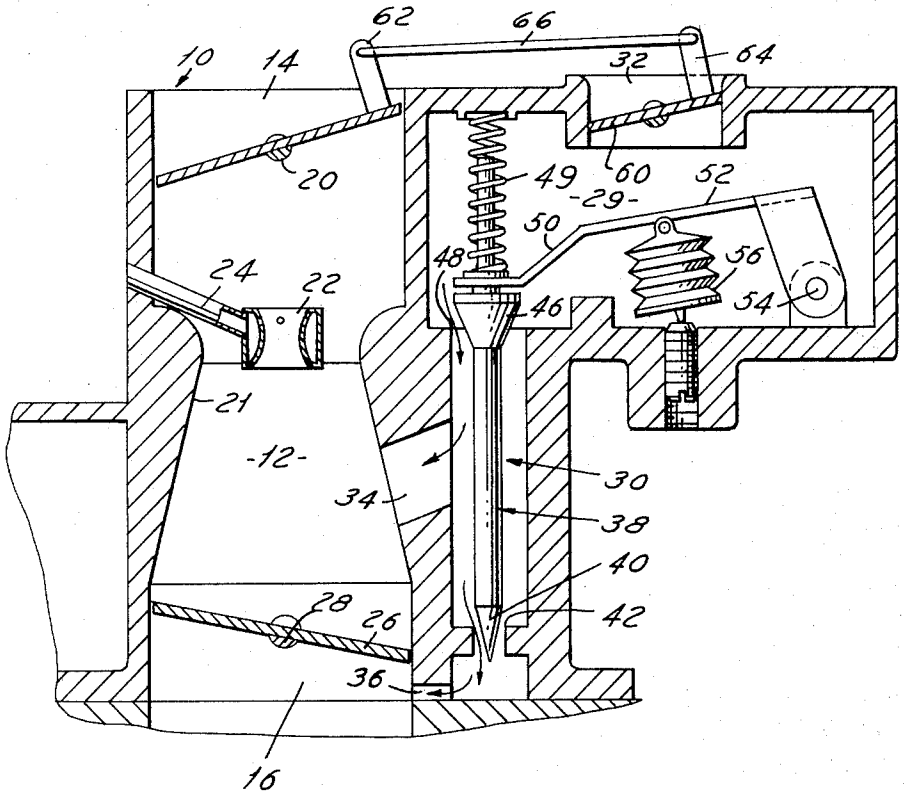
[57] **ABSTRACT**

A carburetor has an air passage in a parallel arrangement with the induction passage for supplying supplemental air around the venturi to the air/fuel mixture in response to changes in ambient operating conditions, the air bypass passage being controlled by a first valve sensitive to changes in ambient conditions, the passage including an additional valve connected to the choke valve for restricting additional airflow in proportion to closing of the carburetor choke valve to provide a desired rich starting and running mixture varying with changes in ambient operating conditions.

8 Claims, 1 Drawing Figure

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CARBURETOR CHOKE ALTITUDE COMPENSATION

This invention relates, in general, to a carburetor for an internal combustion engine. More particularly, it relates to one that compensates for changes in density of the air due to changes in altitude and/or temperature.

Most production type carburetors in use today have no means for correcting the carburetor airflow requirements to compensate for changes in air density as a result of changes in altitude or temperature. As a result, increases in altitude cause a richening of the mixture and consequently off-design operation. This is especially noticeable during cold starting operation when the conventional choke valve is essentially closed. More specifically, as altitude increases, the lower density of the air coupled with the lower volume of air as a result of closing of the choke valve will result in a richer than normal starting running mixture.

Carburetor constructions are known in which air bypass passages are provided to vary the supply of air when ambient operating conditions change. For example, Stoltman U.S. Pat. No. 3,011,770, Altitude Compensated Carburetor, shows such an air bypass passage controlled by a bellows to provide additional air as required by the changing ambient operating conditions. The air bypass passage in this case has an inlet connected to the induction passage between the choke valve and the venturi and an outlet connected to portions both above and below the conventional throttle valve. The outlet connection as described by Stoltman permits correction for changing ambient operating conditions during engine idle speed operation as well as during other periods. As the altitude increases, the lowering density of the air is offset by the increase of air through the bypass passage.

While the Stoltman device shows compensating means for correcting for changes in air density, it does not provide additional air for leaning out the starting mixture when the choke valve is closed during cold weather operation. That is, when the choke valve of the Stoltman device is closed, the additional air bypass passage also is effectively blocked off, and, accordingly, the starting mixture will be richer than desired, in the manner stated above.

The invention eliminates the above objection by providing a construction in which an additional air supply not only is maintained but also controlled during the choking operation as well as at other times so that the air/fuel mixture is compensated during all engine operations for changes in air density or temperature.

It is a primary object of the invention, therefore, to provide a carburetor construction that is sensitive to changes in ambient operating conditions to compensate for changes in air density to provide essentially a constant calibrated fuel/air ratio for any given speed/load condition of the engine.

It is another object of the invention to provide a carburetor with an air bypass passage flowing air around the carburetor venturi, the passage being controlled by first valve means that is responsive to ambient temperature and pressure changes to compensate for changes in air density, and an additional control valve connected to the choke valve to decrease the additional supply of air to the air passage in proportion to the closing of the induction passage when the choke valve is moved towards an engine starting position, to maintain the desired rich starting mixture.

Other objects, features and advantages of the invention will become more apparent upon reference to the succeeding detailed description thereof, and to the drawing illustrating the preferred embodiment thereof; wherein, the single FIGURE is a schematic cross-sectional view of a portion of a carburetor embodying the invention.

The FIGURE shows a portion **10** of a downdraft type carburetor. It includes the usual air induction passage **12** having one end **14** open to air at essentially atmospheric pressure. The opposite end **16** is adapted to be connected to the intake manifold of an internal combustion engine, not shown, so as to subject the induction passage to the changes in engine vacuum level.

The passage **12** includes the usual choke valve mounted on a shaft **20** rotatably mounted in the walls of the air horn section of the carburetor. The choke valve is variably rotatable by the usual mechanism, not shown, from the closed position shown to a nearly vertical position permitting unrestricted flow of air through the induction passage.

Passage **12** also includes a conventional main venturi **21** and a booster venturi **22.** Fuel is inducted, in a known manner, through a tube **24** into booster venturi **22,** where it is mixed with the air from inlet **14** for flow past a throttle valve **26.** The latter is mounted on a shaft **28** rotatably mounted in the walls of the carburetor body.

Further details of construction and operation of the carburetor per se are not given since they are known and are believed to be unnecessary for an understanding of the invention. Suffice it to say that during normal cold start operations, the choke valve **18** is in the essentially closed position shown restricting airflow through the carburetor. The strong vacuum signal from the engine pistons causes a supply of fuel to be drawn from the idle system, not shown, and mixed with the small amount of air available so that the starting mixture is rich. As soon as the engine is started, the conventional dechoking mechanism will crack open the choke valve **18** by a slight amount sufficient to permit continued operation of the engine at a leaner air/fuel ratio.

In this instance, the carburetor body is formed with an air bypass chamber **29** communicating with a bypass passage **30.** An air inlet **32** communicates air at ambient or essentially atmospheric pressure level to chamber **29.** One discharge **34** of air passage **30** is located below venturi **22** so as not to cause a metering of fuel through venturi **22** by the air. Passage **30** has an additional discharge outlet **36** located below the closed position of throttle valve **26** to provide additional air during closed throttle, engine idle speed operation.

Airflow through passage **30** is controlled in this instance by a valve means **38** that is movable in response to ambient operating changes. More specifically, the valve means consists of a lower needle valve portion **40** adapted to cooperate with a valve seat **42** formed in a portion of passage **30.** It further includes a conical valve **46** that is biased against a seat **48** by a spring **49** to variably block or open the flow of air to outlets **34** and **36.** Conical valve portion **46** has a finger actuator **50** engaging a stem extension of the valve, the actuator being formed on one end of a lever **52.** The latter is hinged at **54** and movably engaged by an aneroid or bellows **56.**

The bellows **56** defines a sealed interior chamber under atmospheric or some chosen reference pressure and temperature. A change in the ambient pressure and temperature conditions causes the bellows or aneroid **56** to exert a force upon the connecting lever **52** to move the valve **38** upwardly or downwardly, as the case may be, to thereby vary the airflow through bypass passage **30.**

Completing the construction, the inlet **32** to chamber **29** is controlled by a secondary choking valve **60** rotatably mounted in the carburetor body. Upstanding ears **62** and **64** project from each of the choke valves **18** and **60,** and are pivotally interconnected by a link **66** for joint rotation.

In operation, when the ambient operating conditions are the same as the reference used for the interior of bellows **56,** then the parts will be positioned with the additional air passage **30** closed. The carburetor then will operate in a conventional manner with no additional air being added to the air/fuel mixture inducted into the intake manifold portion **16.** As the ambient temperature increases, or if the altitude rises, the density of the air taken into the carburetor will also change. However, since the induction of fuel and air through the carburetor is on a volume basis rather than by weight, there normally would be a change in the air/fuel ratio with a resultant richening of the mixture. However, with the construction as shown, a rise in temperature level or increase in altitude will cause the bellows **56** to raise the valve **38** against the bias of spring **49** to open the air passage **30** for passage of additional air to induction passage **12.** The additional air will compensate for the loss in density to provide a substantially constant air/fuel ratio for the particular engine speed and load.

During idle speed operation, throttle valve **26** will be essentially closed. Accordingly, compensation for changes in density at this time will be made by the addition of air through the outlet **36** instead of **34.**

During choking operation, both the choke valves **18** and **60** will be moved towards an essentially closed position shown. The closed position of choke valve **60** controlling the volume of airflow through inlet **32** will of course be such in proportion to ambient operating conditions that enough additonal air will flow through passage **30** during choking operation when ambient conditions so warrent that the starting and running choking operations will not be overrich or richer than conventional choking operation; yet, the control will be such as to not permit an unlimited supply of air to valve **46,** which could make the starting mixture too lean.

While the invention has been described and shown in its preferred embodiments, it will be clear to those skilled in the arts to which it pertains that many changes and modifications may be made thereto without departing from the scope of the invention.

I claim:

1. A carburetor having an induction passage connected to air at one end and to an engine intake manifold at the opposite end and having a venturi connected to a source of fuel for the induction thereof into the passage in response to airflow therepast, a choke valve mounted anterior of the venturi and rotatable at times to control airflow therepast, means defining a separate air passage in a parallel airflow relationship to the induction passage bypassing the venturi for supplying additional air to the induction passage at a location below the venturi, ambient pressure and temperature responsive means for controlling the overall air/fuel ratio in the intake manifold by controlling airflow through the air passage to compensate for changes in air density of the air in the induction passage with changes in altitude and temperature, and control means coupled to the choke valve to maintain a controlled supply of air to the air passage when the choke valve is rotated to a choking position.

2. A carburetor as in claim **1,** the control means comprising a second valve controlling the airflow to the air passage.

3. A carburetor as in claim **1,** the pressure and temperature responsive means including a further valve movable with respect to the air passage in response to ambient operating conditions to control the airflow therethrough.

4. A carburetor as in claim **3,** the control means comprising a second valve controlling the inlet of air to the further valve.

5. A carburetor as in claim **2,** including linkage means movably connecting the choke and second valves to variably control the flow through both passages.

6. A carburetor as in claim **1,** the ambient pressure and temperature responsive means comprising a bellows connected to valve means controlling the flow of air through the air passage and spring biased to close the air passage.

7. A carburetor having an induction passage connected to air at one end and to an engine intake manifold at the opposite end and having a venturi inbetween connected to a source of fuel for the induction of fuel into the passage in response to airflow therepast, a choke valve mounted anterior of the venturi and rotatable at times to control airflow through the passage, means defining an air passage separate from the induction passage for supplying air thereto around the venturi, the air passage having an air inlet in parallel with the induction passage air inlet and connected at its other end to the induction passage below the venturi, valve means movable in response to ambient pressure and temperature changes for controlling airflow through the air passage to compensate for changes in air density of the air in the induction passage with changes in altitude and temperature, and additional valve means in the air passage air inlet pivotally connected to the choke valve for concurrent operation for controlling the supply of air to the air passage when the choke valve is rotated to a choking position essentially closing the induction passage air inlet and decreasing the additional air passage airflow in proportion to the choking of the air in the induction passage.

8. A carburetor as in claim **7,** the ambient pressure and temperature responsive means comprising a bellows.

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