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Littlehales

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[54] **FUEL INJECTION SYSTEMS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ...**261/69 R,** 123/139 AM, 123/139 BG, 123/140 MP

[51] **Int. Cl.**.....**F02m 3/00**

[58] **Field of Search**..123/139 AM, 139 BG, 140 MP, 123/140 I; 261/51, 69 R

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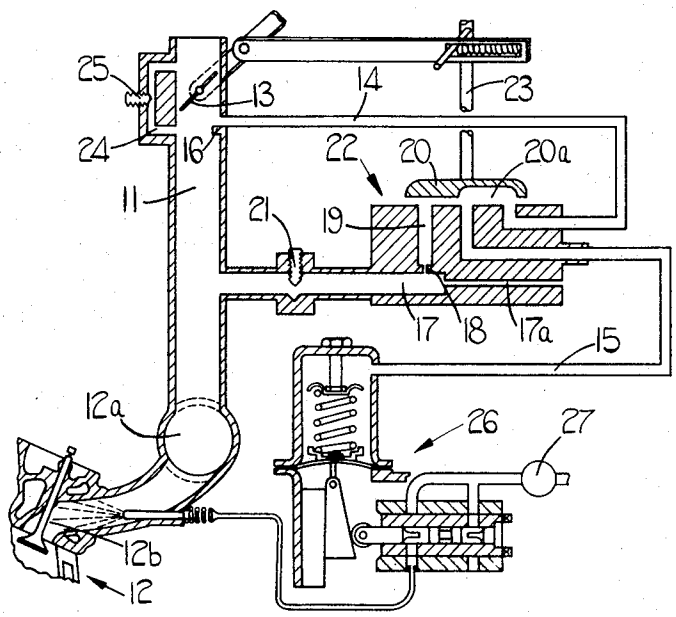
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[57] **ABSTRACT**

A fuel injection system for an engine has a metering unit controlled by one of a pair of pressure signals, the signals being selected by a valve arrangement so that when the engine throttle is shut, the signal applied to the metering unit has a predetermined value.

8 Claims, 3 Drawing Figures



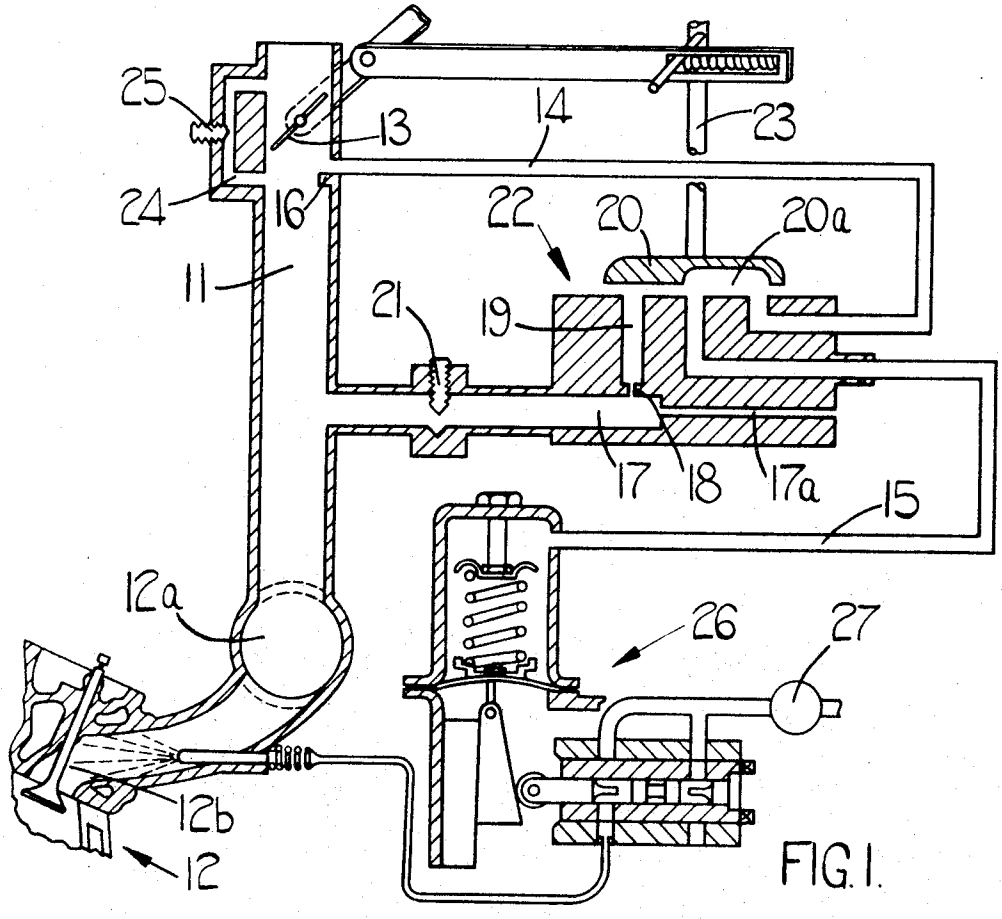


FIG. 1.

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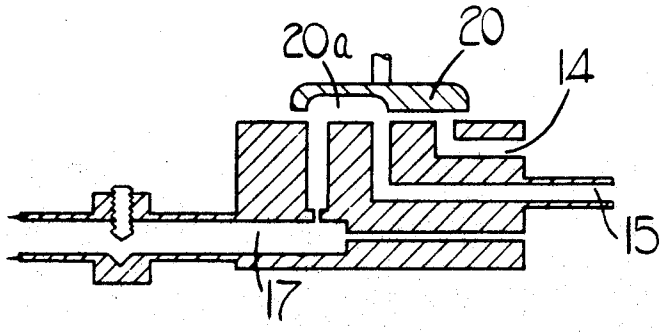


FIG. 2.

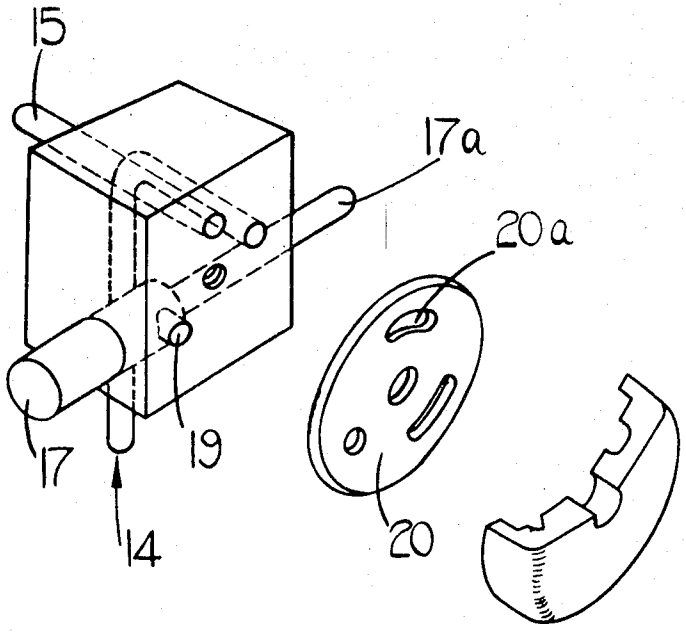


FIG. 3.

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FUEL INJECTION SYSTEMS

This invention relates to fuel injection systems for internal combustion engines.

A system according to the invention includes a control unit for metering the fuel supplied to the engine, means for applying a pressure signal derived from an air inlet passage of the engine to the control unit to control operation of the unit, and further means operable when a throttle valve associated with said inlet passage is closed for applying a predetermined control signal to the control unit.

On example of a fuel injection system according to the invention will now be described with reference to the accompanying drawings in which:

FIG. 1 shows a fuel injection system diagrammatically;

FIG. 2 shows a valve in FIG. 1 in an alternative position, and

FIG. 3 is an exploded view of the valve in FIGS. 1 and 2.

An air inlet passage 11 communicates at one end with the cylinders of a petrol engine 12, via a manifold 12*a* and the valve gear 12*b* of the engine. At its end remote from the engine 12 the passage 11 is open to atmosphere, and between its ends the inlet passage 11 contains a manually operable throttle valve 13. Communicating with the passage 11 downstream of the valve 13 is a passage 14 which communicates with a fuel control unit 26 through a valve arrangement 22 and a conduit 15. The fuel control unit 26 is operable to meter the fuel supplied to the cylinders of the engine by a pump 27, and is itself controlled by a pressure signal derived from the passage 1. Within the passage 11, adjacent, but downstream of the point at which the passage 14 communicates with the passage 11 is an abutment 16. The pressure signal applied to the control unit 26 via the passage 14, conduit 15 and valve arrangement 22 is equal to the static pressure in the passage 11 plus a pressure component which results from impingement on abutment 16 of an airflow in passage 11. This component is therefore dependent upon the rate of flow of air through the passage 11.

The valve 22 includes a passage 17 which communicates at its respective ends with atmosphere and, via a variable flow restrictor 21, with the passage 11 downstream of the abutment 16. Passage 17 includes a restricted portion 17*a* whose junction with the remainder of passage 17 is formed as a sharp step. A passage 19 communicates with the passage 17 via a flow restrictor 18. A disc closure member 20 is formed with a recess 20*a* and is rotatable by a spindle 23 between a pair of limiting positions so as to allow conduit 15 to communicate either with passage 19 or with passage 14, an alternative position of the closure member 20 being shown in FIG. 2. The arrangement of valve 22 is such that, when valve 13 is closed, passage 14 is isolated from the control unit 26 and passage 15 and 19 are in communication, as shown in FIG. 2. A small opening of the throttle valve 13 is sufficient to move the closure member 20 to the position shown in FIG. 1. Though the valve 22 is shown diagrammatically as requiring a 180° rotation of the closure member 20, in practice the arrangement is, as shown in FIG. 3, such that only a relatively small angular rotation is required, and can be effected by a simple linkage of a known type.

In use, when valve 13 is open, a signal is applied to the control unit 26 via passage 14, control unit 26 supplying a required amount of fuel to the engine 12. When valve 13 is shut, during overrun or idling conditions of the engine, the signal in passage 14 consists solely of the static pressure in the inlet passage 11, and would cause the control unit 26 to supply the engine 12 with more fuel than that required in these conditions. Operation of valve 22, however, isolates passage 14 from unit 26 and at the same time subjects unit 26 to the pressure in passage 17. The portion 17*a* of passage 17 and the variable restrictor 21 combine to form an air potentiometer. When the airflow in passage 17 is below a predetermined level, the pressure in passage 19 has a value between atmosphere and the pressure in passage 11. When the airflow in passage 17 exceeds this predetermined level there is created, immediately downstream of the step in passage 17, a low pressure which is below that in passage 11 and which is sensed in passage 19. The pressure in passage 19 may thus be above or below that in passage 11 and restrictor 21 is ajdusted to provide a signal whereby control unit 26 supplies an amount of fuel appropriate to a closed-throttle condition.

Air flow through passage 17 is insufficient to significantly affect the air/fuel mixture supplied to the engine, and is, moreover, insufficient for the engine idling condition. Valve 13 therefore has a bypass passage 24 which includes a variable restrictor 25. Restrictor 25 is adjusted to provide a suitable air/fuel mixture for idling.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A fuel injection system for an internal combustion engine, including an air inlet passage for the engine, a throttle valve within the said passage, a control unit for metering the fuel supplied to the engine, means for applying a first pressure signal derived from the said inlet passage downstream of the throttle valve to the control unit to control the operation of the unit and a valve arrangement including a member operable by closing of the throttle valve to isolate said first pressure signal from the control unit and also operable when the throttle valve is closed to apply a predetermined second pressure signal to the control unit.

2. A system as claimed in claim 1 which includes an airpressure potentiometer arrangement comprising a pair of flow restrictors in series in a further passage between the inlet passage and atmosphere.

3. A system as claimed in claim 2 in which the potentiometer arrangement is connected to the inlet passage at a position downstream of the location where said first pressure signal is sensed.

4. A system as claimed in claim 2 in which the dimensions of the said restrictors are such that air flow therethrough does not significantly affect the air/fuel ration supplied, in use, to the engine.

5. A system as claimed in claim 4 which includes a bypass passage for the throttle valve and a flow restrictor in the bypass passage.

6. A system as claimed in claim 2 in which one of said restrictors is variable.

7. A system as claimed in claim 6 in which the other of said restrictors is defined by a reduced bore in said further passage, a step being defined between said reduced bore and the remainder of said further passage.

8. A system as claimed in claim 7 in which said valve communicates with said further passage at a location therein immediately downstream of said step.

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