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R. K. SMITH

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FUEL EMISSION CONTROL SYSTEM

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FIG. 1

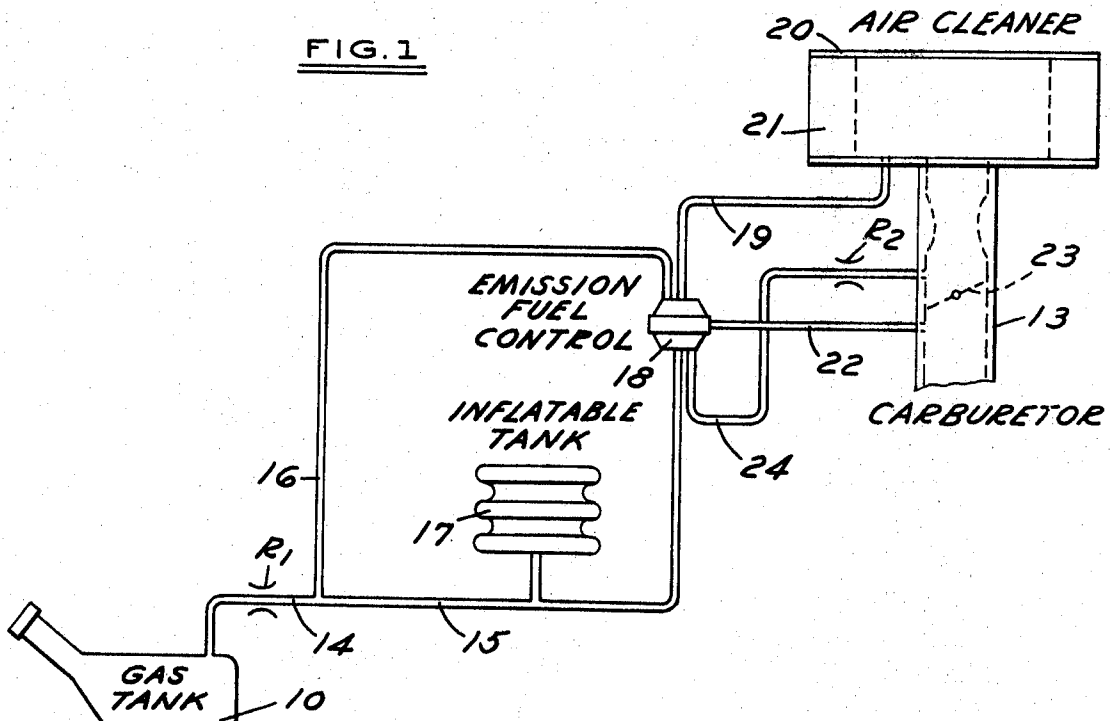
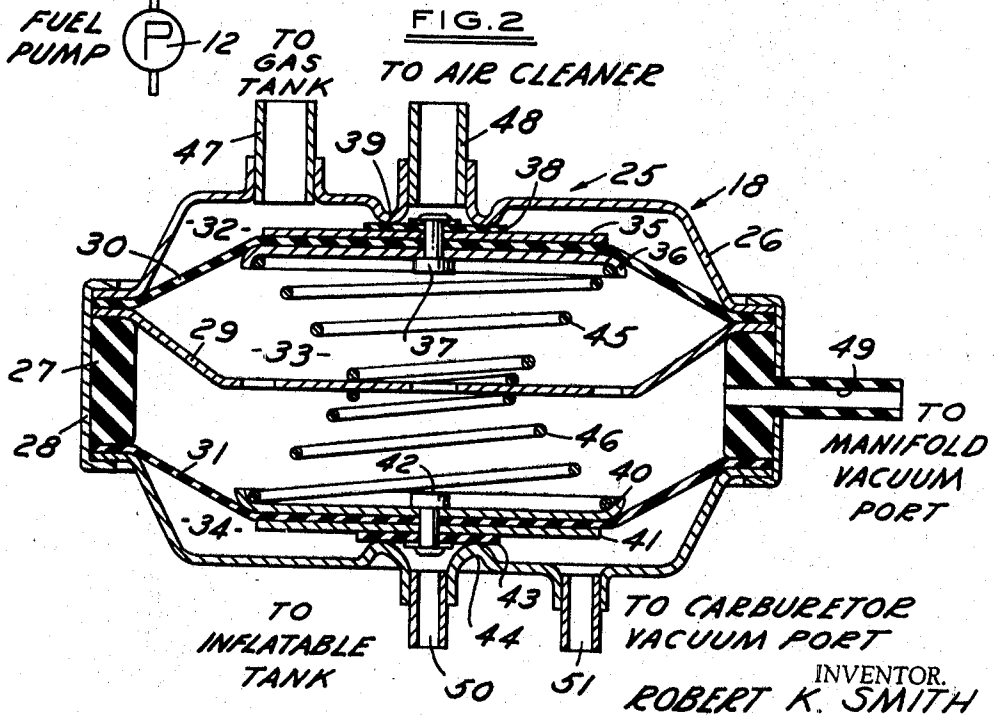


FIG. 2



INVENTOR.
ROBERT K. SMITH

BY

Barnes, Kisselle, Raich & Choate

ATTORNEYS

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FUEL EMISSION CONTROL SYSTEM

Robert K. Smith, Birmingham, Mich., assignor to F & E Manufacturing Company, Flint, Mich., a corporation of Michigan

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10 Claims

ABSTRACT OF THE DISCLOSURE

A fuel emission control system comprising a gas tank and interconnecting lines with an inflatable tank and a pressure responsive valve which is operable to vent the excess pressure in the fuel tank and the inflatable tank to the atmosphere through emission absorptive material.

This invention relates to fuel emission control system.

One of the problems with automotive fuel systems is the evaporative emission of fuel to the atmosphere. This may occur due to vapors from the fuel tank, which vapors may be emitted when the engine is excessively warm during operation or when the engine is turned off and the heat rises to cause the vapors to be formed. Further vapor may be formed due to temperature changes.

Among the objects of the invention are to provide a fuel emission control system which will effectively prevent excess pressures in the system; which will absorb the vapors emitted; which will return the vapors to the carburetor when the engine is operated; and which employs a novel valve.

In the drawings:

FIG. 1 is a partly diagrammatic view of a fuel emission control system embodying the invention.

FIG. 2 is a sectional view through the valve embodied in the system shown in FIG. 1.

Referring to FIG. 1, the fuel emission control system comprises a sealed gas tank 10 which supplies fuel through a line 11 to a fuel pump 12 and in turn to the carburetor 13. A line 14 extends from the gas tank overlying the fuel through a restrictor R_1 and thereafter is bifurcated into a first line 15 and a second line 16. Line 15 has an inflatable tank 17 connected thereto and extends to a valve 18. Line 16 also extends to the valve 18. A line 19 extends from the valve to an air cleaner 20 which has absorptive material 21 such as charcoal therein. A fourth line 22 extends from the valve 18 to a point downstream from the throttle 23 of the carburetor 13. A fifth line 24 having a restrictor R_2 therein is connected to a point upstream of the throttle valve 23.

As shown in FIG. 2, the valve 18 comprises a housing 25 consisting of the two halves 26, an intermediate plastic ring 27 and a clamping ring 28. An intermediate perforated spring support wall 29 and a flexible diaphragm 30 are interposed between the ring 27 and the housing half 26. A diaphragm 31 is interposed between the ring 27 and the turned-over flange of clamping ring 28.

The diaphragms 30, 31 divide the housing into a first outer chamber 32, a second intermediate chamber 33 and an outer third chamber 34. Diaphragm 30 supports a pair of washers 35, 36 held thereon by a rivet 37 and supporting a resilient annular valve 38 that seats against an annular inwardly deformed portion 39 of the housing. Diaphragm 31 similarly supports washers 40, 41 by a rivet 42 to support an annular resilient valve 43 which seats against an annular seat 44. Springs 45, 46 are interposed between the wall 29 and their respective diaphragms to yieldingly urge the diaphragms outwardly and in turn the valves 38, 43 in the contact with their respective seats.

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First chamber 32 includes an outlet 47 that is connected to line 16 and an outlet 48 within seat 39 that is connected to line 19. The ring 27 includes a radial outlet 49 that is connected to line 22. Chamber 34 includes an outlet 50 within seat 39 that is connected to line 15 and an outlet 51 that is connected to line 24.

In operation, when the engine is running, manifold vacuum through line 22 enters chamber 33 and the chamber 34 through line 24. The action of the vacuum in the chamber 33 moves the diaphragms 30, 31 inwardly against the action of the springs 45, 46 and thereby moves the valve members 38, 43 away from their respective valve seat.

The operation of the engine will draw any fuel vapors from the inflatable tank through line 15 and chamber 34 and line 22 into the carburetor. Any excess fuel vapors in the gas tank will also be withdrawn if a positive pressure exists in the gas tank. If there is no excess pressure in the line 15, air will flow through the air cleaner, lines 19, 16 and back through line 15 to the carburetor. In case a negative pressure exists in the gas tank, air will flow through the air cleaner and lines 19, 16 to the gas tank.

When the engine is shut off, the manifold vacuum will decrease through line 22 and the diaphragms will return under the action springs 45, 46 to bring their valve members against the valve seat sealing the fuel system.

When the engine is off, any vapors evaporated from the fuel in the gas tank will fill the inflatable tank 17. This will continue until a predetermined pressure is achieved at which time the pressure acting against the diaphragm 30 will open the valve 38 venting the vapors to the air cleaner 20. The vapors will become entrapped in the absorptive material 21 and therefore not pass through the atmosphere. When the pressure is dissipated below a predetermined value, the valve 30 will return to its original position.

When the engine is again started, the flow of air through the air cleaner will cause the condensed gas in the absorptive material 21 to pass through the carburetor.

Restrictor R_1 limits the degree of vacuum applied directly to tank 10 and restrictor R_2 restricts the flow of vapors into the carburetor.

I claim:

1. In a fuel emission control system for use with an engine having a carburetor, the combination comprising a gas tank, an inflatable tank, a first line extending from the gas tank to said inflatable tank, a second line extending from the gas tank, a valve having pressure displacement valve means therein, said first and second lines being connected to said valve means, a third line extending from said pressure displacement valve means to the atmosphere, a fourth line extending from said valve means to a vacuum port in advance of the throttle valve of the carburetor, and a fifth line extending from said valve means to a point downstream of the throttle valve of the carburetor, said valve means being responsive to the manifold vacuum through said fifth line to permit venting of the first line including the inflatable tank to the carburetor, said valve means being responsive to manifold vacuum through said fifth line to vent the second line to the carburetor,

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said valve means being responsive to the pressure in the first line to vent said first line to the atmosphere through said second and third lines.

2. The combination set forth in claim 1 including absorptive material through which any flow must pass to the atmosphere.

3. The combination set forth in claim 1 wherein said valve means comprises a housing,

a pair of fluid responsive pressure sensitive elements in said housing,

said elements dividing said housing into two outer chambers and an intermediate chamber,

said first and fourth lines being connected to said one outer chamber,

said second and third lines being connected to said other outer chamber, and

said fifth line being connected to said intermediate chamber.

4. The combination set forth in claim 3 wherein said first pressure sensitive element includes valve means for interrupting communication between its chamber and said first line,

said second pressure responsive element including valve means for interrupting communication between said chamber and said fourth line.

5. The combination set forth in claim 1 including a restrictor in said first line between said gas tank and said inflatable tank.

6. The combination set forth in claim 1 including a restrictor in said fifth line.

7. In a fuel emission control system for use with an engine having a carburetor, the combination comprising an inflatable tank,

a gas tank,

a first line extending from the gas tank to said inflatable tank,

a second line extending from the gas tank,

said first and second lines being connected to a valve having pressure displacement valve means therein,

a third line extending to the atmosphere,

a fourth line extending to a vacuum port in advance of the throttle valve of the carburetor,

and a fifth line extending to a point downstream of the throttle valve of the carburetor,

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valve means comprising a housing,

a pair of fluid responsive diaphragms in said housing, said diaphragms dividing said housing into two outer and an intermediate chamber,

spring means yieldingly urging said diaphragms outwardly,

said first and fourth lines being connected to said one chamber,

said second and third lines being connected to said other chamber,

an a fifth line extending to a point downstream of chamber,

said first diaphragm including valve means for interrupting communication between its chamber and said first line,

said second diaphragm including valve means for interrupting communication between said chamber and said third line.

8. The combination set forth in claim 7 including absorptive material through which the flow from the third line must pass in passing through the atmosphere.

9. The combination set forth in claim 8 including a restrictor in said line extending from said gas tank to said inflatable tank.

10. The combination set forth in claim 8 including a restrictor in said fifth line extending from said valve means to said point down the stream of said throttle valve of the carburetor.

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LAURENCE M. GOODRIDGE, Primary Examiner

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137—595; 251—61.1