United States Patent

[11] 3,565,109

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[21] Appl. No. 871,032
[22] Filed Sept. 11, 1969
Division of Ser. No. 721,430, Apr. 15, 1968.
[45] Patented Feb. 23, 1971

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[54] **FUEL EMISSION CONTROL SYSTEM**
3 Claims, 2 Drawing Figs.

[52] U.S. Cl. 137/595, 251/61.2
[51] Int. Cl. F02m 59/00
[50] Field of Search 251/61.0-61.5; 137/595; 123/119, 136

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ABSTRACT: 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.

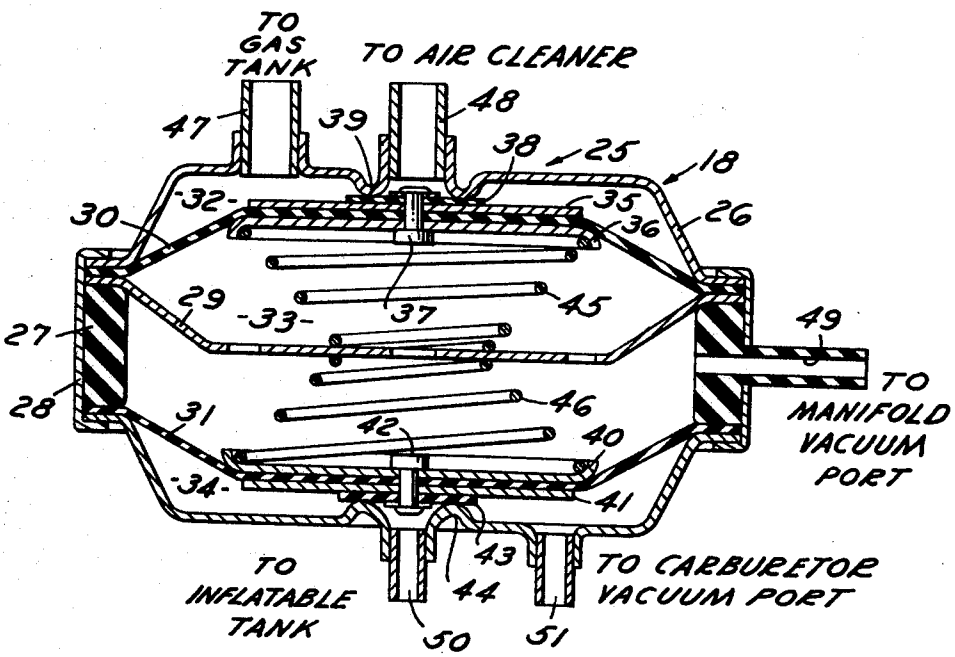


FIG. 1

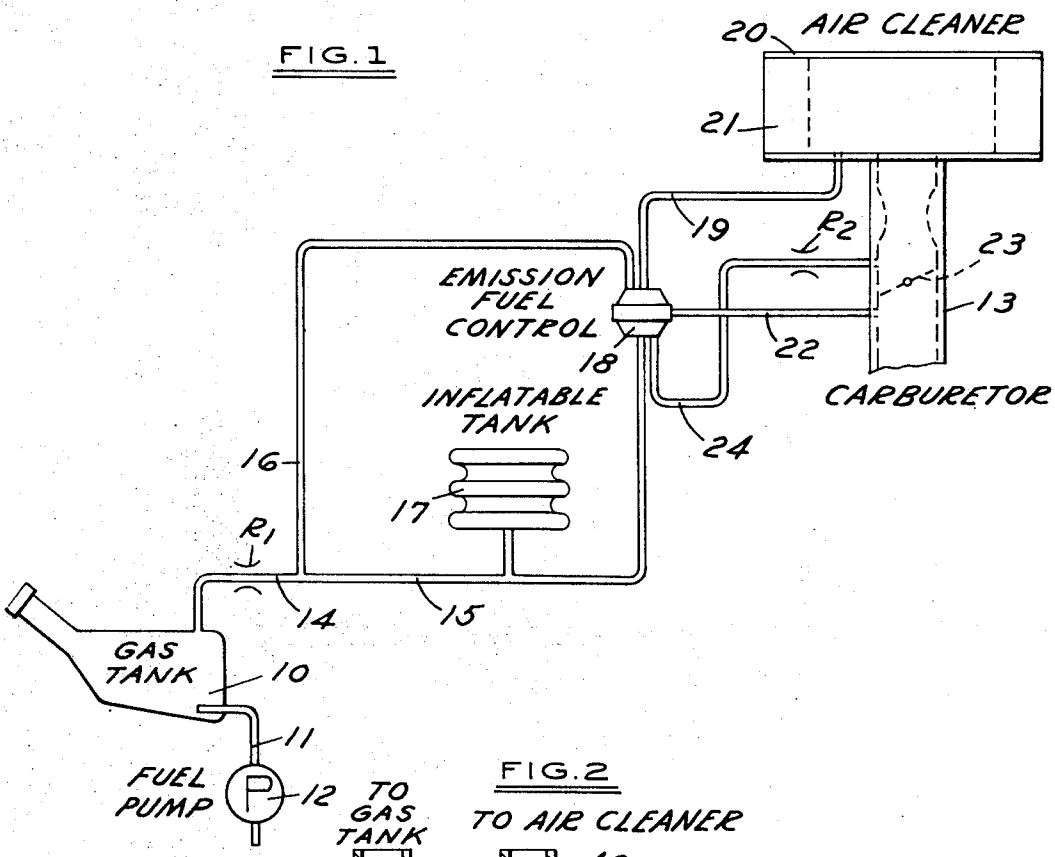
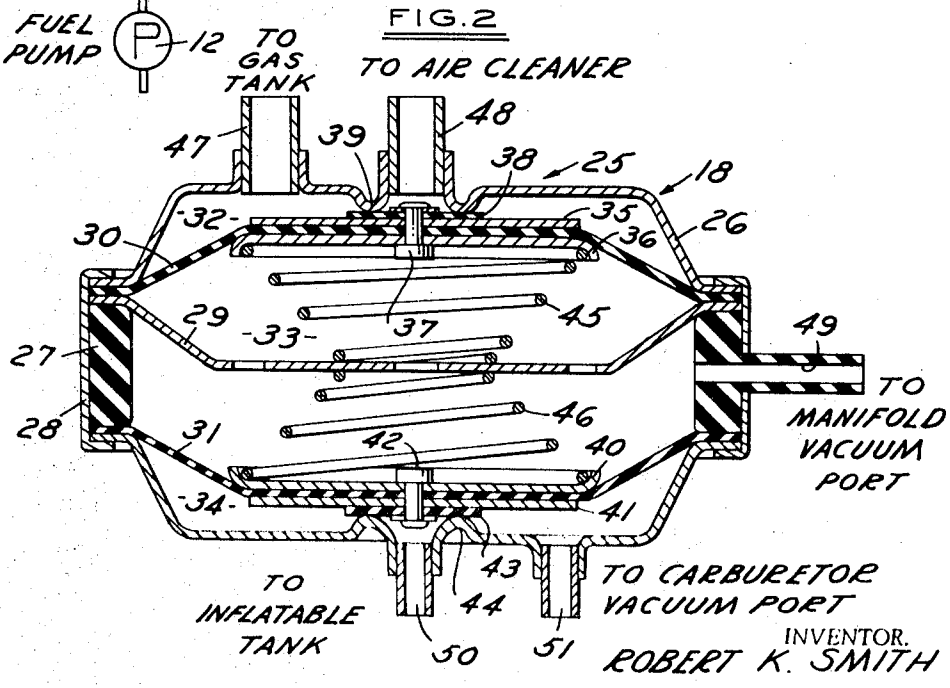


FIG. 2



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FUEL EMISSION CONTROL SYSTEM

This application is a division of application Ser. No. 721,430, filed Apr. 15, 1968.

This invention relates to fuel emission control systems.

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 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.

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 seats.

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. For use in a fuel emission control system or the like;
a valve comprising a valve housing;
a pair of fluid-responsive diaphragms in said housing dividing said housing into an intermediate and two outer chambers;
spring means yieldingly urging said diaphragms outwardly away from one another;
an intermediate wall between said diaphragms;
said wall having passages providing communication between the opposite sides thereof;
said spring means comprising separate spring elements interposed between said wall and the respective diaphragms;
each of said outer chambers having a pair of openings therein;
each said diaphragm having valve means thereon closing one of said openings in each chamber under the action of said spring means; and
said housing having another opening providing communication from the intermediate chamber to the exterior of the housing.

2. The combination set forth in claim 1 wherein said housing comprises a pair of housing members and an intermediate plastic ring having said last-mentioned opening therein, said housing members, intermediate wall, ring and diaphragm being clamped together to form a unitary valve structure.

3. The combination set forth in claim 1 wherein each said diaphragm includes spaced discs on opposite sides thereof;
said valve means each comprising a resilient member mounted on the outermost disc of each said diaphragm; and
said resilient member engaging the periphery of an opening of its respective chamber under the action of said spring means.