United States Patent

Gauck

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[54] **GAS VAPOR DEVICE**

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[52] **U.S. Cl.**.....**123/136,** 123/121
[51] **Int. Cl.**.....**F02m 59/00**
[58] **Field of Search**.....123/119, 120, 121, 136; 220/85 V, 85 VC

[56] **References Cited**

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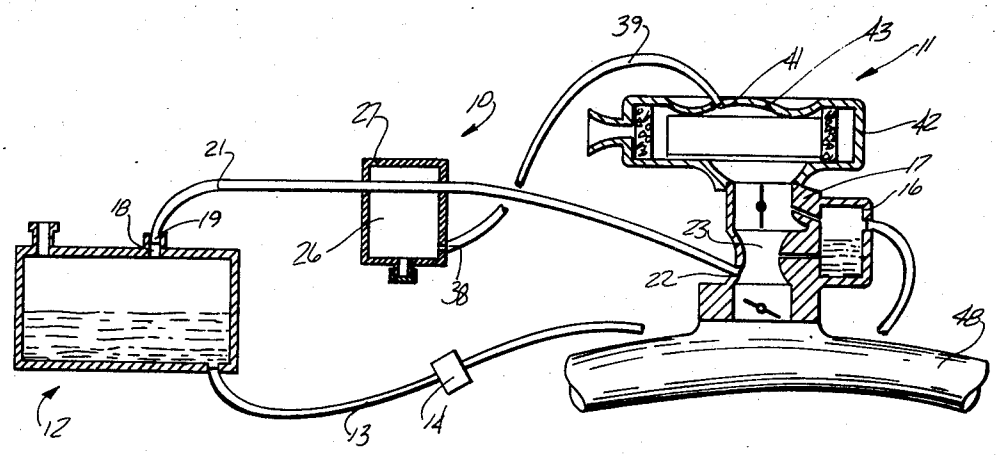
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[57] **ABSTRACT**

A gas vapor device for an internal combustion engine, the device having: a tube fluidly connecting the gas tank vent pipe to the carburetor and having a hole formed therein intermediate its ends; a canister disposed over the hole and sealed at the points where the tube enters and leaves the canister; and a hose fluidly connecting the canister to the air cleaner of the engine; wherein the combination provides for the direct utilization of gas vapors otherwise lost to the air.

3 Claims, 2 Drawing Figures



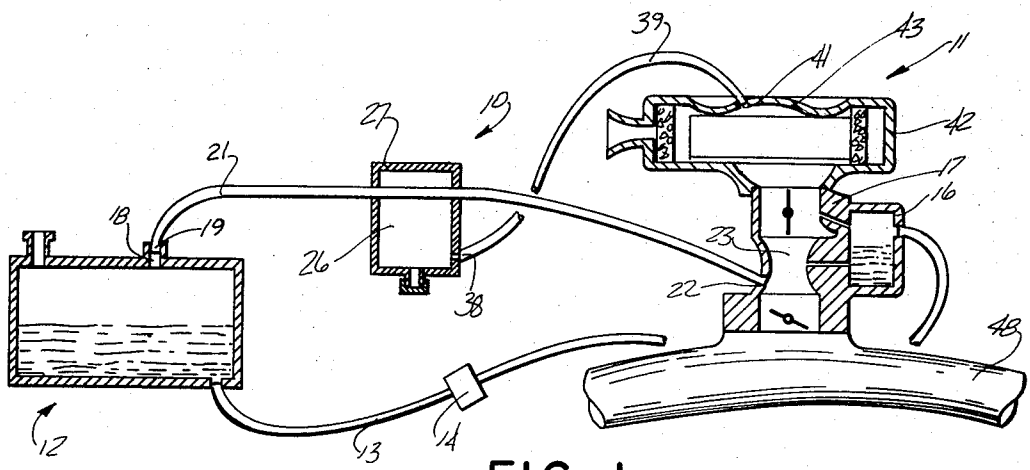


FIG. 1

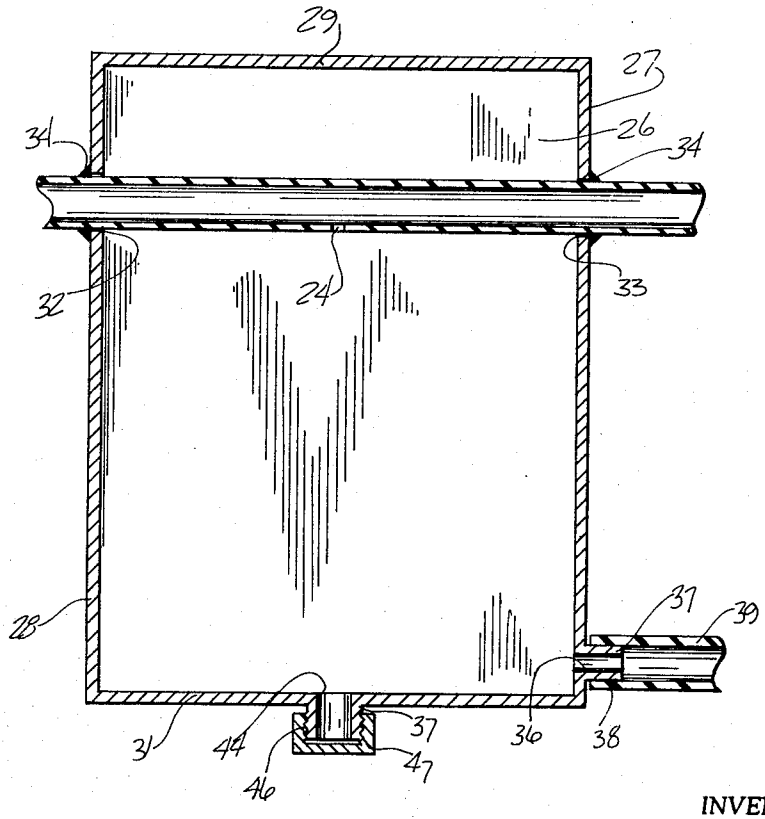


FIG. 2

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GAS VAPOR DEVICE

BACKGROUND OF THE INVENTION

It is well known that air pollution presents health, nuisance, and economic problems, and that the fumes, vapors and gases evolved from internal combustion motor vehicles contribute significantly to air contamination. It is also known that generally these fumes and vapors are emitted into the atmosphere from the motor vehicle as exhaust gases discharged through the tailpipe, or are due to unburned fuel constituents which are emitted through the vent in the fuel storage tank and through vents in the carburetor bowl. For example, it has been estimated that from about 10 to 20 percent by volume of the total vapors from an internal combustion engine are evaporated from the gasoline tank and the carburetor bowl.

The losses from the fuel reservoir tank are caused by factors which include the rising atmospheric temperature of the fuel as the vehicle is operated and rising atmospheric temperatures which cause the fuel tank to breathe through the vent in the fuel tank, thereby emitting unburned fuel constituents into the atmosphere. In many instances, the temperature of the fuel reservoir may be from about 20° to 40° F. higher than the atmospheric or ambient temperature. The vapor pressure of the summer grade of gasoline is roughly 8 pounds per square inch at 100° F., and therefore the amount of evaporation is significant, especially on a hot day. It has been estimated that the loss from a gasoline tank may range from about 2 to 150 grams per day.

The greatest degree of evaporation from the fuel tank occurs during operation of a motor vehicle. In addition to being heated by the atmospheric temperatures, the fuel tank also is heated by radiant heat from the highway surface and to some extent by the heat from the operating engine. Furthermore, the movement of the vehicle over an uneven surface and with its accelerations and decelerations, causes turbulence within the fuel tank, which in turn increases the amount of fuel that is vaporized and hastens the evaporation process.

Early inventions have provided for the venting of the fuel tank vapors to the carburetor or intake manifold of the engine by extremely complicated structures for utilization in the combustion process. However, no method was provided to permit auxiliary air to be added to the system to compensate for the vacuum produced in the line by the operating engine.

Subsequent inventions introduced vapor collecting devices in the form of absorbent canisters. However, the function of these canisters was to contain the escaping gas vapors from the fuel tank and carburetor while the engine was not operating. They served no useful function during operation of the engine, but were then purged of gas vapors collected during the non-operational period.

These inventions were designed to reduce or eliminate all fuel vapor losses from the carburetor and fuel tank primarily during operational periods. Thus, they involved such requirements as valves, timing devices, and air pumps; as well as the absorbent packed canisters and labyrinth of tubes.

SUMMARY OF THE INVENTION

This invention relates generally to a fuel vapor device and more specifically to a device which provides for the utilization of vaporized gas escaping from the air vent of a motor vehicle fuel tank. It concentrates on reducing or eliminating the loss of fuel tank vapors during the period in which it is greatest — during operation of the engine — to increase gasoline mileage to 20 per cent and over. It also produces a richer gas/air mixture in the carburetor by introducing the additional, saved gas vapors, which gives the engine more power and permits the use of a lower octane fuel. Thus, lead-free gasoline can be used in high compression engines.

A tube is secured at one end to the air vent tube of the fuel tank and at the other end to the engine carburetor, thus providing for the direct flow of gas vapor from the fuel tank and for its economical utilization in the combustion process. To prevent the possible collapse of the return tube or fuel tank by the slight vacuum created by the operation of the engine, a hole is formed in the tube intermediate the two ends thereof, thereby providing for the passage of air into the tube. Surrounding the hole, and a portion of the tube on each side of the hole, is a hollow canister through which the tube passes. The canister provides an accumulation zone for the gas vapors during engine non-operational periods and a source of clean air to enter the tube hole. A hose leading from the canister wall to the air cleaner of the engine insures that no unclean air enters the canister and return tube.

It is therefore an object of this invention to provide for the economical use of the gas vapors escaping from the fuel tank of a internal combustion engine.

Another object of this invention is the provision for reduction of air pollution caused by gas vapors escaping from the fuel tank of an internal combustion engine.

A further object of this invention is the provision for fluidly connecting the fuel tank air vent of a motor vehicle to the carburetor of its engine.

Yet another object of this invention is the provision for relieving the vacuum in a tube connecting a fuel tank air vent to the engine carburetor, when the engine is operating.

A further object of this invention is the provision for a supply of dirt-free air to be admitted into a gas vapor device when its associated engine is in operation.

A still further object of this invention is the provision for a gas vapor device that is economical to produce, simple to install, and reliable in use.

These and other features and advantages become more readily apparent upon reference to the following description when taken in conjunction with the appended drawings.

In the drawings as hereinafter described, a preferred embodiment of the invention is included; however, various modifications can be made thereto without departing from the true spirit and scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view of the invention as used in combination with a fuel tank and internal combustion engine.

FIG. 2 is an enlarged sectional side view of the canister portion of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing and particularly to FIG. 1, the gas vapor device is indicated generally by the numeral 10. The device 10 is shown in assembled relation with a conventional internal combustion engine 11 and associated fuel tank 12. A fuel line 13, having a fuel pump 14 interconnected intermediate its two ends, fluidly connects the fuel tank 12 to the float bowl 16 of the carburetor 17.

From the upper portion of the fuel tank 12 protrudes an air vent 18, a small cylindrical tube, which allows the expanding gas vapors to flow outwardly from the fuel tank, thereby relieving any internal pressures that may build up. Extending over, and fitting snugly around the outer surface of the air vent 18 is the intake end 19 of a flexible tube 21 fabricated from rubber or other suitable non-porous material. The opposite, exhaust end 22 of said tube 21 is similarly connected to the carburetor 17 so as to fluidly connect the carburetion means 23 to the air vent 18 of said fuel tank 12. Intermediate ends 19 and 22 of the tube 21 is a small hole 24 extending through the wall of said tube 21.

Enclosing a zone 26 that surrounds the hole 24 is a cylindrical canister 27 (FIGS. 1 and 2) having a side wall 28 and top and bottom end walls 29 and 31. The hole 24 is situated approximately in the center of the canister with the tube 21 passing through the side wall 28 through inlet and outlet holes 32 and 33 formed therein. A sealant 34 is placed around the tube 21 to provide an air-tight fitting where said tube 21 passes through said holes 32 and 33. In the lower portion of the side wall 28 of the canister 27 is provided an opening 36 leading to a cylindrical, hollow boss 37 secured to the outer surface of the sidewall 28. Secured over the boss 37 is one end 38 of a relief hose 39 which provides air to the internal canister zone 26. The opposite end 41 (FIG. 1) of the relief hose 39 is disposed within the air cleaner 42, the hose 39 extending through the upper surface 43 of the air cleaner 42 and sealed at that point. This arrangement provides for clean air flow to the canister. An opening 44 is formed in the bottom end wall 31 and a threaded cylindrical member 46 is integrally secured to the end wall over the opening 44. A cap 47 is threadably secured over the member 46 thus effectively sealing the canister. The cap is thus removable to permit cleaning of the canister and to unplug the hole in the tube.

During engine operation, the vapors from the fuel tank 12 will pass through the air vent 18 into the tube 21 where it will flow to the carburetion means 23 of the engine and be mixed with air and fuel to be burned. The vacuum created by the intake manifold 48 of the engine will in turn create a vacuum in the carburetion means 23 and in the tube 21. To equalize the pressure and prevent the collapse of either the tube 21 or the fuel tank 12, the hole 24 admits air from the internal canister zone 26 and therefore lowers the pressure there. The final pressure equalizing source is the air cleaner 42 which allows clean air to pass through hose 39 to the canister 27. The combination saves gas vapor otherwise lost, and introduces it to the carburetion means 23 to provide a richer gas/air mixture, thereby resulting in increased power and improved gasoline mileage. It will further be noted that the system is effectively sealed against the entrance of any contaminated air thereto.

I claim:

1. In combination with an internal combustion engine and its associated fuel tank, the tank having an air vent for allowing vapors to escape therefrom and the engine having a carburetor, an air cleaner, and a manifold; a gas vapor device for utilizing fuel tank air vent escape vapors, comprising:

a hollow canister having an inlet hole, an outlet hole and an opening formed therein;

a tube fluidly connecting the air vent of the tank to the engine carburetor to permit the gas vapors in the tank to be drawn to the carburetor by the vacuum created therein due to the operation of the engine, said tube having a hole formed therein between the ends thereof, said hole permitting the flow of air into the tube during operation of the engine to prevent the collapse of the tube and the tank, said tube disposed in said inlet hole and said outlet hole with said tube hole disposed inside said canister; and

a hose fluidly connected on one end to said canister at said canister opening and at the other end to the air cleaner thus permitting clean air to be drawn into said tube.

2. A gas vapor device as defined in claim 1 and including sealing means disposed over said tube at said inlet and outlet holes to seal said canister.

3. A gas vapor device as defined in claim 2 and including a closable opening formed in said canister to permit cleaning of said canister and said tube hole.

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