

the valve opens and closes in response to the particular vacuum pressure created within the tank 10. The valves 112 and 114 are designed to admit just enough air to the tank 10 from the apertures 100 at engine idle to prevent the engine from stalling.

Referring now to FIGS. 6 through 8, the vapor equalizer chamber 16 of the present invention is seen to include front and rear walls 152 and 154, respectively, a top wall 156, a side wall 158, and another side wall 160. The vapor equalizer chamber 16 is secured to the manifold 18 as by a plurality of bolts 162 under which may be positioned a conventional gasket 164.

In the top wall 156 of the vapor equalizer 16 is formed an opening 166 for communicating the outlet end of vapor conduit 14 with a mixing and equalizing chamber 168. Adjacent the mixing and equalizing chamber 168 in wall 154 is formed another opening 170 which communicates with ambient air via opening 178 formed in the upper portion of housing 176. The amount of air admitted through openings 178 and 170 is controlled by a conventional butterfly valve 172. Butterfly valve 172 is rotated by a control rod 180 that, in turn, is coupled to a control arm 182. Cable 26 is connected to the distal end of control arm 182 and acts against the return bias of spring 184, the latter of which is journaled to side plate 152 of vapor equalizer 16 via an upstanding flange 188. Reference numeral 186 indicates generally a butterfly valve operating linkage, as illustrated more clearly in FIG. 8, and which is conventional as may be appreciated by a person of ordinary skill in the art.

Positioned below mixing and equalizing chamber 168 is a filter unit which is indicated generally by reference numeral 188. The filter unit 188, which is illustrated in an exploded view in FIG. 11, comprises a top plastic fluted cover 190 and a bottom plastic fluted cover 192. Positioned adjacent the top and bottom covers 190 and 192 are a pair of screen mesh elements 194 and 196, respectively. Positioned between the screen mesh elements 194 and 196 is a support member 198 which is preferably formed of a sponge-like filter material, such as, for example, neoprene. The support member 199 has formed on the top and bottom surfaces thereof a pair of receptacles 200 and 202, respectively, whose diameters are sized similarly to the opening 166 in top plate 156 and the openings formed in the intake manifold 18 which are respectively indicated by reference numerals 210 and 212 in FIG. 6.

Positioned in receptacles 200 and 202 are carbon particles 204 and 206, respectively, for vapor retardation and control purposes.

Referring now to FIG. 9, the filter unit 38 mounted in vapor conduit 14 is illustrated in a longitudinal sectional view and is seen to comprise an outer flexible cylindrical hose 214 which is adapted to connect with hose 14 at both ends by a pair of adapter elements 216 and 218. Contained within the outer flexible hose 214 is a cylindrical container 220, preferably of plastic, that houses in the central portion thereof a mixture of carbon and neoprene filter fibers 222. At both ends of the mixture 222 are deposited carbon particles 224 and 226, while the entire filtering unit is held within the container 220 by end screens 228 and 230 which permit passage of vapors therethrough while holding the carbon particles 224 and 226 in place.

FIG. 10 illustrates one form of the thrust adjustment valve 40 which is placed within line 14. The valve simply controls the amount of fluid passable through the conduit 14 via a rotating valve member 41.

In operation, the thrust adjustment valve 40 is initially adjusted to achieve as smooth an idle as possible for the particular motor vehicle in which the system is installed. The emergency shut-off valve 42, which is closed when the engine is off, generally traps enough vapor between it and the vapor equalizer 16 to start the engine 20. Initially, the rear intake valves 12 on the tank 10 are fully closed, while the air intake valves 22 on the equalizer 16 are open to admit a charge of air to the vapor equalizer prior to the vapor from the tank, thus forcing the pre-existing vapor in the vapor equalizer into the manifold. The small apertures 100 formed in base plate 96 on tank 10 admit just enough air to actuate the reed valves to permit sufficient vapor and air to be drawn through vapor conduit 14 and equalizer 16 to the engine 20 to provide smooth idling. The front air valves 22 are always set ahead of the rear air valves 12 and the linkages 24 and 26 are coupled to throttle pedal 28 such that the degree of opening of front valves 22 always exceeds the degree of opening of the rear valves 12.

Upon initial starting of the engine 20, due to the closed condition of rear valves 12, a high vacuum pressure is created within tank 10 which causes the filter assembly 134 positioned in tank 10 to rise to its operative position indicated by solid outline in FIG. 2. In this manner, a relatively small amount of vapor will be drawn directly from filter 134 through vapor conduit 14 to the engine to permit the latter to run on an extremely lean mixture.

Upon initial acceleration, the front air intake valve 22 will open further, while the rear butterfly assembly 12 will begin to open. The latter action will reduce the vacuum pressure within tank 10 whereby the filter assembly 134 will be lowered to its alternate operating position illustrated in dotted outline in FIG. 2. In this position, the lower end of the filter assembly 134 may actually rest in the liquid gasoline contained within the tank 10. Accordingly, upon acceleration, the filter assembly 134 is moved out of direct fluid communication with the opening 82 such that the vapor conduit 14 then draws fuel vapor and air from the entire tank 10 to provide a richer combustion mixture to the engine, which is necessary during acceleration.

When the motor vehicle attains a steady speed, and the operator eases off the accelerator pedal 28, the rear butterfly valve assembly 12 closes, but the front air intake 22 remains open to a certain degree. The closing of the rear air intake 12 increases the vacuum pressure within tank 10 to the point where the filter assembly 134 is drawn up to its initial operating position. As illustrated, in this position, the opening 82 is in substantial alignment with the aperture 151 of hose 150 to place the filter unit 134 in direct fluid communication with the vapor conduit 14, thereby lessening the amount of vapor and air mixture fed to the engine. Any vapor fed through conduit 14 while the filter 134 is at this position is believed to be drawn directly off the filter unit itself.

I have been able to obtain extremely high gas mileages with the system of the present invention installed on a V-8 engine of a conventional 1971 American made automobile. In fact, mileage rates in excess of one hundred miles per gallon have been achieved with the present invention. The present invention eliminates the need for conventional fuel pumps, carburetors, and gas tanks, thereby more than offsetting whatever the components of the present invention might otherwise add to the cost of a car. The system may be constructed with readily