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(54) Fluid flow device for fuel evaporative emission control system

(57) A fluid flow device (22) is provided which can be positioned in a vent line (5) between a sealed fuel tank (10) and an activated carbon adsorber canister (20) in a fuel evaporative emission control system. The fluid flow

device (22) is adapted to provide little pressure drop and vortex generation in a vent direction, while providing substantial pressure drop and vortex generation in a purge direction. The fluid flow device (22) may comprise the serial combination of a converger (28) and a diffuser (30).

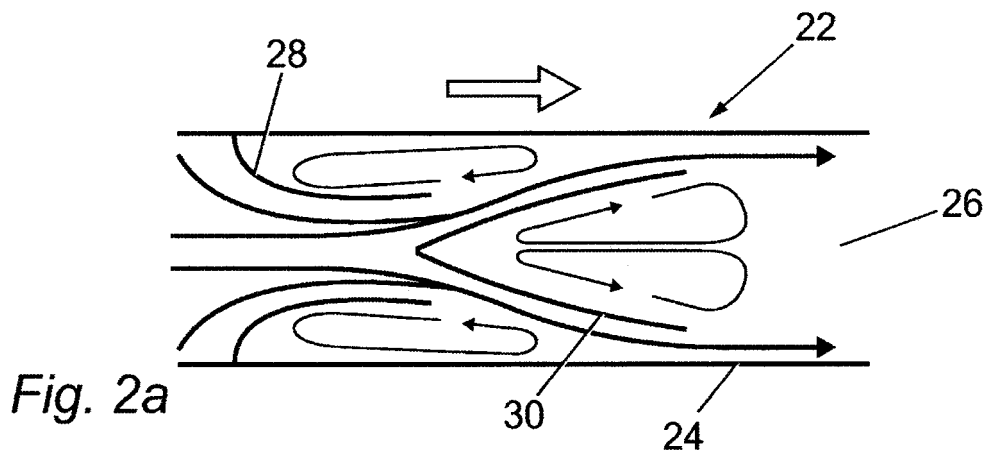
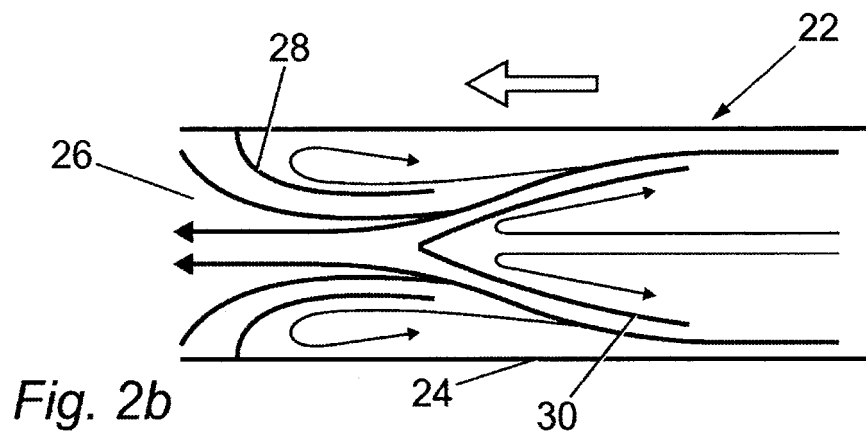


Fig. 2a



Description

[0001] This invention relates to a fluid flow device for use in a fuel evaporative emission control system.

[0002] In many jurisdictions regulations require the use of systems to prevent or minimise air pollution by evaporation of fuel from vehicle tanks. Commonly, such systems make use of a "carbon canister" arrangement, in which hydrocarbon vapours arising from evaporation of tank fuel are adsorbed on activated carbon particles within a container or canister when the vehicle is inactive. The adsorbed hydrocarbons are subsequently removed or purged during engine operation by drawing air through the canister and directing the resulting air/fuel mixture into the engine intake system.

[0003] The purging of canisters is frequently inefficient, leading to hydrocarbons remaining within the canister. There is a need to improve the efficiency and completeness of such purging.

[0004] It is known to use conical or frusto-conical flow diverters in carbon adsorption canisters: see for example US4,403,587, US4,338,106US4,507,132, and EPO, 756,079. However, these prior art arrangements use such elements to distribute incoming fluid within the activated carbon, and the conical/frusto-conical elements are not used for gas dynamic purposes.

[0005] The present invention provides a fluid flow device for use in a fuel evaporative emission control system, the device comprising a fluid flow passage having an inlet and an outlet, and fluid flow alteration means within the fluid flow passage effective to give relatively unobstructed flow in one direction and relatively obstructed flow in the opposite direction, whereby in use flow in said opposite direction aids purging of an adsorption canister.

[0006] Preferred features and advantages of the invention will be apparent from the claims and from the following description.

[0007] Embodiments of the invention will now be described, by way of example only, with reference to the drawings, in which:

Figure 1 is a schematic diagram of a vehicle fuel system incorporating the invention;

Figure 2a is a schematic cross-section of one embodiment of device with fluid flow in a first direction; Figure 2b shows the device of Fig. 2a with flow in the opposite direction;

Figures 3a and 3b are perspective views from different directions of one form of practical realisation of the device of Fig. 2; and

Figures 4 and 5 are schematic cross-sections of alternative forms of device.

[0008] Referring to Figure 1, a vehicle fuel system includes a fuel tank 10 containing fuel 11 and having a fill pipe 12 closed by a cap 14 which forms a seal with the fill pipe 12. Fuel is discharged from the tank 10 via a fuel line 16. The fuel tank is vented to atmosphere by a connection line 18 which leads to a canister 20 containing granules / pellets of activated carbon. The canister 20 has a first chamber 20A and second chamber 20B. A purge line 4 having a valve 3 is connected to first chamber 20A and a vent line 5 having a fluid flow device 22 is connected to second chamber 20B. As shown in Fig. 1A, when the vehicle engine is inactive the valve 3 is closed and any increase in pressure caused by fuel evaporation is vented to atmosphere along route 1 which passes via canister chambers 20A, 20B (in which fuel vapours are adsorbed onto the activated carbon) and fluid flow device 22. When the engine is activated, valve 3 is open and ambient air is drawn through the canister chambers 20A and 20B via the fluid flow device 22, and this air flow "purges" the activated carbon by de-adsorbing the fuel there through. The outflow is purged to the engine via line 4.

[0009] The invention improves upon known types by providing the fluid flow device 22 in the line between the canister 20 and the vent. The fluid flow device 22 is based on the concept of a device which provides a relatively low resistance to fluid flow during venting, while providing a relatively high resistance during purging so as to give more intimate contact between the purge air and the carbon particles.

[0010] Figure 2 shows one form of fluid flow device 22. This consists of a housing 24 forming a flow passage 26 which contains, in series, a converger 28 and a diffuser 30. When flow is in one direction (Figure 2a), the pressure drop through the device is small and there is little creation of vortices and low turbulence. When flow is in the other direction (Figure 2b), the pressure drop is much higher, and substantial vortices and turbulence are present.

[0011] Figure 3 shows a practical realisation of the scheme of Figure 2, like parts being denoted by like references. The housing 24, the converger 28 and the diffuser 30 can each be formed as a plastics moulding, suitably of polypropylene. The housing 24 will of course be in two parts before assembly.

[0012] It is possible to provide a useful, though less desirable, flow device with only a converger, as in Figure 4, or only a diffuser, as in Figure 5. The required effect could also be produced by flow devices including other forms of interruption or baffle.

[0013] The device shown in Figure 3 is suitable for inclusion as a separate item in a vent line. Alternatively, the device of the invention could be integrated with the carbon canister itself to reduce the part count and speed installation.

Claims

1. A fluid flow device for use in a fuel evaporative emission control system, the device comprising a fluid flow passage having an inlet and an outlet, and fluid flow alteration means within the fluid flow passage effective to give relatively unobstructed flow in one

direction and relatively obstructed flow in the opposite direction, whereby in use flow in said opposite direction aids purging of an adsorption canister.

2. A device according to claim 1, in which the fluid flow alteration means operates by producing dynamic effects within the fluid flow. 5
3. A device according to claim 2, in which the fluid flow alteration means has no moving parts. 10
4. A device according to claim 3, in which the fluid flow alteration means comprises a series combination of a diffuser and a converger. 15
5. A device according to any preceding claim, in the form of a stand-alone device adapted to be connected in a fluid conduit.
6. A device according to any of claims 1 to 4, the device forming an integral part of an adsorption canister. 20
7. A device according to any preceding claim, formed of moulded plastics. 25
8. A device according to claim 7, formed of polypropylene.

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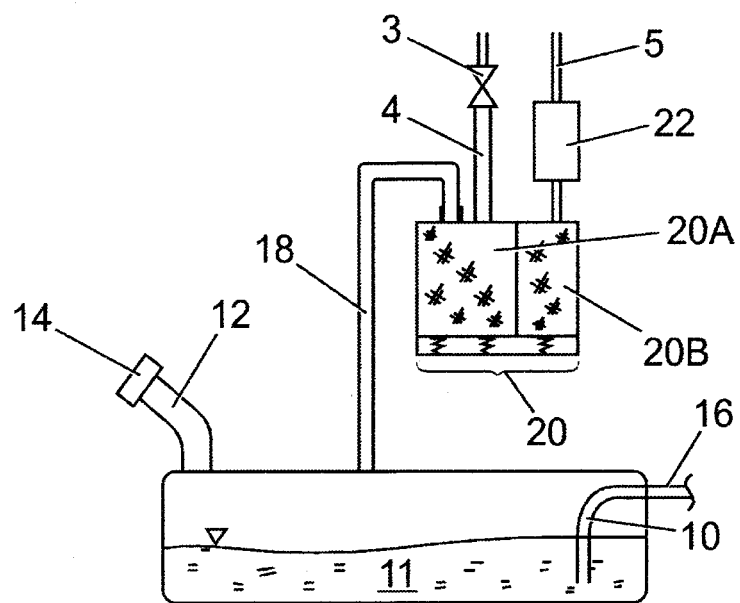


Fig. 1

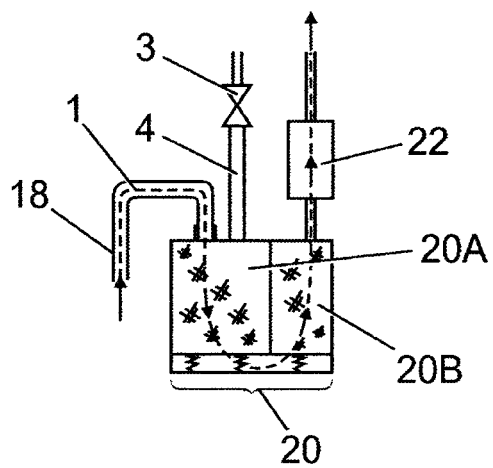


Fig. 1a

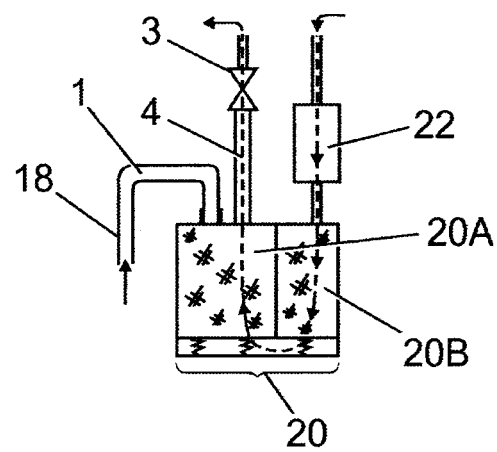
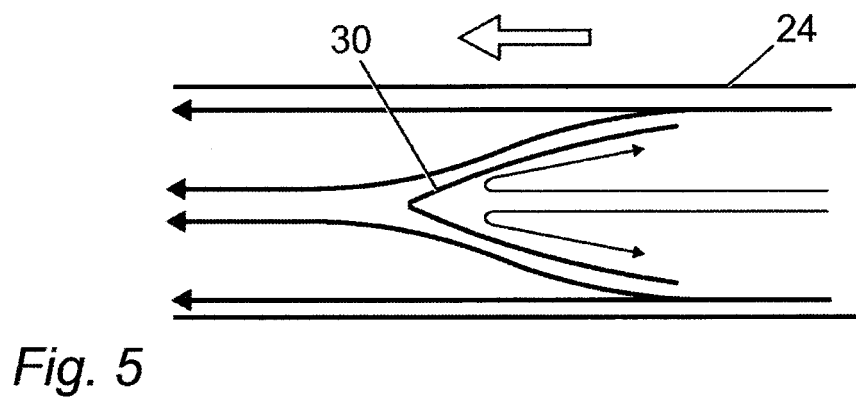
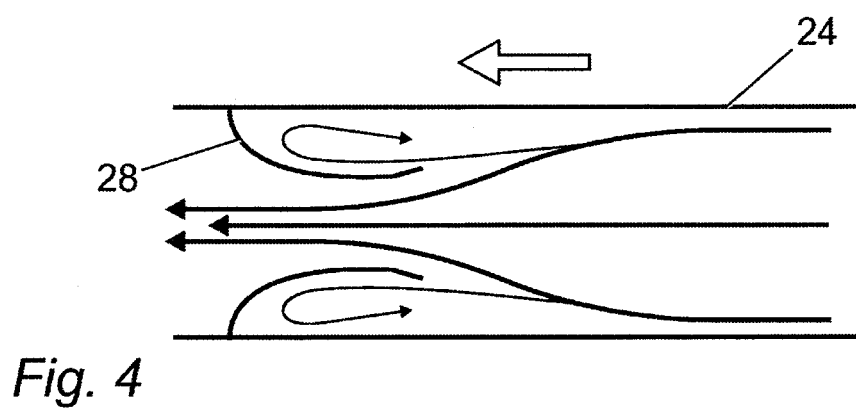
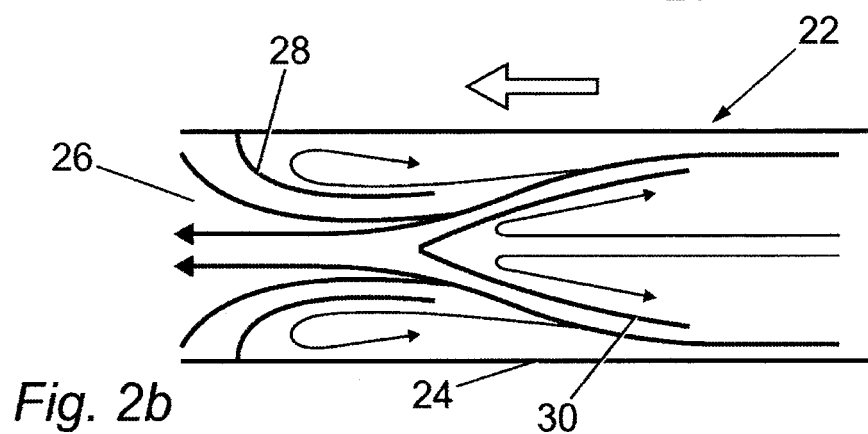
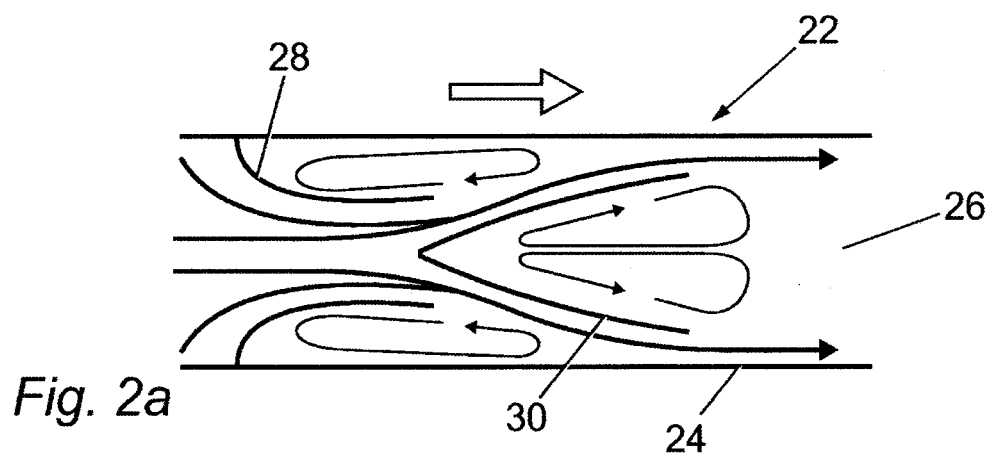


Fig. 1b



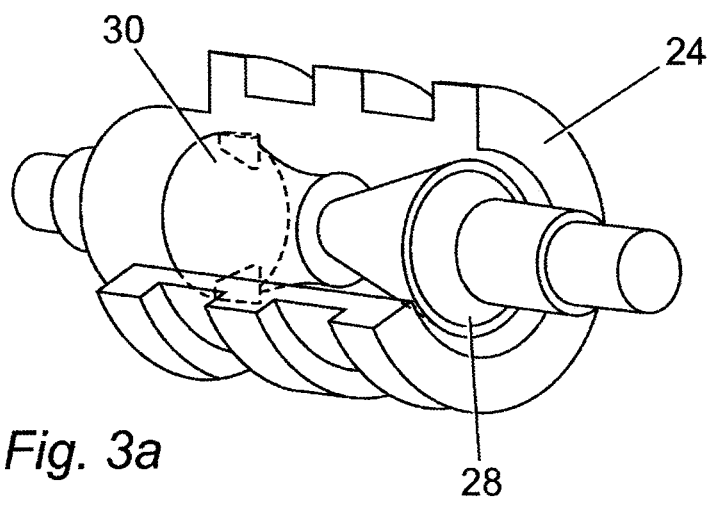


Fig. 3a

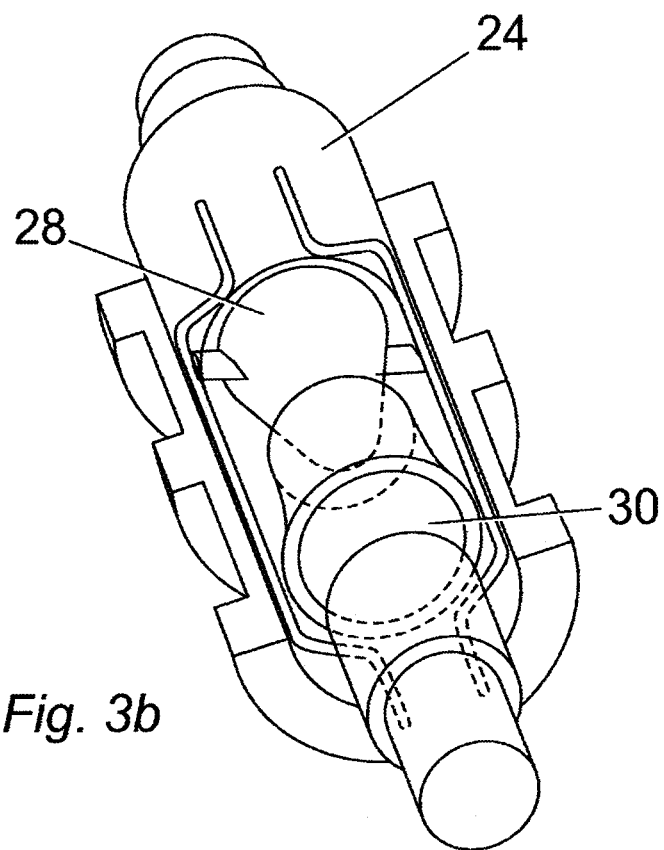


Fig. 3b