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(54) Fuel vapour storage canister.

(57) A fuel vapour storage canister (10) that contains a trap housing (34) with a separating chamber (36) to capture the liquid component of the fluid from a fuel tank. The trap housing is designed so that the storage canister can be installed in the vehicle in a number of possible orientations while still isolating the liquid component from the adsorbent bed (18) of the storage canister.

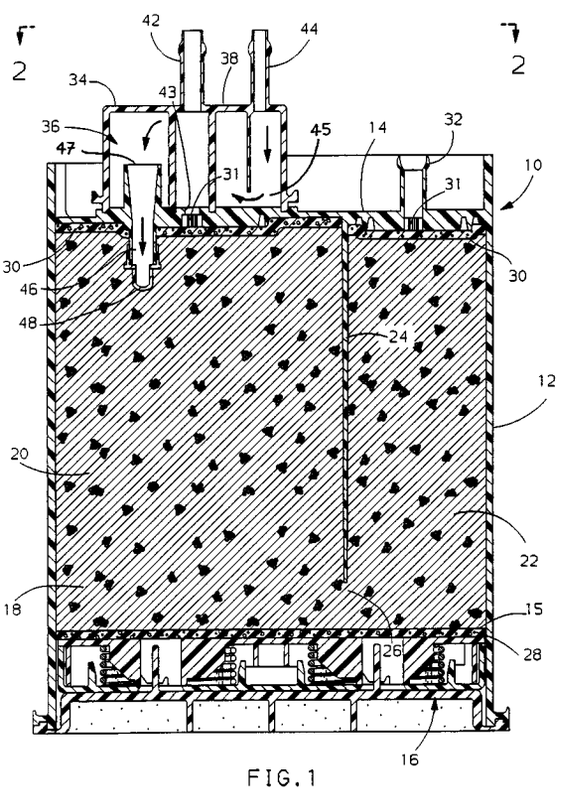

FIG.1

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This invention relates to a vehicle fuel evaporation loss control system in general, and specifically to a fuel vapour storage canister that contains a liquid trap that can be installed in the vehicle in a number of possible orientations.

In most current evaporative systems, fuel vapour that accumulates in the fuel tank vents to a fuel vapour storage canister located in a location remote from the fuel tank in the vehicle. The fuel vapour is captured by an adsorbent bed; usually composed of charcoal. Liquid fuel from condensation or direct entry into the storage canister can contaminate or degrade the efficiency of the adsorbent bed, therefore many evaporative systems have incorporated therein liquid traps to prevent liquid entering the adsorbent bed.

One example of a liquid trap can be seen in US Patent No. 4,750,465. In this publication, the bottom of the storage canister has a cone shaped shell beneath the adsorbent bed. A tube connected to the fuel tank extends through the adsorbent bed and opens into the cone shaped shell. Any liquid component of the fluid from the fuel tank collects in the apex of the shell.

In US Patent No. 4,655,189, a separating chamber at the upper end of the storage canister prevents the liquid component from flowing into the adsorbent bed. As the fluid enters the storage canister, the liquid component is collected at the bottom of the separating chamber. Openings to the adsorbent bed are located above the surface of the liquid component in the separating chamber to allow only the gaseous component to be stored in the adsorbent bed.

One disadvantage of these storage canisters is that they can only be placed in the vehicle in one particular orientation. These storage canisters lack the versatility to be placed in some engine compartments. In US Patent No. 4,853,009, a storage canister has a number of liquid trap kits that can be connected to the storage canister to allow for various installation orientations in the vehicle.

A fuel vapour storage canister in accordance with the present invention is characterised by the features specified in the characterising portion of claim 1.

The current invention is a fuel vapour storage canister with a liquid fuel trap that has the capability of multi-orientation installations in the vehicle without the necessity of supplying a number of assembly kits to fit on a particular storage canister for a particular vehicle. One storage canister provides the necessary liquid fuel trap with the convenience of being able to position it in the vehicle in any one of a number of various orientations.

The storage canister is filled with an adsorbent material such as charcoal. Within the canister housing the interior is divided longitudinally into two compartments, a main and auxiliary compartment. The two compartments communicate with each other by a connecting passage. At the end opposite the connecting passage is an air aperture which opens into the auxiliary compartment. At the same end of the storage canister is a box-shaped trap housing which encloses a separating chamber that collects the liquid component of the fluid. The trap housing is situated next to the main compartment of the storage canister. In the centre of the trap housing is a purge tube that extends through the separating chamber and opens into the main compartment of the storage canister. Situated in one corner of the trap housing is the tank vent tube that receives fluid vented from the fuel tank. The tank vent tube extends to near the bottom of the separating chamber. Within the separating chamber is a raised inlet tube that opens from about the middle of the separating chamber and extends into the main compartment of the storage canister. By positioning the storage canister in the vehicle so that the tank vent tube is in the low position in relation to the inlet tube, the liquid component will not flow into the inlet tube and into the adsorbent bed. Because the inlet tube is not visible by looking at the exterior of the canister housing, the tank vent tube will be in the low position in relation to the inlet tube if it is oriented to be in the low position in relation to the purge tube. In this way any liquid entering the trap housing will remain in the separating chamber while the gaseous component will be allowed to flow through the inlet tube to the adsorbent bed in the storage canister.

The present invention will now be described, by way of example, with reference to the remainder of the specification, and the accompanying drawings, in which:-

Figure 1 is a sectional view of a fuel vapour storage canister employing this invention;

Figure 2 is a top view of the fuel vapour storage canister from the perspective of line 2-2 in Figure 1; and

Figures 3A-3C are partial sectional views of the three possible installation orientations of the fuel vapour storage canister, showing how liquid is trapped.

A fuel vapour storage canister 10 in accordance with the present invention is shown in the drawings which has a (generally elongated rectangular) canister housing 12 with rounded corners. Figure 1 displays the fuel vapour storage canister 10 with the elongation being on a vertical axis. The cross section of fuel vapour storage canister 10 has different width W and length L, as illustrated in Figure 2. The canister housing 12 is usually made of a plastic material and includes an end face 14 that encloses the fuel vapour storage canister 10 at the one end. In the preferred embodiment, the

other end 15 of the fuel vapour storage canister 10 has a volume compensator 16. The current invention is not dependent upon such a volume compensator 16 and the other end 15 of the fuel vapour storage canister 10 could be closed by a cap.

The canister housing 12 encloses an interior volume, containing an adsorbent bed 18 that is charged with activated charcoal granules, or the like. The interior volume is partitioned parallel to its elongated axis into a main compartment 20 and an auxiliary compartment 22. A partition 24 separates the main compartment 20 and the auxiliary compartment 22, and has a passage 26 at the other end 15 of the canister housing 12 that allows vapour to pass between the two compartments. Sandwiched between the adsorbent bed 18 and the volume compensator 16 is a foam screen 28. Foam screens 30 also separate the end face 14 of the canister housing 12 and the adsorbent bed 18. The side of the end face 14 that abuts the foam screens 30 may have ribs 31 to prevent the foam screens 30 from moving and obstructing air flow to and from the absorbent bed 18. In the end face 14 is a tubular air aperture 32 which opens into the auxiliary compartment 22 of the fuel vapour storage canister 10.

A (box-shaped) trap housing 34, also made of a plastic material, is welded to the end face 14, and encloses a separating chamber 36. The trap housing 34 has an end wall 38 spaced from and parallel to the end face 14 of the fuel vapour storage canister 10. In the centre of the end wall 38 is a purge tube 42 that extends through the separating chamber 36 and opens through an aperture 43 in the end face 14 into the main compartment 20 of the fuel vapour storage canister 10. The purge tube 42 is adapted for connection to the engine vacuum source. In one corner of the end wall 38 is a tank vent tube 44, which extends through the end wall 38 to provide an open end 45 near the end face 14, and within the separating chamber 36. The tank vent tube 44 is adapted for connection to the fuel tank. Within the separating chamber 36 is an inlet tube 46 which is located on the opposite side of the purge tube 42 from the tank vent tube 44. The inlet tube 46 starts at one end 47 within the separating chamber 36 at a position spaced from the end face 14 and extends through the end face into the main compartment 20 of the fuel vapour storage canister 10. Gaseous fluid that has entered the separating chamber 36 through the tank vent tube 44 from the fuel tank will flow through the inlet tube 46 to the adsorbent bed 18 in the main compartment 20. Any liquid fluid entering the separating chamber 36 will settle in the low point of the separating chamber 36. It will remain there until it either evaporates and then flows through the inlet tube 46 to the adsorbent bed 18 or is purged back to the fuel tank when the tank pressure falls below atmospheric pressure. At the end point of the inlet tube 46 located in the main compartment 20 is a nylon mesh filter 48 that is press set onto the inlet tube 46. The nylon mesh filter 48 prevents charcoal granules from entering the separating chamber 36.

The tank vent tube 44 is located in a corner of the trap housing 34 so that its open end 45 can always be situated at a low point in relation to the inlet tube 46 and thereby keep the liquid component near to the connection to the fuel tank and out of the adsorbent bed 18. Since the inlet tube 46 is not visible by looking at the canister housing 12 or the trap housing 34, the purge tube 42 may be used as a reference point. If the tank vent tube 44 is oriented to be at a low point in relation to the purge tube 42 (see Figures 3B and 3C), this will have the same result as being at a low point in relation to the inlet tube 46.

During purge, vacuum will be applied to the purge tube 42. Atmospheric air will enter the air aperture 32 and flow through the auxiliary and main compartments 22, 20 of the fuel vapour storage canister 10. Vapour that has been captured in the adsorbent bed 18 will be desorbed and sent to the engine induction system through the purge tube 42.

Figures 3A-3C represent the three possible different orientation installations of the fuel vapour storage canister 10, and show the separating chamber 36 partially filled with liquid 50. For example, Figure 3A shows the fuel vapour storage canister 10 in an upright position with its longitudinal axis vertical, where the trap housing 34 is on the top of the fuel vapour storage canister 10. The fuel vapour storage canister 10 can be turned around about its vertical axis in any direction since the tank vent tube 44 will not be higher than the purge tube 42. The positioning of the one end 47 of the inlet tube 46 at a distance from the end face 14 ensures that the liquid 50 does not reach the adsorbent bed 18. As seen in Figures 3B and 3C, the fuel vapour storage canister 10 can also be installed with its longitudinal axis horizontal. In Figure 3B the fuel vapour storage canister 10 is shown with its major transverse axis vertical, and in Figure 3C with its minor transverse axis vertical. In both Figures 3B and 3C it is important where the tank vent tube 44 is located in relation to the purge tube 42. In both these orientations, the trap housing 34 must be installed so that the tank vent tube 44 is at the low point in relation to the purge tube 42. This will then ensure that the inlet tube 46 is at a higher position than the tank vent tube 44, so that the liquid 50 will collect in the separating chamber 36 and will not reach the inlet tube 46 that leads to the

adsorbent bed 18.

As an alternative to the above, the tank vent tube may enter the separating chamber through a side wall of the trap housing to have an open end adjacent a corner of the trap housing and adjacent the end face 14. Also, although the end wall 38 has been shown as substantially rectangular, any other suitable shape, such as circular, may be used, as long as the tank vent tube 44 is positioned as required relative to the inlet tube 46.

Claims

1. A fuel vapour storage canister (10) for connection with a fuel tank of a vehicle, the fuel vapour storage canister comprising a canister housing (12) containing an absorbent bed (18) for absorbing the vapour component of fluid from the fuel tank; a trap housing (34) located at an end face (14) of the canister housing, the trap housing enclosing a separating chamber (36) in which the liquid component of the fluid can be held to substantially prevent the liquid component from flowing into the absorbent bed; an inlet tube (46) extending from the separating chamber into the canister housing, the end (47) of the inlet tube within the separating chamber being spaced from the end face; a tank vent tube (44) for connection with the fuel tank extending into, and having an open end (45) within, the separating chamber, and being spaced from the inlet tube; characterised in that the position of the tank vent tube relative to the inlet tube is such that the tank vent tube is below the inlet tube for at least two orientations of the fuel vapour canister.

2. A fuel vapour storage canister as claimed in Claim 1, wherein the open end (45) of the tank vent tube (44) is positioned adjacent the end face (14) within the separating chamber (36).

3. A fuel vapour storage canister as claimed in Claim 1 or Claim 2, wherein the trap housing (34) is substantially box-shaped and has an end wall (38) which is substantially rectangular and substantially parallel to the end face (14), the tank vent tube (44) passing through the end wall and being positioned adjacent a corner of the end wall.

4. A fuel vapour storage canister as claimed in Claim 3, wherein a purge tube (42) passes through the end wall (38), extends through the separating chamber (36), and opens into the canister housing (12).

5. A fuel vapour storage canister as claimed in Claim 4, wherein the purge tube is substantially centrally positioned with respect to the end wall (38).

6. A fuel vapour storage canister as claimed in any one of Claims 3 to 5, wherein the end (47) of the inlet tube (46) within the separating chamber (36) is positioned substantially midway between the end wall (38) and the end face (14).

7. A fuel vapour storage canister as claimed in any one of Claims 1 to 6, wherein the canister housing (12) is divided internally by a partition (24) into a main compartment (20) and an auxiliary compartment (22), the partition extending away from the end face (14), and the compartments being connected by a passage (26) through the partition at the opposite end (15) of the canister housing to the end face; and wherein the trap housing (34) is positioned on the opposite side of the end face to the main compartment.

8. A fuel vapour storage canister as claimed in Claim 7, wherein an air aperture (32) passes through the end face (14) and opens into the auxiliary compartment (22).

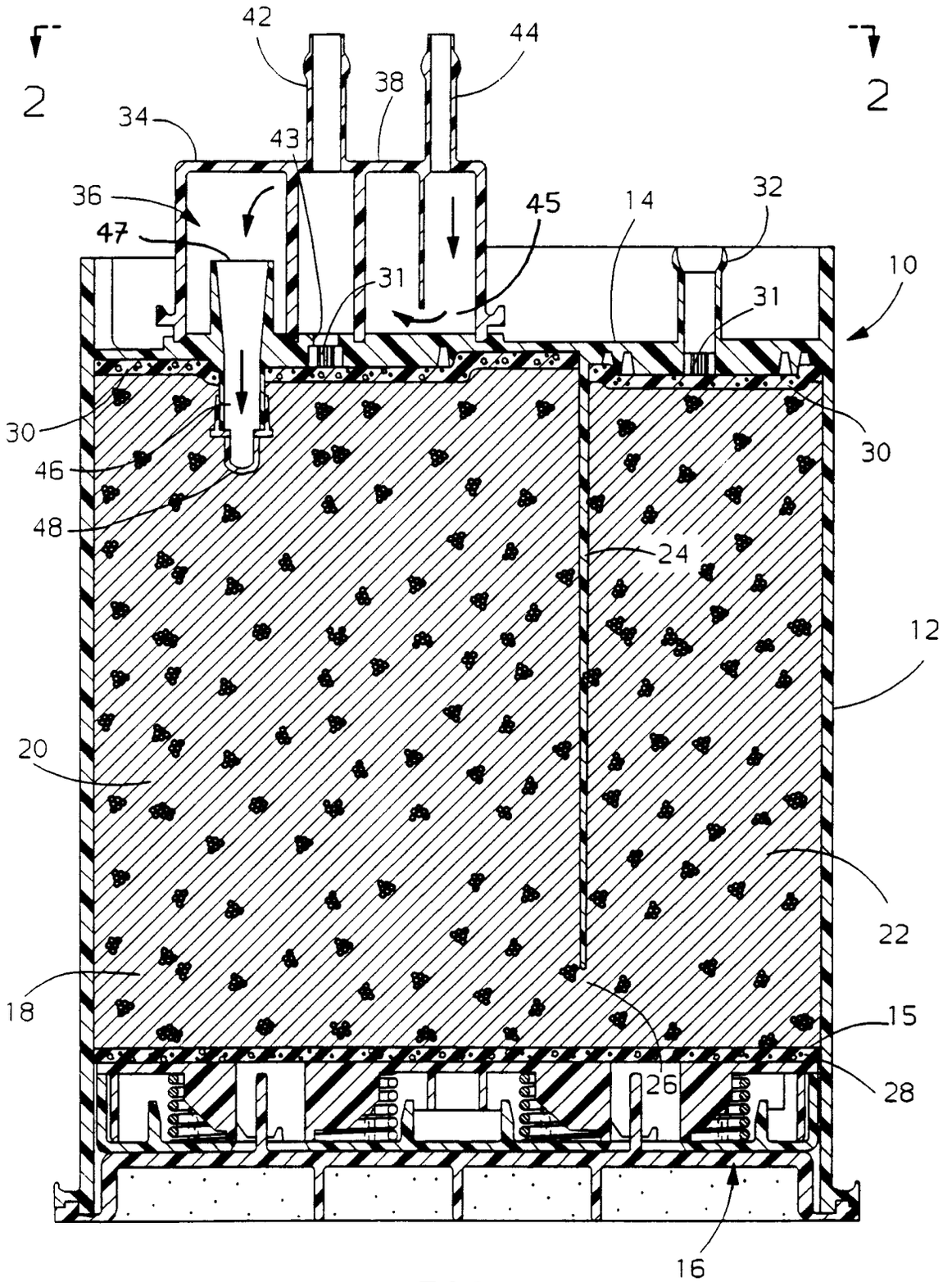
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FIG. 1

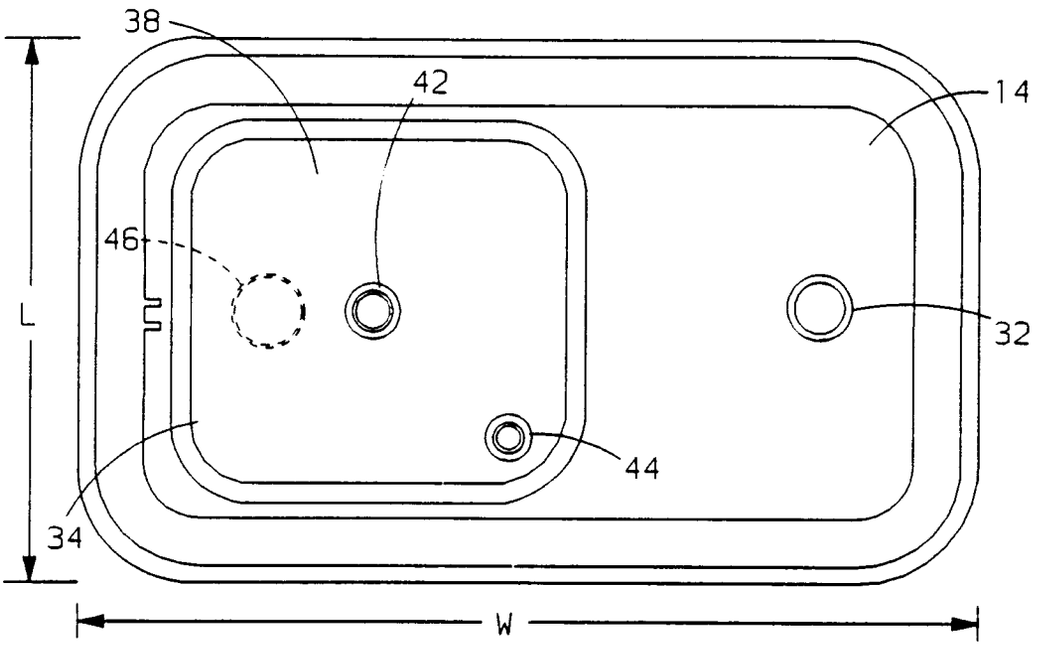
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FIG. 2

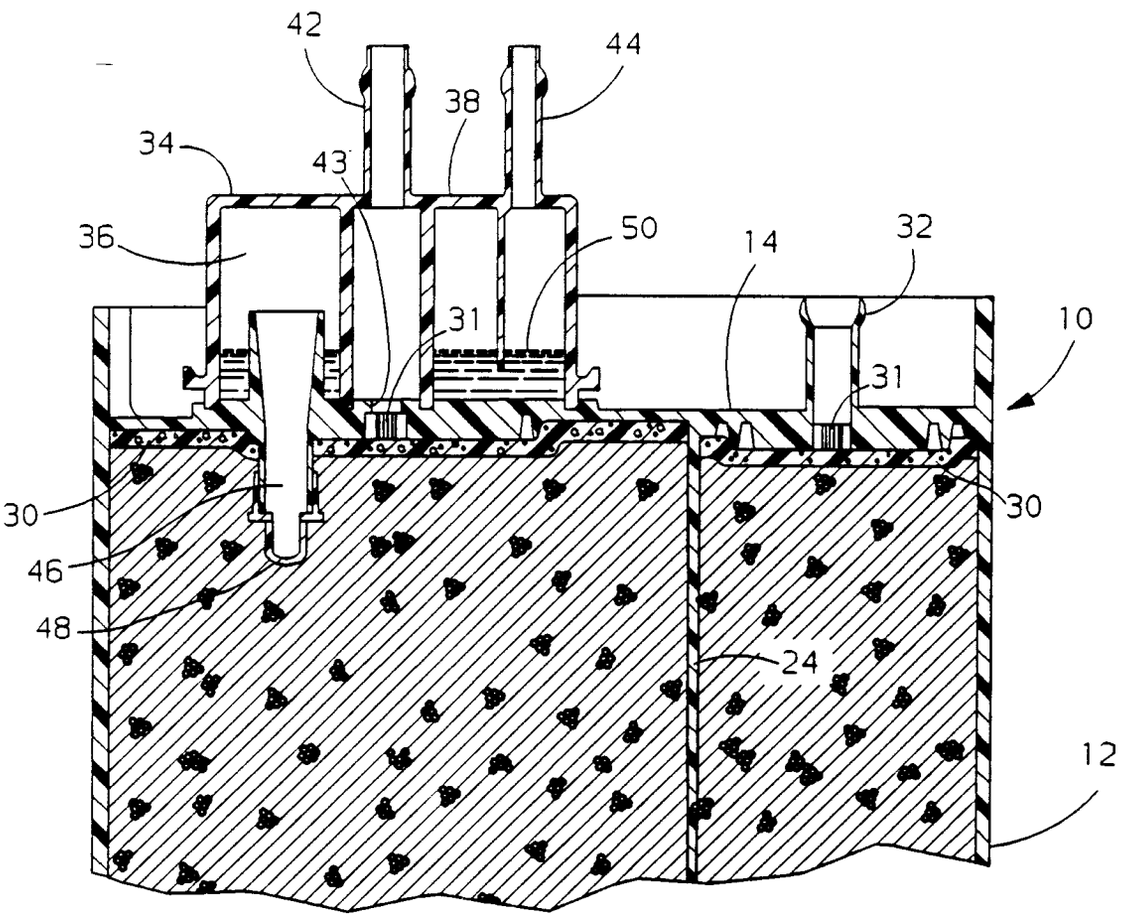
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FIG. 3A

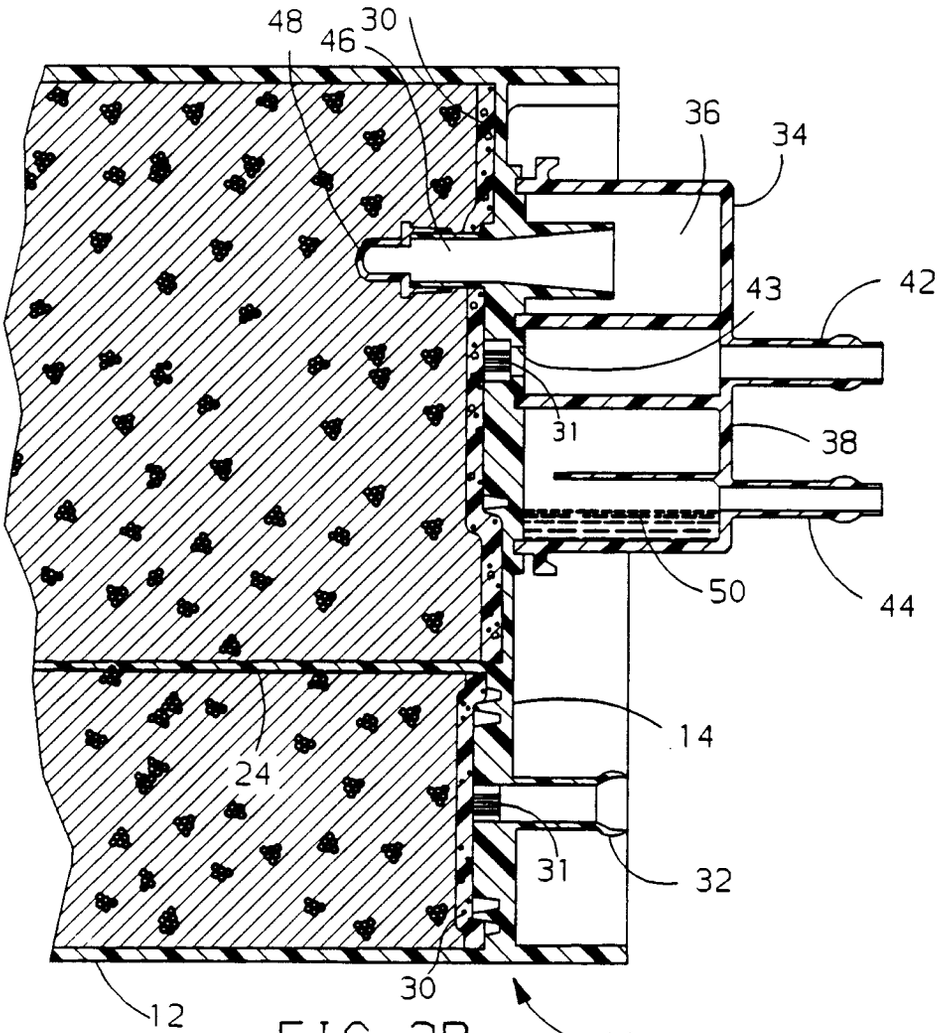
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FIG. 3B

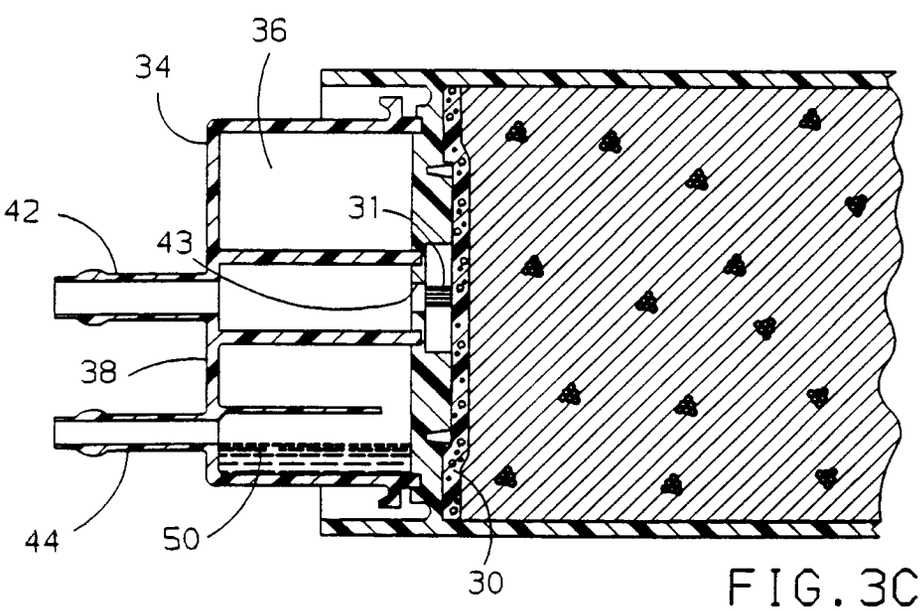
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FIG. 3C

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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 0434

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A,D	US-A-4 853 009 (TURNER) * column 3, line 39 - column 4, line 47; figures 1-3 *	1-5	F02M25/08
A	US-A-4 658 796 (YOSHIDA) * column 3, line 15 - column 4, line 16; figures 1-4 *	1,2,4,7	
A,D	US-A-4 655 189 (KOGA) * column 2, line 10 - line 58; figures 1-3 *	1,2,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F02M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 AUGUST 1992	VAN ZOEST A.P.

CATEGORY OF CITED DOCUMENTS

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