Title: INTERFACE HOSE SEAL FOR LOW PERMEATION FUEL SUPPLY FLANGE

Abstract: A flange structure (W) for a fuel supply unit of a vehicle includes an electrically conductive fuel port (16') having a periphery and first and second ends (22, 23). The first end includes first barb structure (28). A plastic flange (20') is overmolded on the periphery of the fuel port between the first and second ends. A portion of the overmolded flange defines fitting structure (25) having second barb structure (27). A hose (30) is provided having first and second inner diameter portions. The first barb structure (28) engages surfaces of the first inner diameter portion (32), and the second barb structure (27) engages surfaces of the second inner diameter portion, thereby preventing fuel or fuel vapor from passing between the periphery of the fuel port and the overmolded flange.
INTERFACE HOSE SEAL FOR LOW PERMEATION FUEL SUPPLY UNIT FLANGE

This application claims the benefit of the earlier filing date of U.S. Provisional Application No.60/839,343, filed on August 21, 2006, which is hereby incorporated by reference into this specification.

FIELD OF THE INVENTION

The invention relates to fuel supply units for automobile vehicles and, more particularly, to providing a permeation barrier between a conductive fuel port and a non-conductive flange.

BACKGROUND OF THE INVENTION

With reference to FIG. 1, a typical fuel supply unit for a vehicle includes flange structure; generally indicated at 10 including a plastic flange 20 configured to be sealed to a wall of a fuel tank. The flange structure 10 is interconnected with a fuel pump assembly 12 by a pair of metal struts 14. The flange structure 10 also includes various ports 16 that provide pathways into and out of the fuel tank for fuel. The ports 16 are connected with the fuel pump 12 to supply fuel to an engine, but the connecting hoses are not shown in FIG. 1.

Recently, there has been a greater focus on Electro Static Dissipation (ESD) in such fuel supply systems. It is known that as fuel flows through various components of the fuel supply system, such as the fuel pump assembly, the fuel filter, and various valving and tubing, there is the potential for static electricity to be generated in the various conductive components of the fuel supply system. To dissipate this static electricity, fuel supply systems electrically ground the components through electrical interconnection.

For example, as shown in FIG. 1, some systems employ a separate cable harness 18 which grounds through the pump negative. Other systems employ
grounding clips (not shown) that touch an inline filter. In addition, conductive portions of fuel ports have been grounded.

[0009] There is a need provide for ESD of fuel ports while creating a barrier to prevent permeation or leakage of fuel around the fuel port.

[0011] **SUMMARY OF THE INVENTION**

An object of the invention is to fulfill the need referred to above. In accordance with the principles of the present invention, this objective is obtained by providing a flange structure for a fuel supply unit of a vehicle. The flange structure includes at least one electrically conductive fuel port having a periphery and first and second ends. The first end includes first barb structure. A plastic flange is overmolded on at least a portion of the periphery of the fuel port between the first and second ends. The flange is constructed and arranged to be coupled with a fuel tank of a vehicle. A portion of the flange overmolded on the portion of the periphery of the fuel port defines fitting structure having second barb structure. A hose is provided having first and second inner diameter portions. The first barb structure of the first end engages surfaces of the first inner diameter portion, and the second barb structure of the fitting structure engages surfaces of the second inner diameter portion, thereby by preventing fuel or fuel vapor from passing between the periphery of the fuel port and the overmolded flange.

[0012] In accordance with another aspect of the Invention, a method of providing a flange structure for a fuel supply unit of a vehicle provides at least one electrically conductive fuel port having a periphery and first and second ends. First barb structure is provided on the first end. A plastic is overmolded on at least a portion of the periphery of the fuel port between the first and second ends. A portion of the flange overmolded on the portion of the periphery of the fuel port defines fitting structure having second barb structure. A hose, having first and second inner diameter portions, is coupled 1) to the first end of the fuel port so that the first barb structure engages an inner surface of the first inner diameter...
portion and 2) to the fitting structure so that the second barb structure engages an inner surface of the second inner diameter portion.

[0013] Other objects, features and characteristics of the present invention, as well as the methods of operation and the functions of the related elements of the structure, the combination of parts and economics of manufacture will become more apparent upon consideration of the following detailed description and appended claims with reference to the accompanying drawings, all of which form a part of this specification.


[0015] The invention will be better understood from the following detailed description of the preferred embodiments thereof, taken in conjunction with the accompanying drawings, wherein like reference numerals refer to like parts, in which:

[0016] FIG. 1 is a view of conventional fuel supply unit of a vehicle.

[0017] FIG. 2 is an enlarged, partial sectional view of a flange structure including a flange, a fuel port and a hose provided in accordance with an embodiment of the invention.

[0018] DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENT

[0019] With reference to FIG. 2, a portion of a flange structure, generally indicated at 10', is shown in accordance with the principles of an embodiment of the invention. The flange structure 10' is similar to the flange structure 10 shown in FIG. 1, employed in a fuel supply unit of a vehicle. The flange structure 10' includes a fuel port, generally indicated at 16' and a flange, generally indicated at 20', overmolded on at least a portion of the fuel port 16'. In the embodiment, a periphery 17 of the fuel port 16' includes surface features such as an annular rim 19 that engage with the overmolded flange 20' to ensure a good connection between the flange 20' and fuel port 16'.
The fuel port 16' is electrically conductive, preferably a pre-molded plastic structure such as polyoxymethylene (POM). The fuel port 16' has a first end 22 accessible inside a fuel tank (not shown) and a second end 23, extending from portion 24, that is accessible outside of the flange 20' and thus outside of the fuel tank. The fuel port 16' has a constant inner diameter D. As noted above, a portion of the periphery 17 of the fuel port 16' between the first and second ends is overmolded with the non-conductive plastic flange 20'. A portion of the overmolded flange 20" defines fitting structure, generally indicated at 25, having barb structure preferably in the form of two annular barbs 27 disposed in spaced relation, the function of which will be explained below. One or more barbs 27 can be provided.

The flange 20' is constructed and arranged to be sealed to a wall of a fuel tank. Thus, as noted above, the second end 23 of the fuel port 16' is accessible outside of the flange 20' and is constructed and arranged to be connected at the engine side of a vehicle. The first end 22 of the fuel port 16' is associated with the inside of the flange 20' and thus is to be exposed to fuel in the fuel tank. The first end 22 of the fuel port 16' preferably is a male end that includes annular barb structure 28 so as engage with a hose, generally indicated at 30, that is connected to a fuel pump (not shown in FIG. 2), preferably of the type shown in FIG. 1. The hose 30 also engages the barb structure 27 of the fitting structure 25, the function of which will be explained below.

In the embodiment, the barb structure 28 includes three annular barbs, disposed in spaced relation, providing a 360 degree hydraulic seal about the fuel port 16' and hose 30 interface. One or more barbs can be provided. Since the overmolded fitting structure 25 is of a diameter larger than a diameter of the end 22 of the fuel port 16', the hose 30 includes a step 29 that defines a first inner diameter portion 32 and a second inner diameter portion 34. The barb structure 28 engages surfaces of the first inner diameter portion 32 and the barb structure 27 engages surfaces of the second inner diameter portion 34 of the hose 30. The hose 30 is electrically conductive and provides a ground to a fuel filter and/or
the fuel pump. Thus, electrostatic energy caused by fuel flowing through the fuel port 16' and the hose 30 can be dissipated by grounding at the fuel pump or fuel filter. Alternatively, the fuel port 16' can be grounded at the engine side.

Since the first end 22 of the fuel port 16' is exposed to fuel in hose 30 and fuel is exposed to the second diameter portion of the hose 30, there is a chance of leakage or permeation of fuel or fuel vapors between the periphery 17 of the fuel port 16' and the overmolded flange 20'. For example, there is a chance of fuel entering at location 36 in FIG. 2 between these two components. In accordance with the embodiment, the annular barb structure 28 engaging surfaces of the first inner diameter portion 32 of the hose 30 prevents fuel or vapors from reaching location 36 from the direction A of FIG. 2. In addition, the annular barb structure 27 of the fitting structure 25 engaging surfaces of the second inner diameter portion 34 of the hose 30 prevents fuel or vapors from reaching location 36 from the direction B. Thus, the permeation of fuel is prevented between the periphery 17 of the fuel port 16' and the overmolded flange 20'. The barb structures 27 and 28, not only define sealing means, but also are constructed and arranged so that removal of the hose 30 in the direction B in FIG. 2 is difficult.

Although only one fuel port 16' is shown in FIG. 2, it can be appreciated that other similar ports, with the associated connection with the flange 20' and hose 30 can be provided.

Hence, by employing a conductive fuel port 16', ESD can be achieved and by providing the barbs 27 and 28, a fuel leakage barrier is provided. Another advantage of the embodiment is that the parting line or transition between electrically conductive and non-conductive material is not pressurized. This eliminates issues regarding material differences for thermal behavior and mechanical force. The hose 30 seals to the barbs and leaves a pressure free transition.

The foregoing preferred embodiments have been shown and described for the purposes of illustrating the structural and functional principles of the present
invention, as well as illustrating the methods of employing the preferred embodiments and are subject to change without departing from such principles. Therefore, this invention includes all modifications encompassed within the spirit of the following claims.
What is claimed is:

1. A flange structure for a fuel supply unit of a vehicle, the flange structure comprising:
   at least one electrically conductive fuel port having a periphery and first and second ends, the first end including first barb structure,
   a plastic flange overmolded on at least a portion of the periphery of the fuel port between the first and second ends, the flange being constructed and arranged to be coupled with a fuel tank of a vehicle, a portion of the flange overmolded on the portion of the periphery of the fuel port defining fitting structure having second barb structure, and
   a hose, having first and second inner diameter portions, the first barb structure of the first end engaging surfaces of the first inner diameter portion, and the second barb structure of the fitting structure engaging surfaces of the second inner diameter portion, thereby by preventing fuel or fuel vapor from passing between the periphery of the fuel port and the overmolded flange.

2. The flange structure of claim 1, wherein the fuel port is composed of electrically conductive plastic.

3. The flange structure of claim 1, wherein at least a portion of the periphery of the fuel port includes a surface feature that engages with the overmolded flange.

4. The flange structure of claim 3, wherein the surface feature is an annular rim.

5. The flange structure of claim 1, wherein the first barb structure includes at least one annular barb.

6. The flange structure of claim 5, wherein the second barb structure includes at least one annular barb.
7. The flange structure of claim 1, wherein fuel port has a constant inner diameter.

8. The flange structure of claim 1, wherein the fuel port is composed of electrically conductive polyoxymethylene.

9. A flange structure for a fuel supply unit of a vehicle, the flange structure comprising:
   - at least one electrically conductive fuel port having a periphery and first and second ends, the first end including first means for sealing,
   - a plastic flange overmolded on at least a portion of the periphery of the fuel port between the first and second ends, the flange being constructed and arranged to be coupled with a fuel tank of a vehicle, a portion of the flange overmolded on the portion of the periphery of the fuel port defining fitting structure having second means for sealing, and
   - a hose, having first and second inner diameter portions, the first means for sealing providing a seal with respect to surfaces of the first inner diameter portion, and the second means for sealing providing a seal with respect to surfaces of the second inner diameter portion, thereby by preventing fuel or fuel vapor from passing between the periphery of the fuel port and the overmolded flange.

10. The flange structure of claim 9, wherein the fuel port is composed of electrically conductive plastic.

11. The flange structure of claim 9, wherein at least a portion of the periphery of the fuel port includes a surface feature that engages with the overmolded flange.

12. The flange structure of claim 11, wherein the surface feature is an annular rim.

13. The flange structure of claim 9, wherein the first means for sealing includes at
least one annular barb engaging a surface of the first inner diameter portion.

14. The flange structure of claim 13, wherein the second means for sealing includes at least one annular barb engaging a surface of the second inner diameter portion.

15. The flange structure of claim 9, wherein fuel port has a constant inner diameter.

16. The flange structure of claim 9, wherein the fuel port is composed of electrically conductive polyoxymethylene.

17. A method of providing a flange structure for a fuel supply unit of a vehicle, the method including:

   providing at least one electrically conductive fuel port having a periphery and first and second ends, first barb structure being provided on the first end,

   overmolding a plastic flange on at least a portion of the periphery of the fuel port between the first and second ends, a portion of the flange overmolded on the portion of the periphery of the fuel port defining fitting structure having second barb structure, and

   coupling a hose, having first and second inner diameter portions, 1) to the first end of the fuel port so that the first barb structure engages an inner surface of the first inner diameter portion and 2) to the fitting structure so that the second barb structure engages an inner surface of the second inner diameter portion.

18. The method of claim 15, wherein the providing step includes molding the fuel port from electrically conductive plastic.

19. The method of claim 15, wherein the providing step includes providing the fuel port with a constant inner diameter, the overmolding step including overmolding the fitting structure so as to define an outside diameter larger
than an outside diameter of the first end of the fuel port.

20. The method of claim 19, wherein the first barb structure includes at least one annular barb on the outside diameter of the first end of the fuel port and the second barb structure includes at least one annular barb on the larger outside diameter of the fitting structure.
FIG. 1
PRIOR ART
A. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both national classification and IPC:

F02M37/00

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

F02M F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

Electronic database consulted during the international search (name of database and, where practical, search terms used):

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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<tr>
<td>A</td>
<td>US 6 379 200 B1 (HARTKE DAVID J [US] ET AL) 30 April 2002 (2002-04-30) column 1, line 15 - column 3, line 46; figures 2,4</td>
<td>1,9,17</td>
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Further special categories of cited documents:

- **X** document defining the general state of the art which is not considered to be of particular relevance
- **E** earlier document but published on or after the international filing date
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