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(54) FUEL FEED DEVICE INSTALLATION STRUCTURE
INSTALLATION EINER BRENNSTOFFZUFUHR
STRUCTURE D’INSTALLATION DE DISPOSITIF D’ALIMENTATION EN CARBURANT

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This invention relates to a fuel supply apparatus and, more particularly, to a mounting structure for a fuel supply apparatus for supplying fuel from a fuel tank to a fuel consuming apparatus such as an internal combustion engine.

BACKGROUND ART

DE 25 50 950 A1 discusses a fuel tank, wherein between a casing of the fuel tank and a holding means, a gasket is disposed. In order to prevent any direct contact between the casing and the holding means, an elastic buffer and support means are disposed between the casing and the holding means for providing an acoustical decoupling.

US 4,651,701 relates to a submersible fuel pump, which is mounted within a fuel tank having a top wall and a bottom wall. A pump-sender includes a circular top plate clamped over an opening in tank top wall by a clamping assembly. The top plate is circular in configuration and has an outer flange that seats against an annular O-ring mounted in a recess formed by a U-shaped annular projection in the tank top wall surrounding the opening therein. The clamping assembly includes three arcuate Z-shaped brackets, welded to the top of the tank around the opening, each including a base, a post portion, and a locking flange. An annular bayonet type locking ring fits between the locking flange and the flange on the top plate to transmit locking pressure from the flange to the top plate. A flat annular elastomeric member is provided between locking ring and the upper surface of top plate flange to minimize the transmission of vibration from the fuel pump-sender assembly to the tank through the clamping assembly.

Fig. 5 is a structural diagram showing the conventional fuel supply apparatus disclosed in Japanese Patent Laid-Open No. 10-311262, for example. Fig. 6 is an enlarged view of a portion A of Fig. 5. In Figs. 5 and 6, 1 is a fuel tank, 2 is a fuel pump for pumping the fuel to an internal combustion engine, and 3 is a set plate made of a synthetic resin for supporting the fuel pump 2 and the like. The set plate 3 is provided to close an opening hole 1a disposed in the top surface of the fuel tank 1 with a gasket 5 made of synthetic rubber for maintaining a seal between the fuel tank 1 and the set plate 3 interposed therebetween, and the set plate 3 is secured thereto by tightening bolts 7 to fasten a holding plate 4 which holds an outer peripheral portion of the set plate 3 to the top of the fuel tank 1.

The material used commonly in forming the set plate 3 is polyacetal resin, or polyoxymethylene (hereinafter referred to as POM) resin. The material used commonly in forming the plate 4 is iron sheet or iron sheet plated with zinc.

In such the conventional mounting structure for the fuel supply apparatus, the set plate 3 made of POM resin and the plate 4 made of iron or iron plated with zinc are in direct contact with each other. The fuel tank 1 is generally mounted under the floor of an automobile body, so that the plate 4 exposed outside of the fuel tank is exposed to salt sprayed for thawing snow during winter in cold districts and to salt particles in sea wind in coastal areas. Under these environmental circumstances, chemical reactions that could take place on the surface of the plate 4 will be explained in conjunction with reaction formulae (1) to (8) given below.

\[
\text{Fe} + \text{CaCl}_2 \rightarrow \text{FeCl}_2 + \text{Ca} \quad \text{formula (1)}
\]

\[
\text{Zn} + \text{CaCl}_2 \rightarrow \text{ZnCl}_2 + \text{Ca} \quad \text{formula (2)}
\]

\[
\text{Fe} + 2\text{NaCl} \rightarrow \text{FeCl}_2 + 2\text{Na} \quad \text{formula (3)}
\]

\[
\text{Zn} + 2\text{NaCl} \rightarrow \text{ZnCl}_2 + 2\text{Na} \quad \text{formula (4)}
\]

\[
\text{FeCl}_2 + \text{H}_2\text{O} \rightarrow \text{HCl} + \text{Fe} \cdot (\text{OH})(\text{Cl}) \quad \text{formula (5)}
\]

\[
\text{ZnCl}_2 + \text{H}_2\text{O} \rightarrow \text{HCl} + \text{Zn} \cdot (\text{OH})(\text{Cl}) \quad \text{formula (6)}
\]

\[
\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^- \quad \text{formula (7)}
\]

\[
\{(\text{CH}_2 - \text{O})_n\}_n\text{H}^+ \rightarrow \text{decomposes to monomer} \quad \text{formula (8)}
\]

On the surface of the plate 4 made of iron or zinc-plated iron, iron oxide or zinc chloride would be generated as a result of a chemical reaction with calcium chloride in salt for thawing snow or with sodium chloride in seawater as
shown in reaction formulae (1) to (4).

In addition, iron oxide or zinc chloride thus generated reacts with water as shown in reaction formulae (5) or (6) and generates hydrochloric acid. When hydrochloric acid deposits on the set plate 3 made of POM resin, the C-O bond cleavage would take place in the POM resin due to the presence of the acid (H+), as shown in reaction formulae (7) and (8), leading to decomposition of the resin. Thus, the set plate 3 has a problem of potential surface corrosion or deterioration.

U.S. Patent 4,651,701 discloses a clamping assembly having a Z-bracket welded to the tank top wall. The tank top wall has an O-ring seated in a recess therein, to minimize vibration and seal a top plate to the tank. Between the top plate and Z-bracket there are located a locking ring and an elastomeric member.


This invention has been made to resolve the problem described above, and has as its object the provision of a fuel supply apparatus mounting structure in which the set plate for fitting a fuel supply apparatus is free from the problem of corrosion or deterioration.

DISCLOSURE OF INVENTION

The invention is defined by claim 1, the preamble of which is based on the prior art shown in Fig. 5 and Fig. 6, and described above. The dependent claims are directed towards preferred embodiments.

The present invention resides in a mounting structure for a fuel supplying apparatus for mounting a fuel pump, which pumps fuel to an internal combustion engine, to an opening hole in a fuel tank to close the opening hole, comprising, a set plate made of a synthetic resin for supporting the fuel pump and placed over the opening hole in the fuel tank, a gasket disposed between the set plate and the fuel tank, and a gasket disposed between the set plate and the plate for maintaining a fluid tight relationship therebetween and the structure is characterized in that a protective member, which is made of a material that is not reacted, dissolved or deteriorated by a reaction product generated by a chemical reaction between the plate and the set plate, is inserted between the plate and the set plate. The plate may be made of an iron sheet or zinc plated iron sheet and said set plate may be made of polyacetal resin. The protective member may be formed as an integral, one-piece structure with said gasket, a coating layer formed on said plate, a synthetic rubber or epoxy resin.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of the fuel supply apparatus being mounted to the fuel tank via a mounting structure useful for understanding the present invention;

Fig. 2 is an enlarged partial sectional side view of Section B of Fig. 1 showing the fuel supply apparatus mounting structure useful for understanding the present invention;

Fig. 3 is a partial sectional view showing another example useful for understanding the present invention;

Fig. 4 is a partial sectional view showing an embodiment of the invention of the present invention;

Fig. 5 is a sectional view of the fuel supply apparatus mounted to the fuel tank via a conventional mounting structure; and

Fig. 6 is a partial enlarged sectional view of Section A of Fig. 5 showing a conventional mounting structure.

EXAMPLE USEFUL FOR UNDERSTANDING THE INVENTION

Fig. 1 is a structural diagram showing a fuel supply apparatus useful for understanding there present invention. Fig. 2 is an enlarged view of Section B of Fig. 1. In Figs. 1 and 2, 1 is a fuel tank having an opening hole 1a having a peripheral portion 1c in its top plate 1b. A set plate 3 is provided for closing the opening hole 1a and holding a fuel pump 2 which pumps fuel to an unillustrated internal combustion engine within the fuel tank 1. The fuel pump 2 is an assembly having a pump 2a, a fuel filter 2b and the like within a case 2c and may be of any known type.

The set plate 3 is a substantially circular member made of a synthetic resin such as polyacetal resin, such as POM resin, and comprises a disc-shaped main body 3a, a support member 3b integrally extending from the main body 3a to support the fuel pump 2, and a fuel supply pipe 3c formed integrally with the main body 3a and connected to the fuel pump 2. While an outer circumferential portion 3d of the main body 3a of the set plate 3 is placed over the peripheral edge portion 1c defining the opening 1a of the fuel tank 1 so that the opening hole 1a in the top of the fuel tank 1 is
closed, an annular gasket 5 made of a synthetic rubber, such as nitrile rubber with PVC is inserted between the outer circumferential portion 3d of the set plate 3 and the peripheral edge portion 1c of the opening hole 1a of the fuel tank 1, thereby to maintain an air tight relationship between the fuel tank 1 and the set plate 3.

[0017] As best shown in Fig. 2, placed over the outer circumferential portion 3d of the set plate 3 is a ring-shaped protective member 6 having a substantially L-shaped cross section which extends not only to the top surface of the main body 3a but also to the outer circumferential surface of the gasket 5. As already described, the protective member 6 is made of a material that does not react, corrode or deteriorate despite the presence of hydrochloric acid that could be generated when iron oxide or zinc chloride reacts with water. Suitable materials for such the member include non-metallic materials that usually exhibits resistance to hydrochloric resistant and, particularly, to synthetic resins such as epoxy resin, synthetic rubber and other.

[0018] Placed on such the protective member 6 is the plate 4 made of, for instance, iron sheet or iron sheet plated with zinc and fastened to the top surface 1b of the fuel tank 1 by bolts 7 via spacers 8. In the illustrated example, the plate 4 is a ring-shaped member of a crank-shaped cross section which holds the set plate 3 at the inner peripheral edge portion 4a with the protective member 6 placed therebetween, while the outer peripheral edge portion 4b is secured to the top surface 1b of the fuel tank 1 by the bolts 7 with the spacers 8.

[0019] In this example, the protective member 6 or an intervening substance made of a synthetic rubber is inserted between the set plate 3 made of a synthetic resin such as POM resin and the plate 4 made of an iron sheet or a zinc-plated iron sheet, so that the set plate 3 and the plate 4 do not come into a direct contact with each other. Therefore, although iron and zinc in the surface of the plate 4 may react with calcium chloride contained in salt for thawing snow and sodium chloride contained in seawater according to the chemical reactions of formulae (1) to (4) to form iron oxide and zinc chloride, and the formed iron oxide and zinc chloride may react with water as shown in the chemical reactions of formulae (5) and (6) to possibly generate hydrochloric acid, since the protective member 6 made of a synthetic rubber covers the outer circumferential surface of the set plate 3, the hydrochloric acid never attaches to the set plate 3, whereby the set plate 3 is not reacted, dissolved or deteriorated.

[0020] Fig. 3 shows another sample of the mounting structure for the fuel supply apparatus useful for understanding the present invention. In the example shown in Figs. 1 and 2, the protective member 6 and the gasket 5 are separate components, while in the example shown in Fig. 3, the gasket 5 is made of the same material as the protective member 6 and is integrally formed to have a substantially U-shaped cross section, wherein the outer circumferential portion 3d of the set plate 3 is inserted in the space between the two legs of the U-shaped member. Needless to say, the gasket 5 may be extended to form an integral protective member to serving as the protective member 6 since any such member of this construction would have an effect similar to that provided by the previously discussed example for the reason described above, as long as the gasket 5 is made of a material resistant to hydrochloric acid as previously discussed.

BEST MODE FOR CARRYING OUT THE INVENTION

[0021] In the embodiment shown in Fig. 4, a coating 8 of an epoxy resin paint or the like is formed by painting for example as a protective member not on the set plate 3 but on the surface of the plate 4 facing to the set plate 3 and its vicinity. In the illustrated embodiment, the coating 8 is formed on the surface of the plate 4 facing the set plate 3 and a portion of the outer surface of the inner peripheral edge portion 4a of the plate 4. With this construction, the set plate 3 and the plate 4 do not directly contact with each other because of the coating 8, so that similar advantageous effects to those of the previous examples can be obtained and the number of components needed to be assembled can be decreased.

INDUSTRIAL APPLICABILITY

[0022] As discussed, the fuel supply apparatus mounting structure of the present invention is useful as a structure for mounting a fuel supply apparatus in a fuel tank.

Claims

1. A mounting structure for a fuel supplying apparatus for mounting a fuel pump (2) for pumping fuel to an internal combustion engine to an opening hole in a fuel tank (1) to close the opening hole (1a), comprising: a set plate (3) made of a synthetic resin for supporting said fuel pump and placed over the opening hole in said fuel tank; a gasket (5) disposed between said set plate (3) and said fuel tank; and a plate (4) for holding said set plate (3) on said fuel tank (1); characterized in that a protective member, which is made of a material that is not reacted dissolved or deteriorated by a reaction product generated by a chemical reaction between said plate (4) and set plate (3), is between said plate (4) and said set
2. A mounting structure for a fuel supplying apparatus as claimed in claim 1, wherein said plate (4) is made of an iron sheet or zinc plated iron sheet and said set plate (3) is made of polyacetal resin.

3. A mounting structure for a fuel supplying apparatus as claimed in claim 1 to 2, wherein said protective member (6) is made of a synthetic rubber.

4. A mounting structure for a fuel supplying apparatus as claimed in claim 1 or 2, wherein said protective member (6) is made of epoxy resin.

Patentansprüche

1. Befestigungsstruktur für eine Kraftstoffzufuhr-Vorrichtung zum Befestigen einer Kraftstoffpumpe (2) zum Pumpen von Kraftstoff an einen Verbrennungsmotor an ein Öffnungsloch in einem Kraftstofftank (1), um das Öffnungsloch (1a) zu schließen, mit:
   - einer Passplatte (3), die aus einem Kunstharz hergestellt ist, zum Stützen der Kraftstoffpumpe und wobei sie über dem Öffnungsloch in dem Kraftstofftank platziert ist;
   - einer Dichtung (5), die zwischen der Passplatte (3) und dem Kraftstofftank angeordnet ist; und
   - einer Platte (4) zum Halten der Passplatte (3) an dem Kraftstofftank (1); **dadjuch gekennzeichnet, dass** ein Schutzelement, das aus einem Material hergestellt ist, das nicht durch ein Reaktionsprodukt, welches durch eine chemische Reaktion zwischen der Platte (4) und der Passplatte (3) erzeugt wird, umgesetzt, aufgelöst oder verschlechtert wird, zwischen der Platte (4) und der Passplatte (3) ist; und wobei das Schutzelement (6) eine auf der Platte (4) ausgebildete Beschichtungslage ist.

2. Befestigungsstruktur für eine Kraftstoffzufuhr-Vorrichtung nach Anspruch 1, bei der die Platte (4) aus einem Eisenblech oder mit Zink plattiertem Eisenblech hergestellt ist, und die Passplatte (3) aus einem Polyacetalharz hergestellt ist.

3. Befestigungsstruktur für eine Kraftstoffzufuhr-Vorrichtung nach Anspruch 1 oder 2, bei der das Schutzelement (6) aus einem Kunstharz hergestellt ist.

4. Befestigungsstruktur für eine Kraftstoffzufuhr-Vorrichtung nach Anspruch 1 oder 2, bei der das Schutzelement (6) aus Epoxidharz hergestellt ist.

Revendications

1. Structure d’installation d’un dispositif d’alimentation en carburant pour installer une pompe de carburant (2) pour pomper le carburant dans un moteur à combustion interne vers un trou ouvrant dans un réservoir de carburant (1) pour fermer le trou ouvrant (1a), comprenant:
   - une plaque d’appui (3) réalisée en résine synthétique pour supporter ladite pompe de carburant et placer sur le trou ouvrant dans ledit réservoir de carburant;
   - une garniture d’étanchéité (5) disposée entre ladite plaque d’appui (3) et ledit réservoir de carburant; et
   - une plaque (4) pour maintenir ladite plaque d’appui (3) sur ledit réservoir de carburant (1); **caractérisée en ce que** un élément de protection, qui est réalisé en un matériau qui n’entre pas en réaction, ni est dissous ni détérioré par un produit de réaction produit par une réaction chimique entre ladite plaque (4) et ladite plaque d’appui (3), se trouve entre ladite plaque (4) et ladite plaque d’appui (3); et ledit élément de protection (6) est une couche de revêtement formée sur ladite plaque (4).

2. Structure d’installation d’un dispositif d’alimentation en carburant selon la revendication 1, où ladite plaque (4) est réalisée en une feuille de tôle ou en une feuille de tôle plaquée zinc, et ladite plaque d’appui (3) est réalisée en résine polyacétal.
3. Structure d'installation d'un dispositif d'alimentation en carburant selon la revendication 1 ou 2, où ledit élément de protection (6) est réalisé en caoutchouc synthétique.

4. Structure d'installation d'un dispositif d'alimentation en carburant selon la revendication 1 ou 2, où ledit élément de protection (6) est réalisé en résine. époxy.
REFERENCES CITED IN THE DESCRIPTION

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