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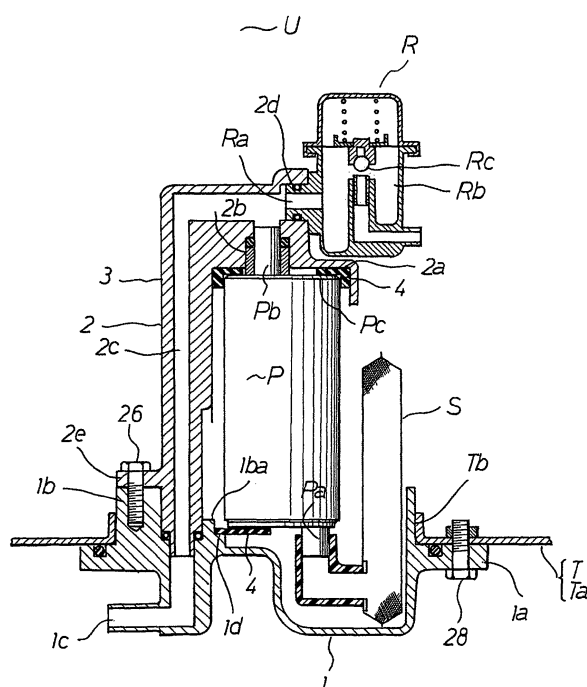
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(54) **Fuel pump unit apparatus**

(57) To reduce manufacturing cost of a fuel pump unit apparatus, a collar portion (1a), an insertion tube portion (1b) protruding upward from the collar portion (1a) and an external fuel discharge path (1c) are formed in a closing member (1), an internal fuel discharge path (2c) is provided in a holder member (2), and a regulator fuel insertion hole (2d) and a pump discharge path insertion

hole (2b) are open toward the internal fuel discharge path (2c), the closing member (1) and the holder member (2) are screwed with each other, whereby a support member (3) is formed, a fuel pump (P) with a strainer (S) is pinched by the closing member (1) and the holder member (2), a pressure regulator (R) is attached to the holder member (2), and the internal fuel discharge path (2c) is connected to the external fuel discharge path (1c).

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to a fuel pump unit apparatus which boosts fuel within a fuel tank by a fuel pump, regulates a pressure of the boosted fuel to a predetermined pressure by a pressure regulator, and is used in a fuel injection apparatus in which the fuel is supplied to an engine via a fuel injection valve.

BACKGROUND ART

[0002] A description will be given of a conventional fuel pump unit apparatus with reference to Fig. 2.

[0003] Reference symbol T denotes a fuel tank inside which a fuel is reserved. A unit insertion hole Tb is formed in a bottom portion Ta of the fuel tank T.

[0004] A fuel pump unit apparatus U is formed in the following manner. Reference numeral (20) denotes a closing member inserted into the unit insertion hole Tb of the fuel tank T so as to be arranged in the bottom portion Ta of the fuel tank T. The closing member (20) is provided with a collar portion (20a) arranged so as to be brought into contact with the bottom portion Ta of the fuel tank T, and an insertion tube portion (20b) protruding toward an upper side from the collar portion (20a) and arranged so as to be inserted into the unit insertion hole Tb.

[0005] Further, an external fuel discharge path (20c) is provided from an upper end (20ba) of the insertion tube portion toward an outer side, an upper end of the external fuel discharge path (20c) is open to the upper end (20ba) of the insertion tube portion (20b), and a lower end thereof is open to an outer side toward a side portion.

[0006] Reference numeral (21) denotes a support member fixedly arranged on the upper end (20ba) of the insertion tube portion (20b) of the closing member (20). The support member (21) is formed by a contact portion (21a) brought into contact with the upper end (20ba) of the insertion tube portion (20b), a coupling portion (21b) formed so as to be folded toward an upper side from the contact portion (21a), and a support portion (21c) formed so as to be folded toward a left side from an upper end of the coupling portion (21b).

[0007] In this case, a first through hole (21ca) and a second through hole (21cb) are provided through in the support portion. Further, reference numeral (22) denotes a hold member fixedly arranged on the support portion (21c) of the support member (21). The hold member (22) is formed by a tubular first hold member (23) arranged on the support portion (21c), and a closed-end tubular second hold member (24) arranged so as to be fitted to the first hold member (23), and a fuel chamber (25) is formed by an upper end of the first hold member (23) and a bottom portion of the second hold member (24).

[0008] Further, a pump discharge path insertion hole (23a), a fuel pipe insertion hole (23b) and a regulator fuel

insertion hole (24a) are open to an inner side of the fuel chamber (25).

[0009] The pump discharge path insertion hole (23a) and the fuel pipe insertion hole (23b) are provided from an upper end of the first hold member (23) toward a lower end, and the regulator fuel insertion hole (24a) is provided from a bottom portion of the second hold member (24) toward an upper end.

[0010] Further, a fuel introduction path Ra of a pressure regulator R is inserted to the regulator fuel insertion hole, whereby the pressure regulator R is fixed to the hold member (22).

[0011] Summarizing the above, the hold member (22) constituted by the first hold member (23) and the second hold member (24) is fixedly arranged on the support portion (21c) of the support member (21), and the pressure regulator R is fixedly arranged in the hold member (22).

[0012] Further, the contact portion (21a) of the support member (21) is screwed and fixedly arranged on the upper end (20ba) of the insertion tube portion (20b) of the closing member (20) by a screw (26). At this time, the fuel pump P is pinched by a lock step portion (20d) formed in the closing member (20) and the support portion (21c) of the support member (21), and a pump discharge path Pb is inserted into the pump discharge path insertion hole (23a) of the first hold member (23). Further, an upper end of a fuel pipe (27) is inserted to the fuel pipe insertion hole (21b) of the first hold member (23), and a lower end is inserted to the external fuel discharge path (20c) of the closing member (20).

[0013] In this case, reference symbol S denotes a strainer connected to a pump suction path Pa of the fuel pump P. The strainer S is arranged within an inner concave portion (20e) of the insertion tube portion (20b).

[0014] Further, the fuel pump unit apparatus U is arranged so as to be inserted into the fuel tank T via the unit insertion hole Tb in the bottom portion Ta of the fuel tank T, the insertion tube portion (20b) of the closing member (20) is inserted into the unit insertion hole Tb of the fuel tank T and the collar portion (20a) is arranged so as to be brought into contact with the bottom portion Ta of the fuel tank T. In the state mentioned above, the collar portion (20a) is screwed with the bottom portion Ta of the fuel tank T via a screw (28), whereby the fuel pump unit apparatus U is fixed to the fuel tank T.

[0015] In accordance with the structure mentioned above, the fuel pump P including the strainer S and the pressure regulator R are arranged within the fuel tank T, and the external fuel discharge path (20c) is arranged so as to be open to an outer side of the fuel tank T.

DISCLOSURE OF THE INVENTION. PROBLEM TO BE SOLVED BY THE INVENTION

[0016] In accordance with the conventional fuel pump unit apparatus mentioned above, the fuel reserved within the fuel tank T is filtered by the strainer S so as to be sucked into the fuel pump P via the pump suction path

Pa, and the fuel boosted by the fuel pump P is discharged into the fuel chamber (25) via the pump discharge path insertion hole (23a) from the pump discharge path Pb.

[0017] A part of the fuel within the fuel chamber (25) is introduced into the fuel chamber Rb via the fuel introduction path Ra, and regulates the pressure within the fuel chamber (25) to a predetermined fuel pressure on the basis of a pressure regulating effect of the valve body Rc.

[0018] Further, the fuel having the regulated pressure is introduced into the fuel pipe (27) from the fuel chamber (25), and is supplied to an external fuel injection valve (not shown) through the external fuel discharge path (20c).

[0019] In accordance with the conventional fuel pump unit apparatus mentioned above, it is necessary to prepare the support member (21), the hold member (22) constituted by the first hold member (23) and the second hold member (24), and the fuel pipe (27). Accordingly, the number of parts and assembling man hour are increased, and it is impossible to effectively reduce a manufacturing cost.

[0020] Further, it is necessary to hold an airtightness between the fuel pipe (27) and the fuel pipe insertion hole (23b) of the first hold member (23), and an airtightness between the first hold member (23) and the second hold member (24), the number of seal members such as O-rings or the like is increased and an airtightness inspection step is increased, thereby obstructing the reduction of the manufacturing cost.

[0021] Further, the support member (21) is formed by pressing a plate material, and it is necessary to employ a thick plate material for securing sufficient rigidity. Accordingly, it is hard to perform pressing for the support member (21) and it is impossible to reduce the manufacturing cost.

[0022] A fuel pump unit apparatus in accordance with the present invention is made by taking the problems mentioned above into consideration, and an object of the present invention is to provide the apparatus which can reduce the number of parts and assembling man hour and is inexpensive.

MEANS FOR SOLVING THE PROBLEM

[0023] In order to achieve the object mentioned above, in accordance with the present invention, there is provided a fuel pump unit apparatus comprising:

- a fuel pump boosting fuel within a fuel tank so as to discharge;
- a strainer filtering the fuel sucked into the fuel pump; and
- a pressure regulator regulating a pressure of the fuel discharged from the fuel pump to a predetermined pressure;
- the fuel pump, the strainer and the pressure regulator being attached to a support member; and

the support member being fixedly arranged in the fuel tank,

wherein the support member is formed by a closing member closing a unit insertion hole open to a bottom portion of the fuel tank, and a holder member fixedly arranged on the closing member,

wherein a collar portion brought into contact with the bottom portion of the fuel tank, an insertion tube portion protruding toward an upper side from the collar portion and inserted into the unit insertion hole, and an external fuel discharge path open toward an outer side from an upper end of the insertion tube portion via the collar portion are formed in the closing member,

wherein the holder member is provided with an internal fuel discharge path in which one end is open to a pump discharge path of the fuel pump and the other end is open to the external fuel discharge path, a pressure regulator arranged so as to be connected to the internal fuel discharge path, and a pump support step portion facing to an upper end surface of the fuel pump,

wherein the fuel pump including the strainer is pinched by the closing member and the pump support step portion of the holder member by fixedly arranging the holder member to the closing member, and

wherein the pump discharge path of the fuel pump is arranged so as to be connected to one end of the internal fuel discharge path and the other end of the internal fuel discharge path is arranged so as to be connected to the external fuel discharge path.

EFFECT OF THE INVENTION

[0024] In accordance with the fuel pump unit apparatus on the basis of the present invention, it is possible to pinch the fuel pump provided with the strainer between the closing member and the holder member by fixedly arranging the holder member to the closing member, the pump discharge path of the fuel pump and the fuel introduction path of the pressure regulator are connected to the internal fuel discharge path formed within the holder member, and the internal fuel discharge path is connected to the external fuel discharge path of the closing member.

[0025] In accordance with the structure mentioned above, since the support member of the fuel pump unit apparatus is formed by the closing member and the holder member, and in particular, the pump discharge path of the fuel pump and the fuel introduction path of the pressure regulator are connected to the internal fuel discharge path formed within the holder member and the internal fuel discharge path is connected to the external fuel discharge path, it is possible to reduce the number of parts, assembling man hour and the airtightness inspection steps. Accordingly, it is possible to provide an inexpensive and compact fuel pump unit apparatus.

[0026] Further, since the internal fuel discharge path is integrally formed in the inner side, the holder member is formed in accordance with an injection molding. Accordingly, it is possible to easily support the fuel pump and the pressure regulator as well as it is possible to properly improve rigidity of the holder member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

Fig. 1 is a vertical sectional view of a main portion showing an embodiment of a fuel pump unit apparatus in accordance with the present invention; and Fig. 2 is a vertical sectional view of a main portion showing a conventional fuel pump unit apparatus.

BEST MODE FOR CARRYING OUT THE INVENTION

[0028] A description will be given below of an embodiment of a fuel pump unit apparatus in accordance with the present invention with reference to Fig. 1. In this case, since the fuel tank T, the fuel pump P and the pressure regulator R have the same structure as those in Fig. 2, a description thereof will be omitted by using the same reference numerals.

[0029] Reference numeral (1) denotes a closing member inserted into the unit insertion hole Tb of the fuel tank T so as to be arranged in the bottom portion Ta of the fuel tank T. The closing member (1) is provided with a collar portion (1a) arranged so as to be brought into contact with the bottom portion Ta of the fuel tank T, and an insertion tube portion (1b) protruding toward an upper side from the collar portion (1a) and arranged so as to be inserted into the unit insertion hole Tb.

[0030] Further, an external fuel discharge path (1c) is provided from an upper end (1ba) of the insertion tube portion toward an outer side, an upper end of the external fuel discharge path (1c) is open to the upper end (1ba) of the insertion tube portion (1b), and a lower end thereof is open to an outer side toward a side portion.

[0031] Reference numeral (2) denotes a holder member. A pump support step portion (2a) facing to the upper end surface Pc of the fuel pump P is formed in an upper side of the holder member (2), and an internal fuel discharge path (2c) is provided from the pump support step portion (2a) via a pump discharge path insertion hole (2b).

[0032] The internal fuel discharge path (2c) is formed in an inverse-L shape within the holder member (2) and is open toward a lower side.

[0033] Further, a regulator fuel insertion hole (2d) is formed so as to be open to the internal fuel discharge path (2c).

[0034] In the present embodiment, the regulator fuel insertion hole (2d) is formed so as to be open toward a right side from the internal fuel discharge path (2c).

[0035] In this case, reference symbol (2e) denotes a collar portion formed toward a left side from a lower side

of the holder member (2) so as to face to the upper end (1ba) of the insertion tube portion (1b).

[0036] Further, the fuel introduction path Ra of the pressure regulator R is inserted to the regulator fuel insertion hole (2d) of the holder member (2), and the pressure regulator R is fixed to the holder member (2).

[0037] Next, the collar portion (2e) of the holder member (2) is arranged on the upper end (1ba) of the insertion tube portion (1b) of the closing member (1), and the holder member (2) is screwed and fixed to the closing member (1) by a screw (26).

[0038] In accordance with the structure mentioned above, the support member (3) integrated by the holder member (2) and the closing member (1) is formed. At this time, the lower end of the internal fuel discharge path (2c) is arranged so as to be connected to the external fuel discharge path (1c) of the closing member (1).

[0039] Further, the fuel pump P is pinched between the pump support step portion (2a) of the holder member (2) and the support step portion (1d) of the closing member (1) via a packing (4), and the pump discharge path Pb is arranged so as to be inserted into the discharge path insertion hole (2b).

[0040] In this case, the strainer S is connected to the pump inflow path Pa of the fuel pump P, and the strainer S is arranged in an inner side of the insertion tube portion (1b).

[0041] Accordingly, the fuel flow path constituted by the internal fuel discharge path (2c) and the external fuel discharge path (1c) is formed within the support member (3), and the pump discharge path Pb of the fuel pump P and the fuel introduction path Ra of the pressure regulator R are connected toward the internal fuel discharge path (2c).

[0042] The support member (3) structured in the manner mentioned above is arranged within the fuel tank T, the insertion tube portion (1b) of the closing member (1) is arranged so as to be inserted into the unit insertion hole Tb of the fuel tank T, and the collar portion (1a) is arranged on the bottom portion Ta of the fuel tank T. In this state, the collar portion (1a) is screwed and fixed toward the bottom portion Ta of the fuel tank T by a screw (28).

[0043] In accordance with the structure mentioned above, the unit insertion hole Tb of the fuel tank T is closed by the collar portion (1a) of the closing member (1), the fuel pump P including the strainer S attached to the holder member (2) and the pressure regulator R are arranged within the fuel tank T, and the external fuel discharge path (1c) connected to the internal fuel discharge path (2c) provided in the holder member (2) is arranged so as to be open toward the outer portion from the closing member (1).

[0044] Accordingly, the fuel pump P sucks the fuel within the fuel tank T, from which a foreign material is removed by the strainer S, via the pump suction path Pa and boosts the fuel within the fuel pump P, and the boosted fuel is discharged into the internal fuel discharge path

(2c) via the pump discharge path Pb.

[0045] Further, a part of the fuel within the internal fuel discharge path (2c) is introduced into the pressure regulator R via the regulator fuel introduction hole (2d), a pressure thereof is regulated to a desired fuel pressure by the pressure regulator R, and the fuel having the regulated pressure is supplied toward the external portion via the internal fuel discharge path (2c) and the external fuel discharge path (1c).

[0046] In accordance with the fuel pump unit apparatus U on the basis of the present invention, since the support member (3) is formed by the closing member (1) and the holder member (2), the internal fuel discharge path (2c) is formed within the holder member (2), the pressure regulator R is attached to the holder member (2), and the fuel pump P is pinched between the closing member (1) and the holder member (2), it is possible to reduce the number of parts and assembling man hour in comparison with the conventional fuel pump unit apparatus, whereby it is possible to largely reduce the manufacturing cost.

[0047] Further, the holder member (2) is formed in accordance with an injection molding by forming the internal fuel discharge path (2c) within the holder member (2), whereby it is possible to very simply increase rigidity of the holder member and it is possible to arrange the holder member compact.

[0048] Further, it is possible to reduce the airtightness inspection steps of the seal member and the seal portion between parts, on the basis of the reduction of the number of the parts. This is effective for reducing the manufacturing cost.

external fuel discharge path (1c) open toward an outer side from an upper end (1ba) of the insertion tube portion (1b) via the collar portion (1a) are formed in said closing member, wherein the holder member (2) is provided with an internal fuel discharge path (2c) in which one end is open to a pump discharge path (Pb) of the fuel pump (P) and the other end is open to the external fuel discharge path (1c), a pressure regulator (R) arranged so as to be connected to the internal fuel discharge path (2c), and a pump support step portion (2a) facing to an upper end surface (Pc) of the fuel pump (P), wherein the fuel pump (P) including the strainer (S) is pinched by the closing member (1) and the pump support step portion (2a) of the holder member (2) by fixedly arranging the holder member (2) to the closing member (1), and wherein the pump discharge path (Pb) of the fuel pump (P) is arranged so as to be connected to one end of the internal fuel discharge path (2c) and the other end of the internal fuel discharge path (2c) is arranged so as to be connected to the external fuel discharge path (1c).

Claims

1. A fuel pump unit apparatus comprising:

a fuel pump boosting fuel within a fuel tank so as to discharge;
a strainer filtering the fuel sucked into the fuel pump; and
a pressure regulator regulating a pressure of the fuel discharged from the fuel pump to a predetermined pressure;
the fuel pump, the strainer and the pressure regulator being attached to a support member; and
said support member being fixedly arranged in the fuel tank,
wherein the support member (3) is formed by a closing member (1) closing a unit insertion hole (Tb) open to a bottom portion (Ta) of the fuel tank (T), and a holder member (2) fixedly arranged on the closing member (1),
wherein a collar portion (1a) brought into contact with the bottom portion (Ta) of the fuel tank (T), an insertion tube portion (1b) protruding toward an upper side from the collar portion (1a) and inserted into the unit insertion hole (Tb), and an

FIG. 1

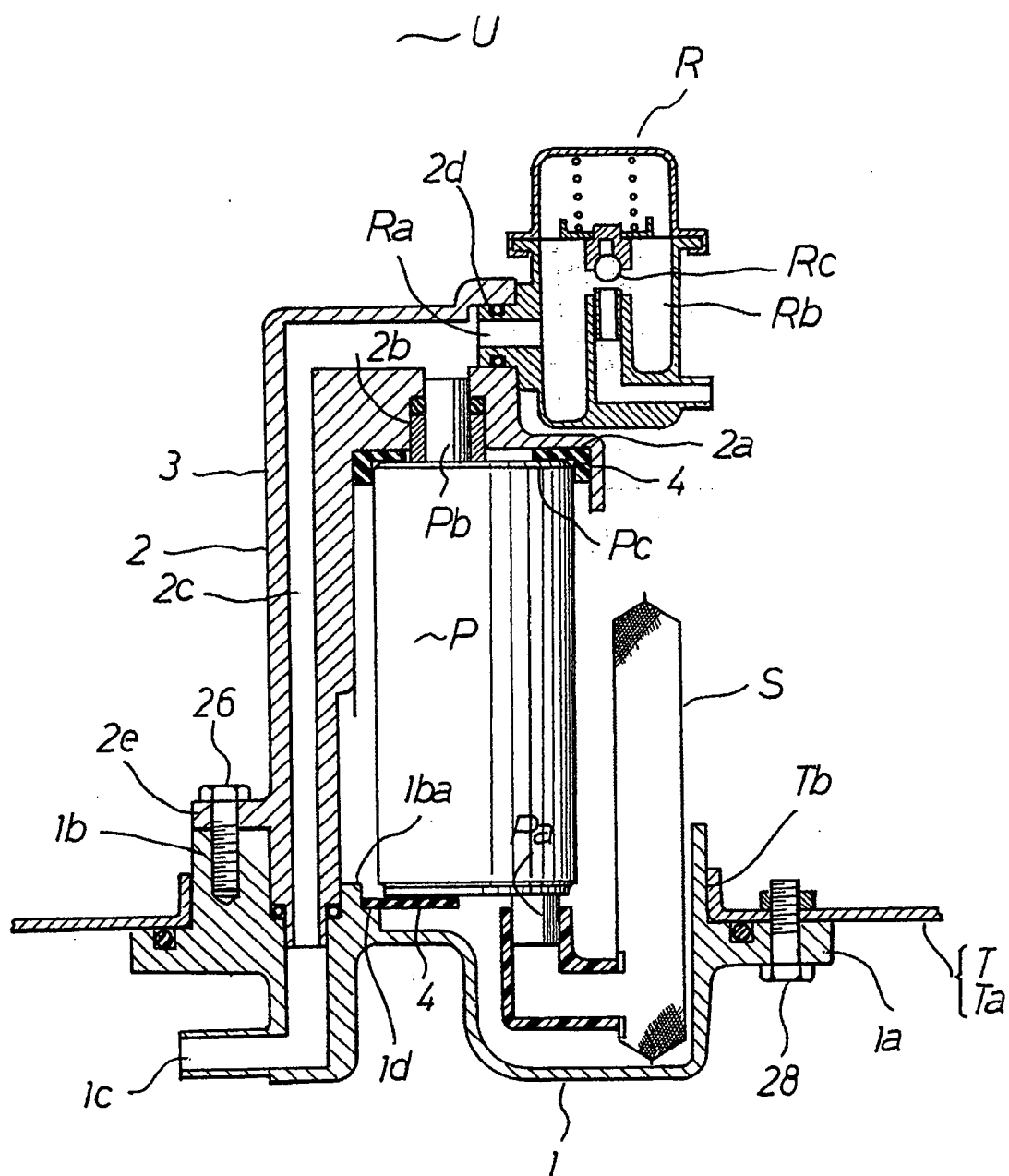


FIG. 2

