

(19)



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(11)

EP 1 299 636 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
17.05.2006 Bulletin 2006/20

(21) Application number: **01947728.0**

(22) Date of filing: **03.07.2001**

(51) Int Cl.:
F02M 37/10 (2006.01)

(86) International application number:
PCT/IB2001/001258

(87) International publication number:
WO 2002/002925 (10.01.2002 Gazette 2002/02)

(54) **APPARATUS FOR THE SUPPLY OF FUEL TO AN INTERNAL COMBUSTION ENGINE,
PARTICULARLY FOR MOTOR VEHICLES**

KRAFTSTOFFVERSORGUNGSEINRICHTUNG FÜR EINE BRENNKRAFTMASCHINE,
INSBESONDERE FÜR KRAFTFAHRZEUGE

APPAREIL D'ALIMENTATION EN CARBURANT DE MOTEUR A COMBUSTION INTERNE, EN
PARTICULIER POUR VEHICULES A MOTEUR

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

(30) Priority: **05.07.2000 IT TO20000678**

(43) Date of publication of application:
09.04.2003 Bulletin 2003/15

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(1997-08-26) -& DATABASE WPI Section PQ,
Week 200130 Derwent Publications Ltd., London,
GB; Class Q53, AN 1997-475937 XP002180826 &
JP 09 222954 A (UNISIA JECS CORP), 26 August
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Description

[0001] The present invention relates to apparatus for the supply of fuel to an internal combustion engine, in particular for a motor vehicle.

[0002] At present systems for the supply of fuel to an internal combustion engine of a motor vehicle are essentially divided into two types, that is with and without return flow of fuel from the engine to the tank.

[0003] Currently, there are provided entirely different fuel supply apparatus for these two fuel supply systems which, nevertheless, in both cases comprise a pump, a filter and a pressure regulator.

[0004] The provision of fuel supply apparatus of different types is technically and economically inconvenient.

[0005] JP 09 222 054 A proposes a system that can be used in both cases, with or without return flow, by changing location of the pressure regulator.

[0006] The object of the present invention is therefore to provide fuel supply apparatus structured in such a way that, with a limited number of relatively simple operations it is possible to configure it for use in a fuel supply system of the type with return flow or for use in a fuel supply system without return flow.

[0007] This and other objects are achieved according to the invention by fuel supply apparatus the main characteristics of which are defined in the attached Claim 1.

[0008] Further characteristics and advantages of the invention will become apparent from the following detailed description given purely by way of non-limitative example, with reference to the attached drawings, in which:

Figure 1 is a perspective view of fuel supply apparatus according to the invention;

Figure 2 is a partially exploded perspective view of the apparatus shown in Figure 1;

Figure 3 is a partial perspective view of the apparatus of the preceding Figures and shows the relative arrangement of various devices of which it is composed;

Figures 4 and 5 are schematic representations which show the fuel supply apparatus according to the invention in two different configurations for use in a fuel supply system of the type with and without return flow.

[0009] In the drawings the apparatus for supply of fuel to an internal combustion engine (not illustrated) is generally indicated 1.

[0010] The apparatus 1 comprises a closure element 2 essentially in the form of a flanged plug, intended to be fixed in a liquid-tight manner in an aperture 3 (Figures 4 and 5) formed in a lower wall 4a of a fuel tank 4. As better seen in Figures 2 and 3, two mushroom shape retainer members 5 are formed in the face of the closure element intended to face into the tank.

[0011] From the same face of the closure element 2

projects a hollow tubular formation 6 in the top of which is formed a passage 7 (Figures 2, 4 and 5). Upwardly from the top of the formation 6 adjacent this aperture 7 project two projections 8.

[0012] A further hollow tubular formation 9 extends in a similar manner from the closure element 2 towards the interior of the tank 4 (see Figures 2, 4 and 5) and its distal portion 9a is upwardly closed and shaped in the form of an hydraulic connector.

[0013] A multi-pole electric connector 10 (Figure 3) is sealingly engaged in an aperture 11 (Figure 2) formed in the closure element 2.

[0014] The apparatus 1 further comprises an electric pump 13 with a lower suction connector 13a, and an upper delivery connector 13b (Figure 2). One end of a tube 14 is engaged on this delivery connector 13b, the other end of which is connected to the inlet connector 15a of a filter 15. This filter has an outlet connector 15b (Figure 2) engaged in a connector tube 16.

[0015] A support structure essentially constituted by a substantially annular wall is generally indicated 17. Close to its lower end the support structure 17 has a pair of ears 18 (of which only one is visible in Figures 1 and 2) provided with respective apertures 19 (Figure 2) into which the retainer members 5 of the closure element 2 can be engaged.

[0016] Together with the closure element 2 the structure or wall 17 forms a settling chamber within the fuel tank 4.

[0017] An hydraulic pressure regulator device is generally indicated 20 in the drawings. In the illustrated embodiment this device comprises a connection and support housing 20a into which a pressure regulator indicated 20b is fitted.

[0018] In the exemplary embodiment illustrated the connection and support housing 20a has an upper inlet connector 20c (Figures 2, 4 and 5) preferably formed blind or closed. The housing 20a further has a lower inlet/outlet connector 20d which can be sealingly coupled with the passage or opening 7 of the lower closure element 2. In the housing 20a, between the connectors 20c and 20d is defined a chamber which communicates with the internal region at a tubular portion 20e of the same housing, which terminates with a flange 20f. The tubular portion 20e has at least one longitudinal lower slot 20g.

[0019] The pressure regulator 20b has an inlet 20h and an outlet connector 20i essentially at 90° to one another. This pressure regulator 20b is fitted in the tubular portion 20e of the housing 20a and has an annular flange 201 which contacts the flange 20f of this tubular portion. The inlet 20h of the regulator 20b extends into the tubular portion 20e of the holder 20a, whilst the outlet connector 20i extends downwardly through the slot 20g of this housing.

[0020] The housing 20a further has two lateral projections 20m (Figures 2 and 3) having respective cut-out portions which can engage with, interference on the protuberances 8 of the formation 6 of the closure element 2.

[0021] The fuel supply apparatus 1 further comprises a Venturi tube device 21 intended to be coupled to the outlet connector 20i of the pressure regulator 20b.

[0022] A fuel level detector device for detecting the level of fuel in the tank is generally indicated 22 in Figures 1 and 2. The device, of type known per se, is in particular intended to provide electrical signals indicative of the fuel level, between a predetermined maximum level and a predetermined minimum level (or reserve level).

[0023] The level detector 22 has an essentially cylindrical body 22a fitted in a support housing 22b of substantially tubular shape.

[0024] The support wall or structure 17 has a cut-out 23 which extends downwardly from its upper edge. From the inner surface of this wall 17 adjacent to the vertical sides of the cut-out 23 extend two guides 24 which can receive and retain in mutual engagement the end flanges 20f and 20l, respectively, of the connection and support housing 20a and the pressure regulator 20b as seen in particular in Figure 1.

[0025] The support structure 17 further has an arcuate wall portion 25 (Figures 1 and 2) internally provided with resilient retainer projections 26 able to clamp and retain the electric pump 13.

[0026] The support housing 22b of the fuel level detector device 22 has a lower tab 22c (Figure 2) engagable in a corresponding seat 27 provided adjacent the upper edge of the support wall or structure 17 (Figure 2).

[0027] The apparatus described above can be arranged in a first or a second configuration, for use in a fuel supply system of the type with and, respectively, without return flow.

[0028] These configurations are schematically illustrated in Figure 4 and 5.

[0029] The configuration shown in Figure 4 relates to, use of the apparatus 1 in a fuel supply system of the type without return flow.

[0030] In this configuration the outlet 15b from the filter 15 is connected, via the tube 16, to the inlet connector 20c (preliminary opened) of the pressure regulator 20. In operation in this configuration the pump 13 supplies fuel towards the tube 14, the filter 15, the tube 16, the pressure regulator 20 and this flow of fuel through the passage 7 of the closure element 2 (via a tube not illustrated) is adapted to the requirements of the internal combustion engine. The fuel which may be in excess is recirculated to the interior of the tank 4 through the pressure regulator 20b and in particular through its outlet connector 20i and the Venturi duct device 21.

[0031] In the configuration shown in Figure 4 the connector or passage 9a of the closure element 2 is closed.

[0032] The configuration shown in Figure 5 is, on the other hand, envisaged for use in a fuel supply system of the type having return flow. In this configuration the outlet 15b of the filter 15 via the tube 16 is connected to the passage or connector 9a (preliminary opened) of the closure element 2 in order to deliver fuel to the internal combustion engine through this connector. The electric con-

connector 20c of the pressure regulator 20 is on the other hand left closed in such a way that the said pressure regulator is able to receive and to re-emit into the settling chamber 17 a flow of excess fuel which returns from the internal combustion engine through the aperture 7 of the lower closure element and the inlet/outlet connector 20d of the pressure regulator. This flow of returning fuel passes through the pressure regulator 20b and is reintroduced into the settling chamber through the outlet connector 20i of this pressure regulator, and the associated Venturi duct device 21.

[0033] As anticipated above, the fuel supply apparatus according to the invention can, with simple and rapid operations, be set in one or the other configuration of use depending on whether it is intended to be used in a fuel supply system of the type with or without return flow.

[0034] Naturally, the principle of the invention remaining the same, the embodiments and the details of construction can be widely varied with respect to what has been described and illustrated purely by way of non-limitative example, without by this departing from the ambit of the invention as defined in the annexed claims.

Claims

- Apparatus (1) for the supply of fuel to an internal combustion engine, particularly for a motor vehicle, comprising
 - a closure element (2) intended for liquid-tight connection to the aperture (3) of a wall (4a) of a fuel tank (4) and in which are formed a first and a second passage (7; 9, 9a),
 - a support structure (17) intended to be fixed on the said closure element (2) within the tank (4);
 - a pump (13) carried by the said structure (17) and the delivery (13b) of which is connected to a filter (15);
 - a pressure regulator device (20) likewise carried by the said structure (17) and having an inlet connector (20c), an inlet/outlet connector (20d) connected to the first passage (7) of the closure element (2) and an outlet (20i);
 the apparatus being such that the apparatus (1) can be arranged in a first or in a second configuration for use in a fuel supply system of the type with or without return flow respectively;
 - in the first configuration the output of the filter (15) being connected with the second passage (9, 9a) of the closure element (2) for the delivery of fuel to the engine through the said second passage (9, 9a); the inlet connector (20c) of the pressure regulator (20) being closed, in such a way that the said pressure regulator (20) is able to receive a return flow of fuel from the engine;
 - in the second configuration the second passage (9, 9a) of the closure element (2) being closed and the filter output (15) being connected to the inlet connec-

tor (20c) of the pressure regulator (20) to supply fuel to the engine through the said first passage (7) of the closure element (2).

2. Apparatus according to Claim 1, in which the second passage (9, 9a) of the closure element (2) and the inlet connector (20c) of the pressure regulator (20) are selectively openable, for the achievement of the said first and the said second configuration of use respectively. 5
3. Apparatus according to any preceding claim, in which the support structure (17) is able to define, together with the said closure element (2), a settlement chamber within the tank (4). 10
4. Apparatus according to any preceding claim, in which the said pressure regulator device (20) is anchored to the closure element (2) along a first direction, and is lodged in the said support structure (17) in a manner restrained along another direction forming an angle with the said first direction. 15
5. Apparatus according to any preceding claim, further comprising a device for detecting the level of fuel in the tank fixed to the upper portion of the said support structure (17). 20
6. Apparatus according to Claim 3, in which the wall (17) of the said settlement chamber is provided externally with at least one resilient retainer projection (26) operable to grip and retain the pump (13). 25
7. Apparatus according to any preceding claim, in which a Venturi tube device (21) is coupled to the outlet (20i) of the pressure regulator (20). 30

Patentansprüche

1. Apparat (1) für die Zufuhr von Kraftstoff zu einem Verbrennungsmotor, insbesondere für ein Kraftfahrzeug, umfassend
ein Verschlusselement (2), das für eine flüssigkeitsdichte Verbindung mit der Öffnung (3) in einer Wand (4a) eines Kraftstofftanks (4) bestimmt ist und in dem ein erster und ein zweiter Durchgang (7; 9, 9a) gebildet sind,
eine Stützkonstruktion (17), die dazu bestimmt ist, am Verschlusselement (2) innerhalb des Tanks (4) befestigt zu werden;
eine Pumpe (13), die von der Konstruktion (17) getragen wird und deren Ableitung (13b) an einem Filter (15) angeschlossen ist;
eine Druckreglervorrichtung (20), die ebenfalls von der Konstruktion (17) getragen wird und ein Eingangsverbindungsstück (20c), ein am ersten Durchgang (7) des Verschlusselements (2) angeschlosse-

nes Eingangs/Ausgangsverbindungsstück (20d) und einen Ausgang (20i) aufweist;
wobei der Apparat solcherart ist, dass der Apparat (1) in einer ersten oder in einer zweiten Konfiguration angeordnet werden kann, und zwar zur Verwendung in einem Kraftstoffzufuhrsystem vom Typ mit bzw. ohne Rückfluss;
wobei der Ausgang des Filters (15) in der ersten Konfiguration mit dem zweiten Durchgang (9, 9a) des Verschlusselements (2) verbunden ist, um durch den zweiten Durchgang (9, 9a) Kraftstoff zum Motor zu liefern; wobei das Eingangsverbindungsstück (20c) des Druckreglers (20) solcherart geschlossen wird, dass der Druckregler (20) vom Motor einen Rückfluss an Kraftstoff erhalten kann;
wobei der zweite Durchgang (9, 9a) des Verschlusselements (2) in der zweiten Konfiguration geschlossen ist und der Filterausgang (15) am Eingangsverbindungsstück (20c) des Druckreglers (20) angeschlossen ist, um dem Motor durch den ersten Durchgang (7) des Verschlusselements (2) Kraftstoff zuzuführen.

2. Apparat gemäß Anspruch 1, wobei der zweite Durchgang (9, 9a) des Verschlusselements (2) und das Eingangsverbindungsstück (20c) des Druckreglers (20) zur Erzielung der ersten bzw. der zweiten Verwendungskonfiguration selektiv zu öffnen sind.
3. Apparat gemäß irgendeinem vorhergehenden Anspruch, wobei die Stützkonstruktion (17) in der Lage ist, zusammen mit dem Verschlusselement (2) eine Absetzkammer innerhalb des Tanks (4) zu definieren.
4. Apparat gemäß irgendeinem vorhergehenden Anspruch, wobei die Druckreglervorrichtung (20) entlang einer ersten Richtung am Verschlusselement (2) verankert ist und in der Stützkonstruktion (17) in einer entlang einer anderen Richtung eingeschränkten Weise befestigt ist, und zwar unter Bildung eines Winkels mit der ersten Richtung.
5. Apparat gemäß irgendeinem vorhergehenden Anspruch, weiters umfassend eine Vorrichtung zum Ermitteln des Kraftstoffstands im Tank, welche am oberen Teil der Stützkonstruktion (17) befestigt ist.
6. Apparat gemäß Anspruch 3, wobei die Wand (17) der Absetzkammer außen mit zumindest einem elastischen Haltevorsprung (26) versehen ist, der dazu betriebsfähig ist, die Pumpe (13) zu erfassen und festzuhalten.
7. Apparat gemäß irgendeinem vorhergehenden Anspruch, wobei am Ausgang (20i) des Druckreglers (20) eine Venturirohr-Vorrichtung (21) angekoppelt ist.

Revendications

1. Appareil (1) d'alimentation en carburant d'un moteur à combustion interne, particulièrement pour un véhicule à moteur, comprenant :
 - un élément de fermeture (2) destiné au raccordement étanche aux liquides avec l'ouverture (3) d'une paroi (4a) d'un réservoir de carburant (4) et dans lequel sont formés un premier et un second passages (7 ; 9, 9a) ;
 - une structure de support (17) destinée à être fixée sur ledit élément de fermeture (2) à l'intérieur du réservoir (4) ;
 - une pompe (13) portée par ladite structure (17) et dont le refoulement (13b) est relié à un filtre (15) ;
 - un dispositif régulateur de pression (20) porté de manière similaire par ladite structure (17) et ayant un raccord d'entrée (20c), un raccord d'entrée/sortie (20d) relié au premier passage (7) de l'élément de fermeture (2) et une sortie (20i) ;
 - l'appareil (1) étant tel qu'il puisse être agencé suivant une première ou une seconde configuration destinée à être utilisée dans un système d'alimentation en carburant du type comportant ou non un écoulement de retour, respectivement ;
 - dans la première configuration, la sortie du filtre (15) étant reliée au second passage (9, 9a) de l'élément de fermeture (2) pour refouler le carburant au moteur à travers ledit second passage (9, 9a) ; le raccord d'entrée (20c) du régulateur de pression (20) étant fermé de telle sorte que ledit régulateur de pression (20) soit capable de recevoir un écoulement de retour du carburant provenant du moteur ;
 - dans la seconde configuration, le second passage (9, 9a) de l'élément de fermeture (2) étant fermé et la sortie (15) du filtre étant reliée au raccord d'entrée (20c) du régulateur de pression (20) afin d'alimenter en carburant au moteur à travers ledit premier passage (7) de l'élément de fermeture (2).
2. Appareil selon la revendication 1, dans lequel le second passage (9, 9a) de l'élément de fermeture (2) et le raccord d'entrée (20c) du régulateur de pression (20) sont susceptibles d'être actionnés de manière sélective, pour obtenir respectivement ladite première et ladite seconde configurations d'utilisation.
3. Appareil selon l'une quelconque des revendications précédentes, dans lequel la structure de support (17) est capable de définir, avec ledit élément de fermeture (2), une chambre de décantation à l'intérieur du réservoir (4).
4. Appareil selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif régulateur de pression (20) est ancré à l'élément de fermeture (2) le long d'une première direction, et est logé dans ladite structure de support (17) de manière retenue le long d'une autre direction en formant un angle avec ladite première direction.
5. Appareil selon l'une quelconque des revendications précédentes, comprenant en outre un dispositif destiné à détecter le niveau de carburant dans le réservoir fixé à la partie supérieure de ladite structure de support (17).
6. Appareil selon la revendication 3, dans lequel la paroi (17) de ladite chambre de décantation est munie à l'extérieur d'au moins une saillie élastique de retenue (26) susceptible d'être actionnée pour saisir et retenir la pompe (13).
7. Appareil selon l'une quelconque des revendications précédentes, dans lequel un dispositif de tube de Venturi (21) est couplé à la sortie (20i) du régulateur de pression (20).

FIG. 2

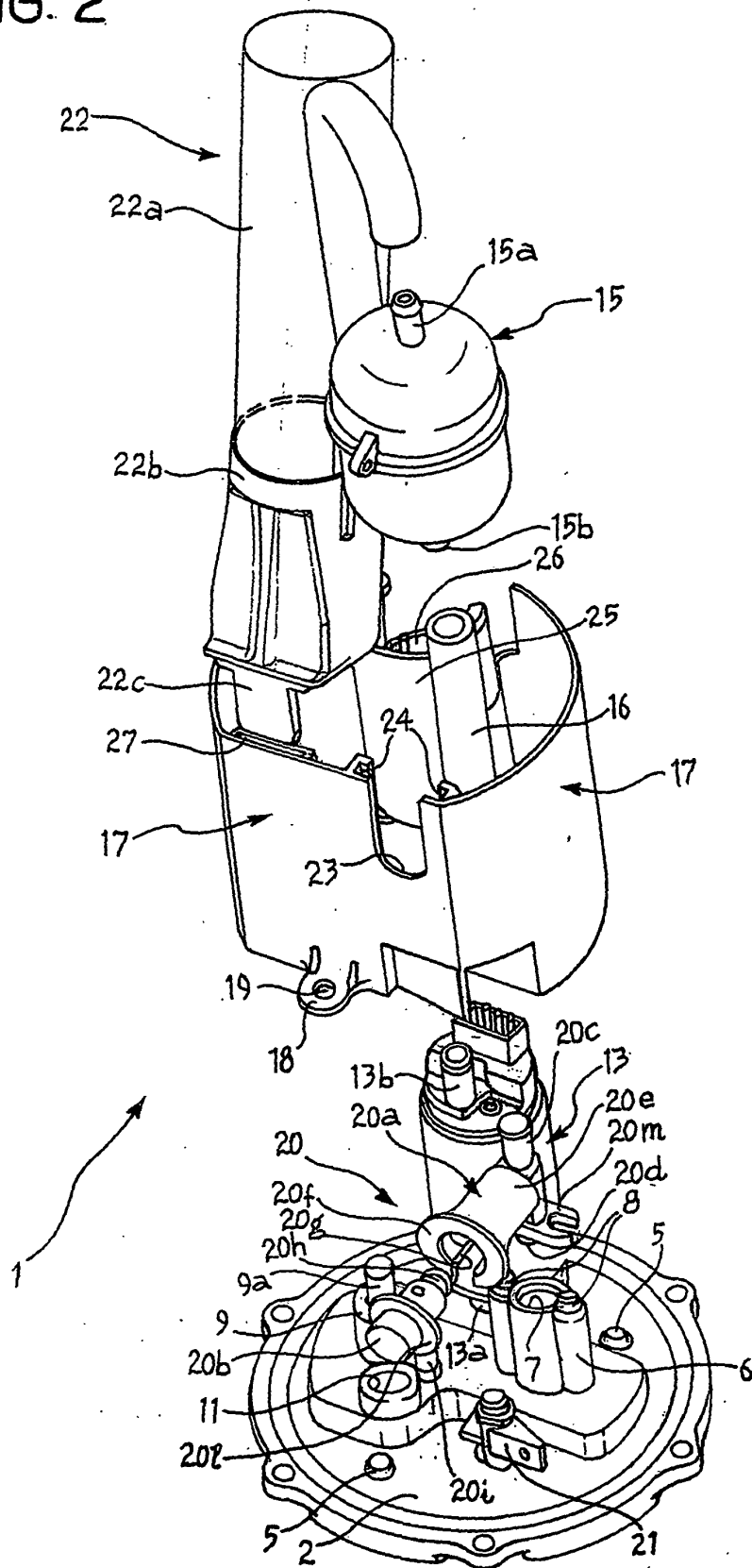


FIG. 3

