(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 103 516 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
20.08.2008 Bulletin 2008/34

(51) Int Cl.:
B67D 5/04 *(2006.01)*

(21) Application number: **00850199.1**

(22) Date of filing: **24.11.2000**

(54) **Vapour recovery device for a fuel filling installation**

Gasrückführungsvorrichtung für Tankstellen

Dispositif de récupération de vapeurs pour station à essence

(84) Designated Contracting States:
DE FR GB IT SE

(30) Priority: **26.11.1999 SE 9904304**

(43) Date of publication of application:
30.05.2001 Bulletin 2001/22

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Description

[0001] The present invention relates to a device for a fuel filling installation. such as disclosed in EP-A-0 511 599, in the embodiment corresponding to fig. 3, according to the preamble of claim 1

[0002] US-A-3,826,291 discloses a filling system for vehicle fuel, said system comprising means for recovering fuel vapour so as to prevent it from polluting the atmosphere. The system comprises a fuel pump and a fuel meter with an output shaft which is connected to a fuel vapour pump which draws in vapour from the tank of the vehicle. The connection is carried out by means of gear wheels in such manner that the volume of dispensed fuel corresponds to the volume of drawn-in vapour. As an example of a vapour pump, mention is made of a wing pump. Gear wheel transmissions are complicated and expensive.

[0003] As vapour pump in such filling systems, use has also been made of piston pumps which are controlled by a variable-speed motor and which have a crank for transferring the rotation of the motor to the piston shaft. The motion of the piston is used on one side only, i.e. the piston is single-acting. Vapour and any entrained fuel droplets are to be avoided on the other side, the crank side of the piston, which means that the piston and the piston shaft must be well sealed.

[0004] US-5,123,817 discloses a filling system where a double-acting piston pump is used as vapour pump. A common shaft is connected between the piston pump and a fuel pump. This permits a coordinated direct operation of the fuel pump and the vapour pump.

[0005] A similar construction of a filling system is disclosed in US-4,223,706 in which a flow of fuel through a hydraulic motor initiates the return flow of vapour through a vapour pump. In this construction, a direct operation, i.e. a common drive shaft, is available between the hydraulic motor and the vapour pump. An overflow valve is arranged between the inlet opening of the vapour pump and the fuel container of the filling system to equalise pressure changes in the system.

[0006] Drawbacks of the above-mentioned filling systems are that they have a complicated construction, which results in high production costs. Moreover, the vapour pumps and the motors are bulky in the filling systems.

[0007] An object of the invention is to obviate the above drawbacks of prior art. This and other objects that will appear from the following specification are achieved by means of a vapour recirculating device according to the independent claim. Preferred embodiments according to the invention are defined by the dependent claims.

[0008] By arranging at least two vapour pumps in a pump housing component, a saving in space is achieved in the fuel filling installation. Moreover, the common direct operation of the vapour pumps results in a simple structure.

[0009] In a preferred embodiment, the pump housing component forms a common pump housing for the two vapour pumps.

[0010] In a further preferred embodiment, each filling unit has a fuel meter and a vapour pump, thereby obtaining improved regulation of the vapour recirculation.

[0011] The invention will now be described in more detail with reference to the accompanying drawings in which

Fig. 1 shows a prior-art system for filling the tank of a vehicle, and
Fig. 2 illustrates the vapour pumping means according to an embodiment of the invention.

[0012] Reference is made to Fig. 1, which illustrates a prior-art fuel filling installation for filling the tank of a vehicle with liquid vehicle fuel and having means for recovery of fuel vapour, see US-3,826,291. For transferring the liquid fuel from a fuel container 1 to a vehicle tank 2 there is arranged a fuel pump 3 driven by a motor, a fuel volume meter 4, a delivery nozzle 5 and a fuel conduit 6 interconnecting the components 1-5. The fuel volume meter 4 has a pulse generator 7 connected to a display 8 for presenting, inter alia, the filled volume of fuel and the price thereof.

[0013] The delivery nozzle 5 has an arrangement for recirculating fuel vapour from the vehicle tank 2 to the container 1, said arrangement comprising a fuel vapour conduit 9 with a fuel vapour pump 10. The fuel vapour pump 10 is connected to the fuel meter 4 in such manner that, when filling the tank with fuel, it displaces a volume of fuel vapour back to the container 1 which is the same as the volume of liquid fuel that is pumped through the fuel meter 4 to the tank 2, via the delivery nozzle 5.

[0014] The fuel volume meter 4 is of a rotary type, i.e. the pulse generator 7 rotates via a shaft 15 connected thereto. Moreover, the fuel volume meter 4 is of the type known per se which lets through the liquid fuel while metering the volume via a piston-and-cylinder assembly having a linearly reciprocating piston. This prior-art type of fuel volume meter has a crank shaft with a crank for converting the rotation of said shaft to a linear motion of the piston of the piston-and-cylinder assembly.

[0015] Fig. 2 illustrates an arrangement of the vapour pumping means 11 according to the invention with two filling units. The vapour pumps 10 are composed as a compact unit in a pump housing component, which preferably has a common pump housing 12 for the two vapour pumps. Alternatively, each vapour pump 10 could be arranged in a separate pump housing. The pistons of the vapour pumps 10 are designated 13 and their cylinders are designated 16. The through-going main shaft fixedly connected to the pistons 13 is designated 14, the double arrow P indicating that the pistons 13 move in unison back and forth in their respective cylinders 16. The common main shaft 14 is operated by means of a motor 24, which causes a saving in space. Non-return valves 17 which are known per se are responsible for correct suction/pressure cycles of the pistons 13. The lead-in of the

common piston shaft 14 through the housing 12 or cylinders 16 of the vapour pumps is of course sealed, see seal 19, although it is not necessary to have a perfect seal (however, sealing defects should not result in undesirable vapour fuel passing between the cylinders 16).

[0016] Furthermore the Figures show conventional flame barriers 20 and overflow paths with valves 21. The overflow valves 21 are most important for simultaneous operation of the two vapour pumps 10. A fuel filling installation usually has two filling units each having at least one delivery nozzle 5 and one fuel meter 4 so that filling the tank of a vehicle can be carried out independently by the associated filling unit. The filling units also have a fuel pump 3 which pumps fuel to the delivery nozzle 5. Each vapour pump 10 is connected to the associated fuel meter 4 in a filling unit to allow control or regulation of the vapour pump 10 according to the flow of fuel or vapour.

[0017] When a filling unit is used to fill the tank of a vehicle, the two vapour pumps are operated simultaneously by means of the motor 24. The vapour pump 10 which is connected to the filling unit used for the filling operation recirculates the fuel vapour to the container 1. The other vapour pump 10 that does not recirculate any fuel vapour to the container 1 then circulates fuel vapour via the overflow path and its valve 21. A common overflow valve 21 can be used for the two vapour pumps 10, but preferably the vapour pumps each have an overflow valve 21. By having a separate vapour pump 10 for each filling unit, it is possible to achieve exact regulation of the recirculation of vapour in relation to the dispensed volume of fuel. Recirculated vapour can be regulated by controlling the pumping capacity of the vapour pump by means of a control valve 22 arranged upstream of the vapour pump 10 in the fuel vapour conduit 9, said control valve 22 being operated by a central processing unit (CPU) 23. The central processing unit is also connected to the associated fuel meter 4 and optionally also to the associated vapour pump 10. The pumping capacity of the vapour pumps 10 can also be varied by speed regulation.

[0018] The vapour pumps 10 need not be piston pumps according to the preferred embodiment of the invention but can also be, for example, displacement pumps, diaphragm pumps, Wankel pumps, rotary pumps or piston-and-cylinder pumps, i.e. double-acting piston pumps.

[0019] According to a second embodiment of the invention (not shown), the pump means with its two vapour pumps can be directly connected to the drive shaft of the fuel pump 4.

[0020] By the vapour pumps according to the invention being arranged for direct operation by means of the common motor 24, the number of electric components in the fuel filling installation is reduced, thus obtaining an improved explosion protection. A common motor also results in a saving in space.

Claims

1. A vapour recirculating device for a fuel filling installation with at least two filling units, said fuel being liquid and highly volatile, such as petrol, and said device comprising a vapour pumping means (11) for recirculating fuel vapour which has been emitted during filling of a tank said vapour pumping means (11) has a respective vapour pump (10) for each filling unit said vapour pumps being separate inlets (9) and outlets (9), said vapour pumps (10) being arranged in a respective or in a common pump housing component for housing the vapour pumps (10), **characterised in that** the vapour pumps (10) are interconnected by means of a common drive shaft (14) and have an overflow valve (21) and an overflow path to allow common operation by, in operation, allowing one of said vapour pumps to circulate fuel vapour via an overflow path and the overflow valve (21), and allowing the other vapour pump to recirculate fuel vapour from said tank to a container (1).

2. A vapour recirculating device as claimed in claim 1, wherein each filling unit has a separate fuel meter (4) which is adapted to meter the dispensed volume of fuel.

3. A vapour recirculating device as claimed in claim 1 or 2, wherein the vapour pumps (10) are piston pumps and preferably double-acting piston pumps.

4. A vapour recirculating device as claimed in any one of the preceding claims, wherein the vapour pumps (10) are connected to and operated by a motor (19) which also operates a fuel pump (3) arranged in the fuel filling installation.

5. A vapour recirculating device as claimed in any one of the preceding claims, wherein the two outlets (9) of the vapour pumps (10) connect with a common fuel conduit (9) connected with a fuel container (1).

Patentansprüche

1. Dampfrückführvorrichtung für eine Kraftstofftankanlage mit mindestens zwei Tankeinheiten, wobei der Kraftstoff flüssig und stark flüchtig ist, wie etwa Benzin, und die Vorrichtung ein Dampfpumpmittel (11) zum Rückführen von Kraftstoffdampf, welcher während des Füllens eines Tanks freigesetzt worden ist, umfasst, wobei das Dampfpumpmittel (11) eine jeweilige Dampfpumpe (10) für jede Tankeinheit aufweist, wobei die Dampfpumpen mit separaten Einlässen (9) und Auslässen (9) ausgestattet sind, wobei die Dampfpumpen (10) in einer jeweiligen oder in einer gemeinsamen Pumpengehäusekomponente zur Unterbringung der Dampfpumpen (10) ange-

ordnet sind, **dadurch gekennzeichnet, dass** die Dampfpumpen (10) mittels einer gemeinsamen Antriebswelle (14) miteinander verbunden sind und ein Überströmventil (21) und einen Überströmweg aufweisen, um einen gemeinsamen Betrieb zu ermöglichen, indem sie in Betrieb einer der Dampfpumpen ermöglichen, Kraftstoffdampf über einen Überströmweg und das Überströmventil (21) zirkulieren zu lassen, und der anderen Dampfpumpe ermöglichen, Kraftstoffdampf aus dem Tank zu einem Behälter (1) zurückzuführen.

2. Dampfrückführvorrichtung nach Anspruch 1, wobei jede Tankeinheit einen separaten Kraftstoffmesser (4) aufweist, welcher dazu eingerichtet ist, das abgegebene Kraftstoffvolumen zu dosieren.

3. Dampfrückführvorrichtung nach Anspruch 1 oder 2, wobei die Dampfpumpen (10) Kolbenpumpen und vorzugsweise doppeltwirkende Kolbenpumpen sind.

4. Dampfrückführvorrichtung nach einem der vorhergehenden Ansprüche, wobei die Dampfpumpen (10) mit einem Motor (19) verbunden sind und von diesem betätigt werden, welcher auch eine Kraftstoffpumpe (3) betätigt, die in der Kraftstofftankanlage angeordnet ist.

5. Dampfrückführvorrichtung nach einem der vorhergehenden Ansprüche, wobei die zwei Auslässe (9) der Dampfpumpen (10) eine Verbindung zu einer gemeinsamen Kraftstoffleitung (9) herstellen, die mit einem Kraftstoffbehälter (1) verbunden sind.

Revendications

1. Dispositif de recirculation de vapeur pour une installation de remplissage d'essence avec au moins deux ensembles de remplissage d'essence, ladite essence étant liquide et fortement volatile, telle que du pétrole, et ledit dispositif comprenant un moyen de pompage de vapeur (11) pour la recirculation de la vapeur d'essence qui a été émise pendant le remplissage d'un réservoir, ledit moyen de pompage de vapeur (11) possédant une pompe à vapeur respective (10) pour chacun des ensembles de remplissage, lesdites pompes à vapeur étant pourvues d'entrées (9) et de sorties (9) séparées, lesdites pompes à vapeur (10) étant disposées dans un composant de carter de pompe respectif ou commun pour loger les pompes à vapeur (10), **caractérisé en ce que** les pompes à vapeur (10) sont interconnectées au moyen d'une tige d'entraînement commune (14) et possèdent une soupape de trop-plein (21) ainsi qu'une voie de trop-plein pour permettre un fonctionnement commun en permettant à l'une desdites pompes à vapeur de faire circuler de la vapeur d'essence par le biais d'une voie de trop-plein et de la soupape de trop-plein (21), lors du fonctionnement, et en permettant à l'autre pompe à vapeur de faire recirculer la vapeur d'essence dudit réservoir vers un conteneur (1).

2. Dispositif de recirculation de vapeur selon la revendication 1, dans lequel chaque ensemble de remplissage possède un mesureur d'essence (4) séparé, qui est adapté pour mesurer le volume d'essence distribué.

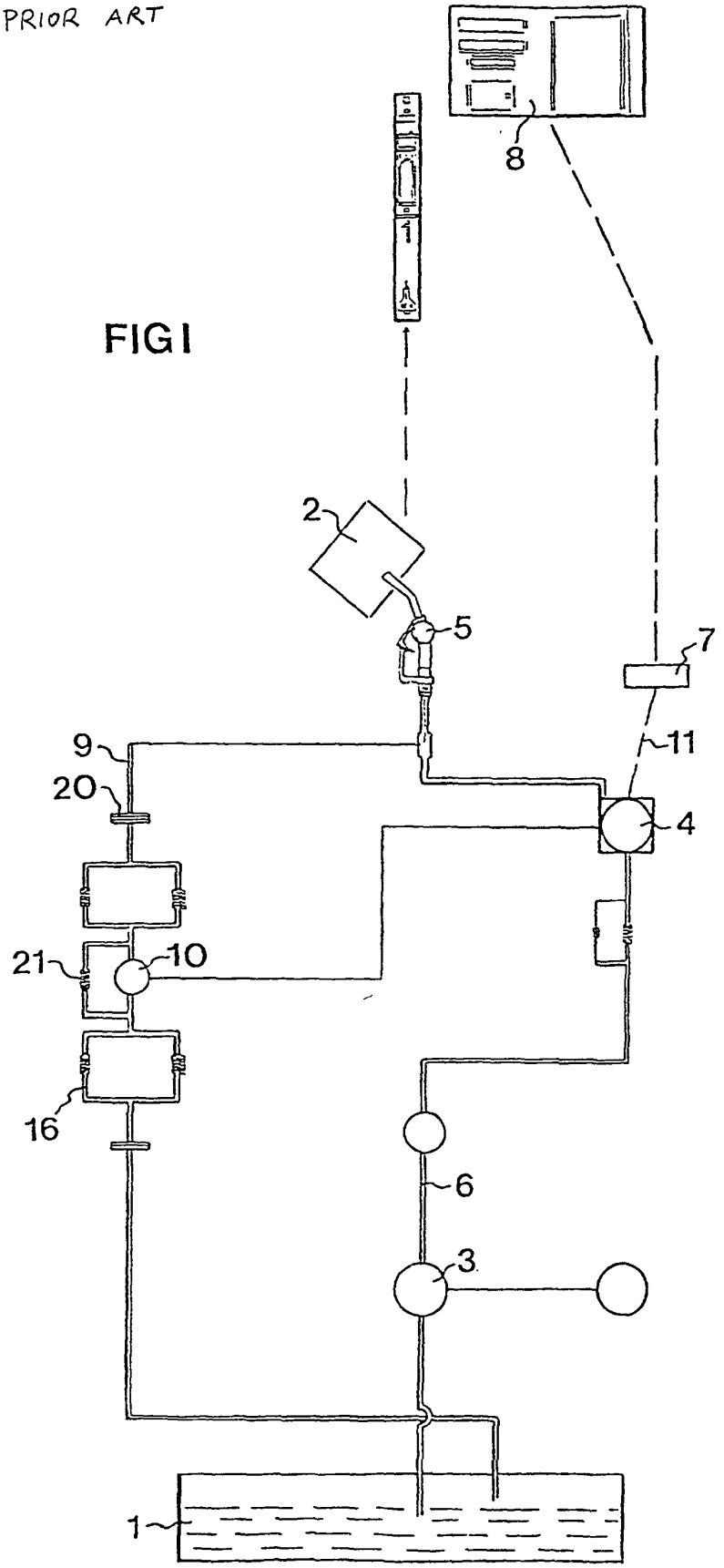
3. Dispositif de recirculation de vapeur selon l'une des revendications 1 ou 2, dans lequel les pompes à vapeur (10) sont des pompes à piston et de préférence des pompes à piston à double action.

4. Dispositif de recirculation de vapeur selon l'une quelconque des revendications précédentes, dans lequel les pompes à vapeur (10) sont connectées à et actionnées par un moteur (19) qui actionne également une pompe à essence (3) montée dans l'installation de remplissage d'essence.

5. Dispositif de recirculation de vapeur selon l'une quelconque des revendications précédentes, dans lequel les deux sorties (9) des pompes à vapeur (10) sont connectées à un conduit d'essence commun (9) qui est relié à un conteneur d'essence (1).

PRIOR ART

FIG1



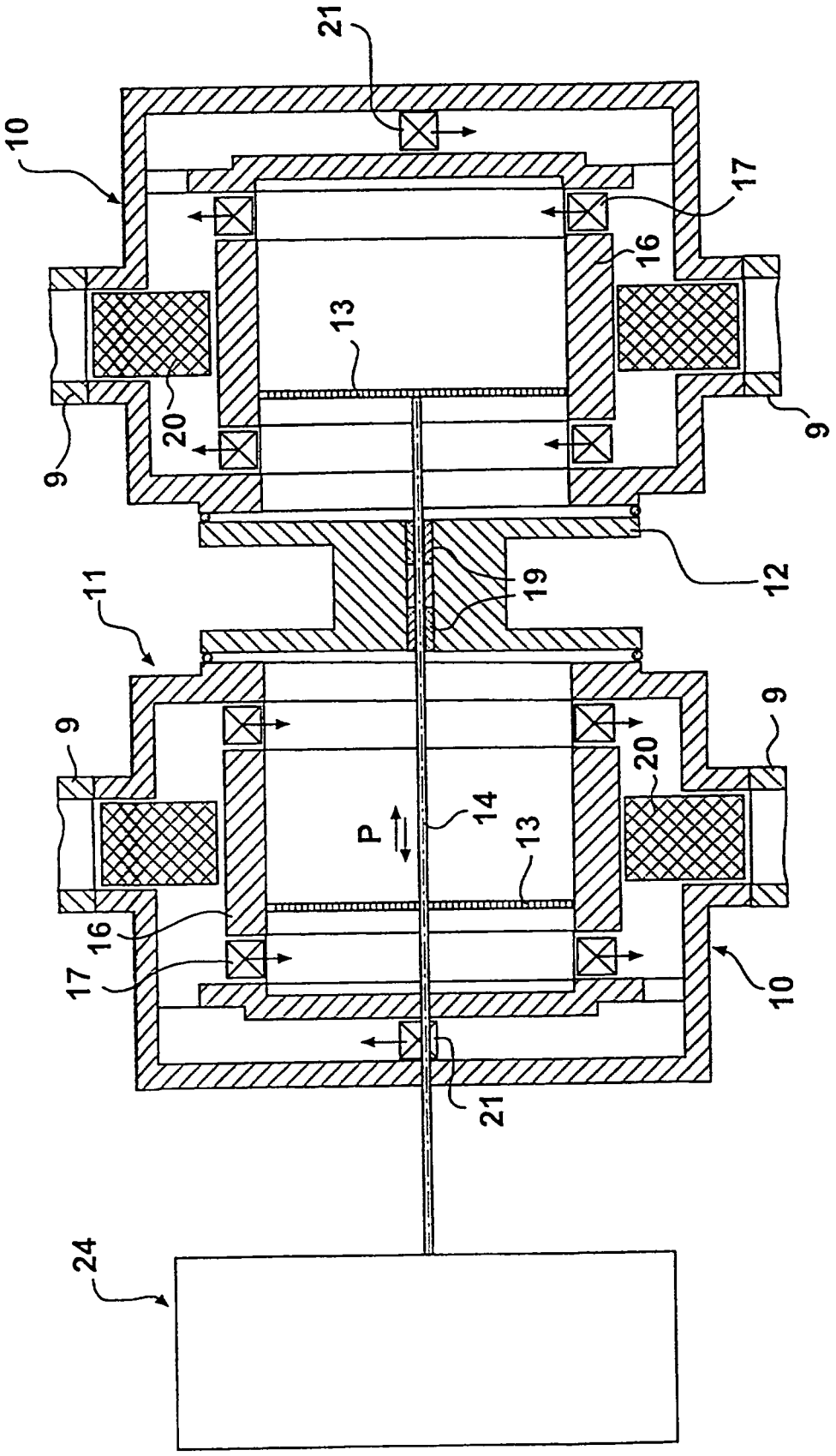


FIG. 2

REFERENCES CITED IN THE DESCRIPTION

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