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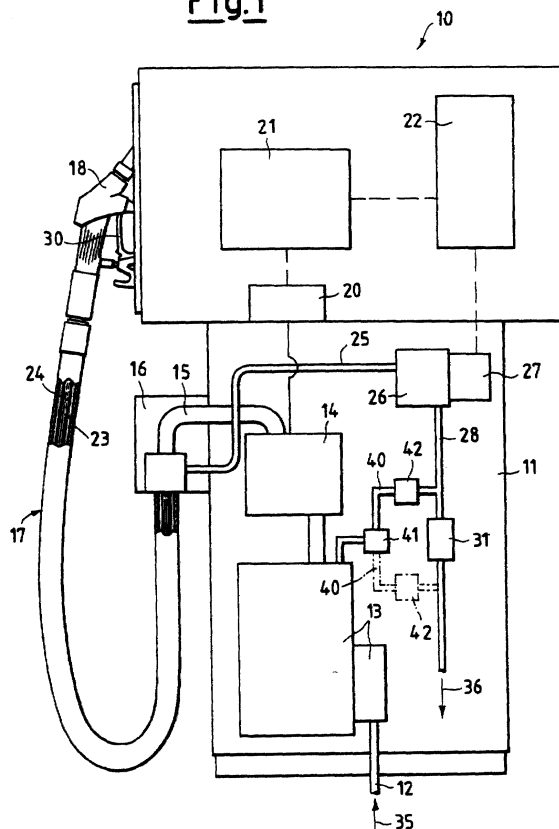
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(54) System for conveying the venting vapours in fuel distributors

(57) A system for conveying the venting vapours in the columns (10) of fuel distributors includes a pipe (40), which connects the fuel pumping unit (13) to the pipe

(28) for delivery of the vapours from the vapour recovery system to the storage tank, and which comprises at least one device (41) for stopping the liquid fuel, and at least one non-return valve (42).

Fig.1



Description

[0001] The present invention relates to a system for conveying the fuel venting vapours in the columns of the distributors, in particular in columns which are provided with a system for recovery of the fuel vapours which are emitted during the operations of supplying to motor vehicles.

[0002] In fuel distributors, and in particular in roadside distributors for supplying to motor vehicles, the standards for safety and protection of the environment require that the vapour phase, consisting of a mixture of air and fuel vapours, which is discharged from the tanks of the motor vehicles during the supplying, may not be dispersed into the environment.

[0003] This emission is caused substantially by the effect of displacement by the liquid which is admitted into the tank, which reduces the volume above its level, and expels an equivalent volume of vapour phase.

[0004] According to the known art, this air/vapour phase is sucked up by providing the fuel distributor pistols both with nozzles for distribution of the fuel and with suction nozzles, which are connected to volumetric pumps. The distributor pistol is connected to the column by means of piping for delivery of the liquid fuel, which is supplied by a pumping unit with a variable capacity, and by means of suction piping, which is connected to a volumetric pump for suction of the vapours, which is actuated with a flow rate which is closely correlated, moment by moment, to the flow rate of delivery of fuel.

[0005] At the same time, the venting vapours of the fuel, which are emitted at the pumping unit of the distributor during the supplying, should not be dispersed into the atmosphere.

[0006] It should be noted that hitherto, no technological solution has been obtained which reduces the damage to the environment caused by emissions of this type.

[0007] The object of the present invention is thus to provide a system for conveying the venting vapours of fuel distributors, which eliminates the above-described disadvantages, and makes it possible to eliminate, or at least reduce, the emission of harmful vapours into the environment.

[0008] According to the present invention, the technical effect pursued is that of preventing dispersion into the air of the fuel vapours (petrol, diesel, a mixture or the like), which are released inside a pumping unit during its normal operation.

[0009] The objects of the present invention are achieved by providing a system for conveying the venting vapours in fuel distributors of the single-product or multiple product type, the said distributor comprising at least one unit for pumping the said fuel, which is collected from at least one storage tank, in order to be conveyed to at least one distributor pistol of a distribution column, by passing through at least one measurer, and a system for recovery of the vapours output from a ele-

ment to contain liquid fuel, during the distribution of the said liquid fuel by the said pistol, the said vapour recovery system including at least a first pipe for connection between the said distributor pistol and at least one pump for suction of the vapours, and at least a second delivery pipe, which connects the said suction pump to the said storage tank, characterised in that at least a third pipe is provided, which conveys the said venting vapours, and is connected to the said second delivery pipe of the said vapour recovery system.

[0010] Preferably, the distribution column comprises a pipe for delivery of the fuel to the distributor pistol, and a return pipe which is connected to at least one suction nozzle, located in the vicinity of at least one distribution nozzle of the pistol, which can suck up the vapours which are discharged from the liquid fuel container whilst the liquid fuel is being distributed. In particular, the delivery pipe of the pump for suction of the vapours is connected to the fuel tank, and, downstream from the pump, comprises a non-return valve, whereas the said third pipe can be connected both upstream or downstream from the non-return valve.

[0011] In addition, this third pipe has a device for stopping the liquid fuel, and at least one non-return valve for the vapours, which are fitted in cascade along the pipe, starting from a reference point located at the pumping unit, until the delivery pipe is reached.

[0012] The characteristics and advantages of the conveying system according to the present invention will become more apparent from the following description of a typical non-limiting embodiment, provided with reference to the attached schematic drawing in figure 1, which represents a column for distribution of fuel to a distributor pistol, with recovery of the vapour phase, and comprising the system according to the invention, for conveying the venting vapours.

[0013] With reference to the aforementioned figure, the column 10 is provided with a box-type support structure 11, which contains and supports its units.

[0014] The fuel is contained in an underground storage tank or cistern, not shown in the figure for the sake of simplicity, from which the fuel is obtained by means of a suction line, indicated schematically as 35, which comprises the intake 12, the pumping unit 13, which is connected to the measurer 14, which measures the quantity of fuel distributed, before conveying it via the pipe 15 to the separator 16, from which there extends the flexible tube 17 of the distributor pistol 18.

[0015] There is connected to the measurer 14 a pulse generator 20, which generates an electric pulse for each unit of fuel distributed, for example for each centilitre.

[0016] This pulse signal has a frequency which is proportional to the flow rate, and is transmitted to the display head 21, which, on the basis of the number of pulses, calculates and indicates the quantity distributed, and the corresponding supply price.

[0017] The same pulse signal is transferred from the head to the electronic control unit 22, which controls and

pilots a vapour recovery system of a known type, according to which the tube 17 of the distributor pistol 18 contains a pipe 23 for delivery of the fuel, which is the extension of the delivery pipe 15 as far as the distribution nozzle, and a return pipe 24, which is connected to a suction nozzle located in the vicinity of the distribution nozzle.

[0018] The vapours discharged from the tank which is being filled are sucked up via this nozzle.

[0019] This return tube 24 is connected in the separator 16 to a pipe 25, which is connected to the volumetric pump 26 for suction of the vapours, which is actuated by a motor 27, which is piloted by the electronic control unit 22 at a number of revolutions, which, moment by moment, is in relation to the frequency of the pulse signal of the generator 20, such as to correlate the revolutions of the pump 26, and thus the suction volumetric flow rate, to the flow rate of the fuel delivery.

[0020] The delivery of the volumetric pump 26 is readmitted, via the pipe 28, into the underground tank or cistern of the distributor, from which the fuel is collected.

[0021] In general, the volumetric ratio between the fuel distributed and the gaseous phase sucked up, is set and maintained in an interval of values of approximately the unit value.

[0022] This setting can be varied according to the type of fuel and the environmental conditions. The fuel is typically distributed with a variable flow rate, and is regulated by the operator by means of the pressure exerted on the regulation lever 30 of the pistol, whereas the suction flow rate must follow moment by moment the development of the delivery flow rate.

[0023] In practice, the sequence of pulses represents faithfully, moment by moment, the situation of the distribution in progress of the liquid, with the number of pulses corresponding to the quantity distributed, and the frequency of the pulses corresponding to the momentary flow rate.

[0024] In addition, in the most recently designed distribution systems, each column 11 is equipped with a plurality of distribution pistols 18, which distribute different products, for example super leaded petrol, unleaded petrol of various grades, diesel, and so on.

[0025] In this case, for each set of pistols 18 on a single side of the column 10, a single distributor pistol 18 can function at a time, such as to supply the motor vehicle which has been positioned in front of the column, whereas each set of pistols 18 per side is equipped with a single volumetric suction pump 26 for recovery of the vapours.

[0026] In the case in which a plurality of distributor pistols 18 is present, downstream from the volumetric pump 26, the pipes 28 for delivery, to the respective underground tanks or cisterns, of the vapours sucked up, are subdivided into various pipes 28, and on each of them there is installed a switching system comprising a series of non-return valves, one of which is represented schematically in figure 1, is generally indicated as 31,

and is provided downstream from the pump 26.

[0027] Thus, depending on the cases, the volumetric pump 26 operates on vapours of different densities, according to the type of fuel, at different temperatures, and different downstream pressure values.

[0028] In order to prevent dispersion into the surrounding air, not only of the fuel vapours generated in the tank of the motor vehicle during supply, but also of the venting vapours which are released from the pumping unit 13 during its normal functioning, these venting vapours are conveyed in a pipe 40, which is connected to the delivery pipe 28 of the vapour recovery system, such that these vapours are also forced to be readmitted into the storage tank, via the line which is indicated schematically as 36.

[0029] In preferred embodiments, provided by way of non-limiting example, the pipe 40 can be connected equally well upstream or downstream (shown respectively as a solid line and as a broken line in figure 1) from the non-return valve 31 of the delivery pipe 28 which belongs to the vapour recovery system.

[0030] The pipe 40 also includes installation of a stopping device 41 and a further non-return valve 42 of known types, which are fitted in cascade along the pipe 40, starting from a reference point located at the pumping unit 13, until the pipe 28 for delivery to the storage tank is reached.

[0031] The stopping device 41 can prevent reflux of liquid fuel through the pipe 40, such as to prevent the liquid phase which may be obtained from venting of the pumping unit 13, from flowing back once more into the storage tank via the line 36.

[0032] According to embodiments provided by way of example, the stopping device 41 can consist of an electric and/or electronic sensor, or of an element which functions mechanically.

[0033] In the latter case, it can have a body which is made of two elements which are associated with one another, such as to form a cavity, a through intake hole, via which the fuel vapours enter into the interior, and an outlet hole, which is also a through hole, via which the vapours are discharged from the body.

[0034] Inside the body there is accommodated a sensor element, which can detect the presence of liquid accumulated inside the device, and, in addition, the sensor element comprises an element which is in the shape of a cup, and is aligned with the through intake hole.

[0035] The element in the shape of a cup constitutes a guide for a float-type shutter contained in the interior, which, at the moment in which liquid accumulates in a base portion, can translate from a position of work, in which an aperture of the through outlet hole is free, in order to permit passage of the vapour, and discharge of the latter from the device, to a position of rest, in which the aperture of the through outlet hole is at least partially closed by the float-type shutter, such as to prevent passage of the vapour, and thus discharge of the latter from the device.

[0036] The stopping device 41 is fitted on the pipe 40, with the intake hole facing the pumping unit 13, such that the venting vapours are conveyed towards the said hole.

[0037] In normal conditions of work, the vapour can pass into the interior of the device via a series of windows, and thus proceed towards the pipe 28, after having passed beyond the outlet hole.

[0038] In addition, a non-return valve 42 is fitted in cascade on the stopping device 41, on the outlet hole side, and in a position which faces the delivery pipe 28 of the vapour recovery system of the column 10, such as to prevent the vapours recovered at the distributor pistol 18 from being channelled into the pipe 40.

[0039] The quantity of vapour which passes through the stopping device 41 is insufficient to displace the float-type shutter which is supported on the base of the element in the shape of a cup, however, when a drawback occurs, leading to reflux of liquid from the pumping unit 13 to the pipe 40 and to the intake of the device 41, both the liquid and vapour phases exist simultaneously, the liquid accumulates inside the cavity, and enters into the element in the shape of a cup, with the result that the float-type shutter is raised, and closes the outlet hole of the stopping device 41.

[0040] Other modifications and variants of the stopping device 41 depend on the number of distributor pistols 18 present on each side of the column 10, on the type of fuel, on the number of storage tanks, and on the type of float used.

[0041] Moreover, the intervention times for closure of the through outlet hole are brief, and adjustable according to the flow of liquid admitted.

[0042] Finally, the stopping device 41 can advantageously be used further, by fitting onto the portion of pipe 40 upstream from the device 41 itself a retention valve (not shown in the figure for the sake of simplicity), such as to prevent reflux of liquid, as well as oscillations of flow rate, thus keeping the portion of pipe 40 which is contained between the retention valve itself and the stopping device 41 completely full of liquid.

[0043] The foregoing description makes apparent the characteristics of the system for conveying venting vapours in fuel distributors, and demonstrates that this system, together with the vapour recovery system, has significant advantages in comparison with the known art, thus making it possible to avoid dispersing further harmful substances into the environment.

Claims

1. System for conveying the venting vapours in fuel distributors of the single-product or multiple product type, the said distributor comprising at least one unit (13) for pumping the said fuel, which is collected from at least one storage tank, in order to be conveyed to at least one distributor pistol (18) of a dis-

tribution column (10), by passing through at least one measurer, and a system for recovery of the vapours output from a element to contain liquid fuel, during the distribution of the said liquid fuel by the said pistol (18), the said vapour recovery system including at least a first pipe (25) for connection between the said distributor pistol (18) and at least one pump (26) for suction of the vapours, and at least a second delivery pipe (28), which connects the said suction pump (26) to the said storage tank, **characterised in that** at least a third pipe (40) is provided, which conveys the said venting vapours, and is connected to the said second delivery pipe (28) of the said vapour recovery system.

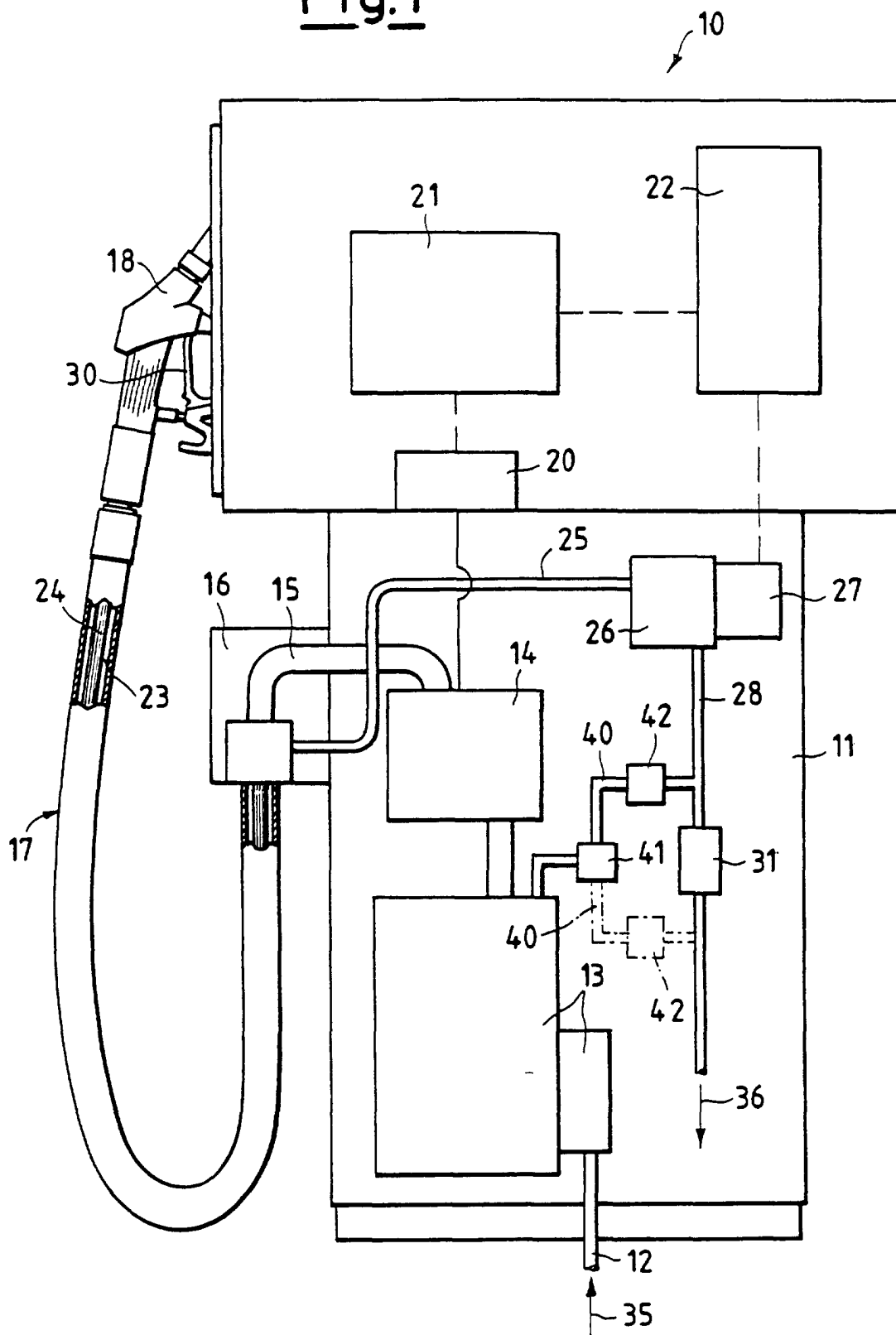
2. System for conveying venting vapours according to claim 1, **characterised in that** the said vapour recovery system comprises a pipe (23) for delivery of the fuel to the distributor pistol (18), and a return pipe (24) which is connected to at least one suction nozzle, located in the vicinity of at least one distribution nozzle of the said pistol (18), which can suck up the vapours which are discharged from the said liquid fuel container whilst the liquid fuel is being distributed.
3. System for conveying venting vapours according to claim 2, **characterised in that** the said return pipe (24) is connected in a separator element (16) to a further pipe (25), which is connected to the said pump (26) for suction of the vapours, the said pump (26) being actuated by a motor (27), which is piloted by an electronic control unit (22) at a number of revolutions, which, moment by moment, corresponds to a frequency value of a pulse signal emitted by a generator (20), such as to correlate a suction volumetric flow rate to a flow rate of the fuel delivery.
4. System for conveying venting vapours according to claim 3, **characterised in that** the said delivery pipe (28) of the said pump (26) is connected to the said fuel tank.
5. System for conveying venting vapours according to claim 4, **characterised in that** the said delivery pipe (28) comprises at least one non-return valve (31) downstream from the said pump (26).
6. System for conveying venting vapours according to claim 5, **characterised in that** the said third pipe (40) is connected upstream or downstream from the said non-return valve (31) of the said delivery pipe (28).
7. System for conveying venting vapours according to claim 1, **characterised in that** the said third pipe (40) has at least one device (41) for stopping liquid fuel, and at least one non-return valve (42) for the

vapours.

8. System for conveying venting vapours according to claim 7, **characterised in that** the said stopping device (41) and the said non-return valve (42) are fitted in cascade along the said third pipe (40), starting from a reference point located at the said pumping unit (13), until the said delivery pipe (28) is reached. 5
9. System for conveying venting vapours according to claim 7, **characterised in that** the said stopping device (41) comprises at least one electric and/or electronic sensor, or an element which functions mechanically. 10
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10. System for conveying venting vapours according to claim 7, **characterised in that** the said stopping device (41) has at least one sensor element, which can detect the presence of liquid which has accumulated internally, the said sensor element comprising an element which is in the shape of a cup, and is aligned with the said through intake hole. 20
11. System for conveying venting vapours according to claim 10, **characterised in that** the said element in the shape of a cup constitutes a guide for a float-type shutter, which, at the moment in which liquid accumulates in a base portion, can translate from a position of work, in which an aperture of the said through outlet hole is free, in order to permit passage of the vapour, to a position of rest, in which the said aperture is at least partially closed by the said float-type shutter, such as to prevent passage of vapour. 25
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12. System for conveying venting vapours according to claim 7, **characterised in that** the said stopping device (41) is fitted on the said third pipe (40) with an intake hole which faces the said pumping unit (13), such that the venting vapours are conveyed towards the said hole. 40
13. System for conveying venting vapours according to claim 7, **characterised in that** the said non-return valve (42) is fitted in cascade on the said stopping device (41), towards an outlet hole, and in a position which faces the said delivery pipe (28), such as to prevent the vapours recovered at the said distributor pistol (18) from being channelled inside the said third pipe (40). 45
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Fig.1





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 2156

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 8 June 2001	Examiner Wartenhorst, F
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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