

The present invention relates to a reservoir for a fuel, normally gaseous stored in the liquid phase, for an device using its combustion in the gaseous phase, this reservoir being able to be made as an integral part of the body of the device, and in this case, is of the disposable type, or comprises a removable cartridge which can be replaced by a full cartridge when it is empty.

When it is in the liquid phase a normally gaseous fuel is described as a pure substance or a mixture of pure substances having the liquid state in the conditions of pressure and temperature in which it is store, the liquid phase being in thermodynamic equilibrium with its vapour phase. When this equilibrium is attained the surface which delimits the two phases, that is to say the interface, can be a plane possessing a certain radius of curvature, notably if the liquid phase is contained in a porous or fibrous body the viscosity and the surface tension of the liquid phase allow a modification of the liquid vapour equilibrium and retention of the liquid phase in the middle of the porous or fibrous body.

The gas can also be dissolved in an appropriate thickening or gelling solvent such as in particular polymers of low molecular weight such as methacrylate, fatty acids like sodium palimate, colloidal silicate, carboxyl acid salts of aluminium and the like.

The devices which are susceptible to the use of the combustion of a normally gaseous fuel stored in the liquid phase are numerous and a variety of types: they can be a gas lighter, hair curlers and irons, soldering irons or the like. These devices can in the course of their use be orientated in all directions.

Normally between the reservoir and the burner of the device, the presence

of a device for the regulation of the outflow of the fuel, such as a pressure reducing filter is indispensable and this device only functions in a stable way if it is used always in the same phase be it liquid or gaseous. Since the gaseous phase is always situated above the liquid phase and the reservoir is often used standing upright, that is to say with the exit orifice turned towards its upper wall it is necessary to set the regulating device to always be used in the gaseous phase.

The preamble of claim 1 refers to a reservoir according to the state of the art as is known from document FR-A-1591263.

One knows of reservoirs of a cylindrical form with or without a circular cross section, with an exit orifice in the centre of the top wall, in which the fuel is enclosed in the liquid phase, held in a porous or fibrous material, such that when they are filled the high porosity permits the level of filling to be increased. However if the reservoir is overfilled, the excess fuel is not held in the porous material so that the liquid itself can reach the regulation device.

The present invention serves to remedy this inconvenience. To this end in the reservoir concerned which is of the type described above, an extended tube is connected to the exit orifice at the centre of the reservoir, the cross section of the free end of the extended tube, situated upstream of the regulator device is closed by a crosswise web, such that at least one entry orifice is provided in the cylindrical wall of the extended tube and the dimensions of which are adapted to provoke the formation of a meniscus at the liquid vapour interface of the fuel in the liquid phase in the normal storage temperature conditions of the reservoir.

Preferably the entry orifice provided in the cylindrical wall of the extended

tube is located at the extremity of its free end that is to say in the proximity of the crosswise web referred to above.

Thus it is ensured that the super saturation in the liquid phase of the reservoir does not pass the average for its volume because the liquid fuel in excess that is to say not enclosed can never attain the entry orifice of the extended tube nor, in consequence, the regulating device situated downstream of this orifice.

Preferably each entry orifice of the extended tube is in the form of a elongated slot, following the profile of the wall of the tube and it is advantageous to provide three orifices angularly spaced evenly about the axis.

Following an interesting embodiment of the invention, the upstream end of the extended tube, that is to say its end located at the exit orifice of the reservoir is dimensioned in a manner to form a sump in which is lodged the regulating device of the outflow of the fuel.

This extended tube can however, be made as an integral part of the reservoir with the wall of which it can be obtained, by moulding or injection, with whatever is the appropriate material to be moulded or injected.

The invention will be comprised, with the help of the description which follows with reference to the attached schematic drawings of a non-limiting example of the invention, in the form of execution of a reservoir.

Figure 1 is a axial cross section view in the standing position,

Figure 2 is a large scale partial view showing the lower end of the extended

tube.

Figure 3 is a view of the free end of the extended tube from below that is to say in the direction of arrow A of figure 2.

As shown in figure 1 the reservoir of the invention is of the type of the cylindrical form with a circular cross section, with an axis 3 around which the cylindrical wall 2a is closed, at each of its extremities by two respective diametrical walls 2b and 2c. One of the diametrical walls the wall 2b in the illustrated example on figure 1 provides in its centre an orifice 4 which constitutes the exit orifice from the reservoir 2.

In addition the diametrical wall 2b carries on its external surface a threaded neck 5 which permits the permanent fixation of the reservoir 2 to the device in use, in order for it to function by the combustion of the fuel stores in the liquid phase in the reservoir 2. In this case the reservoir comprises a movable cartridge which can be replaced by a full cartridge when it has become empty.

Thus as is already known the interior of the reservoir 2 is filled with a porous or fibrous material 6 which is destined to hold in the fuel in the liquid phase. However as can be readily seen the fuel in the liquid phase can only be totally retained with the reservation that the quantity of fuel in the liquid phase introduced into the reservoir can not exceed the capacity which the porous or fibrous material possesses for the total absorption. Consequently if the filling of the reservoir 2 is made at a level which exceeds that which is tolerated by the porosity of the porous material 6, it results in a super saturation of the fuel in the liquid phase, which is not held in and is susceptible to direct contact, in the liquid phase with the orifice 4 of the reservoir 2 and consequently, the regulating device of the outflow situated

in the proximity of the orifice 4 upstream or downstream.

In addition, with the rates of production of the reservoirs 2 being generally very high, the time taken for filling is very short, to the extent that it is very difficult to provide the required dose with a high degree of precision in such a short length of time, the quantity of fuel introduced in each of them.

As shown in the drawings and most particularly in figure 1 in the reservoir according to the invention it is provided with an extended tube 7 coaxial with the axis 3 of the reservoir connected to the exit orifice 4 in the centre of the reservoir 2, that is to say with the length of the tube essentially equal to half of that of the reservoir. The free end 7a of the extended tube 7, is provided essentially in the centre of the reservoir 2 in the middle of the porous or fibrous material 6.

This free end 7a of the extended tube 7 is closed by a cross wise web 7b. In addition in the region of the end 7a of the extended tube 7 three entry orifices 7c are formed, angularly spaced evenly around the periphery of the end 7a of the tube 7 in the region of the cross wise web 7b as is particularly visible in figures 2 and 3. Each orifice 7c which comprises an entry orifice of the extended tube 7, is in the form of a slot disposed longitudinally that is to say extending axially of the cylindrical wall of the extended tube 7. In addition the dimension of each of them is sufficiently small to provoke the formation of a meniscus at the liquid / gas interface of the fuel in the liquid phase in the normal conditions of temperature of the storage of the reservoir 2.

The result is that in all cases of excess fuel in the liquid phase being introduced into the reservoir 2, with the reservation that the quantity of excess or supersaturation does not exceed half the volume of the reservoir

2, the part which is in excess and not held by the porous or fibrous material contained in the reservoir 2 can not penetrate into the central canal 7d of the extended tube 7, not only due to the formation of a meniscus in each of the orifices 7c, which are the only orifices through which the fuel can penetrate into the canal 7d to reach the exit orifice 4 of the reservoir, but also because, in these conditions, such as in the position of the latter, the excess fuel that is to say not held by the porous or fibrous material, contained in the reservoir, can not reach the level of the free end 7a of the extended tube 7.

If, on the contrary, following the consumption of a large part of the fuel contained in the reservoir 2, fuel in the gaseous phase found itself at the level of the entry orifices 7c of the extended tube 7, this gas can penetrate into the central canal 7d of the extended tube 7, without resulting in any inconvenience because it can reach the regulating device of the outflow, situated upstream or downstream of the orifice 4 in the gaseous phase.

In all intermediate situations between the two extreme situations described, the fuel in the liquid phase finds itself at the level of the free end 7a of the tube 7 and will not be able to penetrate into the central canal of the tube 7 in the liquid phase by the entry orifices 7c.

In the example illustrated in the drawings and more particularly in figure 1 one can see that the end 7e of the extended tube 7, that is to say opposite to its free end 7a, is arranged to comprise a sump which serves as a housing for the outflow regulating device 8 associated with the reservoir 2.

Finally as shown again more particularly in figure 1, the extended tube 7 can be made as an integral part of the body of the reservoir 2, that is to say that of its cylindrical walls 2a and of the ends 2b which it is possible to obtain

by moulding or injection. One can note in this regard that the form of the longitudinal slots of the entry orifices 7c of the central canal 7d of the extended tube 7 are particularly convenient for the fabrication by moulding or injection because the slots can be formed without opposing inserts.

CLAIMS

1. A reservoir for normally gaseous fuel stored in the liquid phase for a device utilising the combustion of the fuel in the gaseous phase, of the type having a cylindrical form with a circular cross section or not, provided with an exit orifice (4) at the centre of one (2b) of its end walls (2a, 2b) and with an extended tube (7) connected to the exit orifice (4) to the interior of the reservoir, a regulating device of the outflow of the fuel being located in the proximity of the said exit orifice (4), the fuel being ultimately held, in the liquid phase in the middle of a porous or fibrous material (6) with which the reservoir is filled, **characterised in that**, the free end (7a) of the extended tube (7) is located in the centre of the reservoir (2), the cross section of the said free end (7a) being closed by a cross wise web (7b) which is provided with at least one entry orifice (7c) and disposed in the cylindrical wall of the extended tube (7), and the dimensions of which being adapted to provoke the formation of a meniscus at the liquid vapour interface of the fuel in the liquid phase, in the normal conditions of temperature of storage of the reservoir (2).
2. A fuel reservoir according to claim 1, **characterised in that** the entry orifice (7c), disposed in the cylindrical wall of the extended tube (7), is located at the proximity of the free end (7a) of the tube (7), that is to say in the proximity of its cross wise web (7b).
3. A fuel reservoir according to claim 1 or 2, **characterised in that** each entry orifice (7c), of the extended tube (7), is in the form of a slot disposed longitudinally, following the profile of the wall of the tube.



4. A fuel reservoir according to claim 2 or 3, **characterised in that** it is provided with three orifices (7c) evenly and radially spaced.
5. A fuel reservoir according to any one of the preceding claims, **characterised in that** the downstream end (7d), of the extended tube (7), that is to say its end located in the exit orifice (4) of the reservoir (2), is dimensioned in a manner to comprise a sump (8) in which the regulating device for the outflow of the fuel is located.
6. A fuel reservoir according to any one of the preceding claims, **characterised in that** the extended tube (7) is formed as an integral part of the body of the reservoir (2) which together with the wall of which it can be obtained by moulding or injection.

