Dec. 28, 1937. R. E. COSSAIS 2,103,935

DEVICE FOR PREVENTING EVAPORATION OF VOLATILE PRODUCTS

Filed Dec. 10, 1935 2 Sheets-Sheet 1

Fig. 1

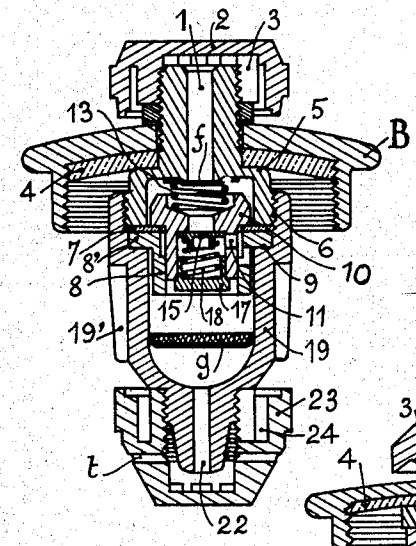


Fig. 2

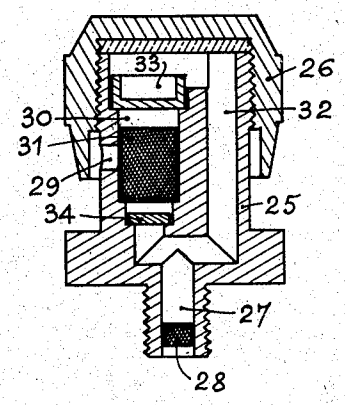


Fig. 6

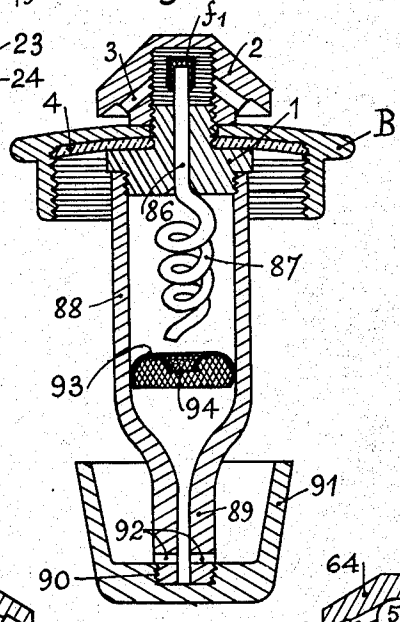


Fig. 3

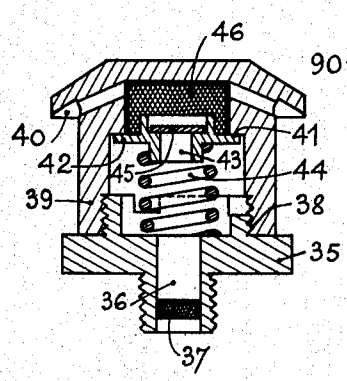


Fig. 4

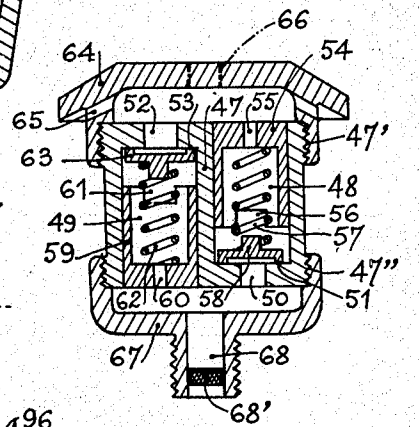
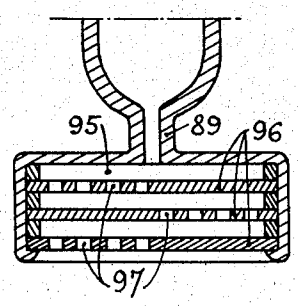


Fig. 7



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DEVICE FOR PREVENTING EVAPORATION OF VOLATILE PRODUCTS

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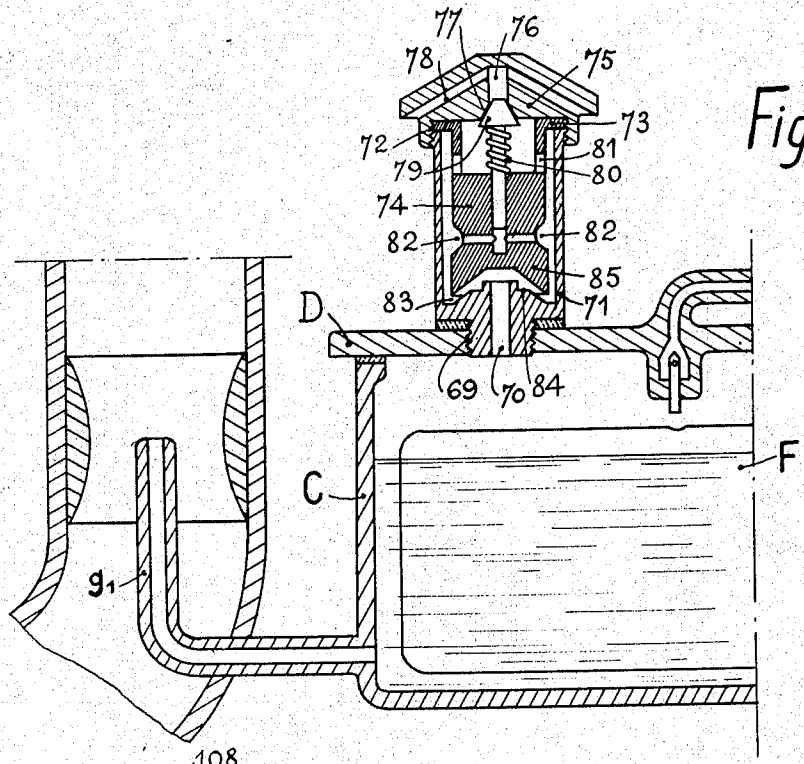


Fig. 5

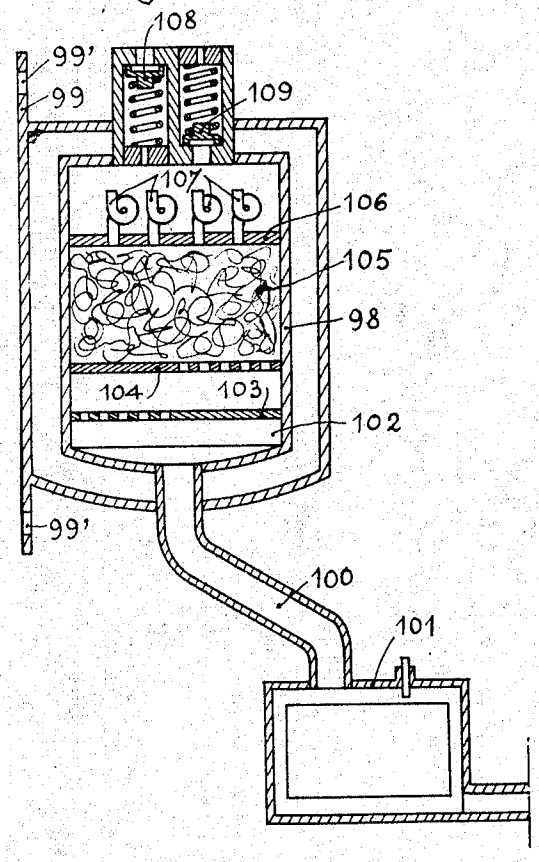


Fig. 8

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Patented Dec. 28, 1937 2,103,935

UNITED STATES PATENT OFFICE

2,103,935

DEVICE FOR PREVENTING EVAPORATION OF VOLATILE PRODUCTS

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Application December 10, 1935, Serial No. 53,833
In Luxemburg December 13, 1934

2 Claims. (Cl. 220—44)

The present invention has for its object a device preventing the evaporation of volatile products, such as fuels, for instance gasoline or heavy oils, or matters which also undergo evaporation as a result of their conditions of use, such as lubricants, especially those employed in internal combustion engines, the high temperature of which causes the formation of vapors, this evaporation being liable to take place either while the matters are being stored up for subsequent use, as it is the case with fuels and lubricants in tanks, or during their flow.

It is a known fact that internal combustion engines are fed with fuel, gasoline for instance, through a carburetter, which includes a float chamber and is fed with gasoline from a reservoir at a higher level, or through a propelling device, such for instance as a pump, drawing the gasoline from the reservoir. Now, this tank or reservoir on the one hand, the float chamber of the carburetter on the other hand, are generally in direct communication with the atmosphere in order to permit the flow of gasoline. It follows that vapors of gasoline, which is an extremely volatile matter, escape through the vent hole of the tank plug and through the air inlets of the float chamber of the carburetter. This continuous outflow of gasoline vapors, which, in the case of automobile vehicles, is increased on the one hand by the rise of temperature resulting from the vicinity of the engine and, on the other hand, by the stirring of the gasoline produced by unevenness of the ground and sudden changes of speed, involves an important loss of fuel and has the further disadvantage of rendering variable the composition of the mixture fed to the engine, which becomes weaker and weaker as the fuel is evaporating. The same drawback is experienced concerning tanks containing the reserve of lubricant, or the lubricant in circulation, and also fuel or lubricant pumps, cisterns and the like.

The object of the present invention is to provide a device which obviates these drawbacks.

The essential feature of the invention consists in the fact that the tank or other container in which the volatile or similar product is present, for instance a gasoline tank or carburetter float chamber, is closed in a fluid-tight manner and includes a device permitting the inflow of air but preventing the vapors of the product to escape.

According to a preferred embodiment of the invention, the air inlet device consists of a valve normally applied upon its seat by an antagonistic spring and which opens so as to permit air to flow in, under the effect of an internal depression or suction produced, for instance, by the flow of fuel. Advantageously, the device according to the present invention is combined with a safety valve adapted to operate in case of an abnormal internal pressure.

A second embodiment of the invention consists in giving the air inlet the form of a conduit at the end of which there is provided a serpentine-shaped capillary tube.

According to another characteristic feature of the present invention, the air inlet of the device is fitted with a conduit or tube immersed at its lower end in a liquid, for instance a condensation liquid, forming a hydraulic joint, or it includes baffle-shaped partitions, porous partitions or the like, with a view to inducing condensation of the vapors that would tend to escape.

An equivalent arrangement consists in combining the device according to the invention with a condenser of a suitable type, producing the condensation of the vapors and eventually capable of being cooled by an air stream resulting from the motion of the vehicle or produced by a device actuated as a result of this motion.

Preferred embodiments of the present invention will be hereinafter described, with reference to the accompanying drawings, given merely by way of example, and in which:

Figs. 1 to 4 inclusive are axial sectional views showing several embodiments of the device according to the present invention, including an air inlet valve and a safety valve;

Fig. 5 shows an analogous device applied to the float chamber of a carburetter;

Fig. 6 shows a modification of the air inlet device, including a serpentine-shaped capillary tube;

Fig. 7 shows a modification of the lower part of this device;

Fig. 8 is a transverse sectional view of the combination of a device according to the present invention with a shock condenser.

In the embodiment of Fig. 1, B designates the plug of a gasoline tank on which is fixed an air inlet conduit 1, by means of a threaded cap 2 including channels 3 opening into the atmosphere. A ring 4, tightly held between the bottom of plug B and a shoulder 5 provided on the body of conduit 1, ensures fluid tightness of the device. The lower end of this body 1 carries a threaded projection 6 on which is screwed the upper end of a tubular element 19 the periphery of which carries bosses or corrugations 19' in-

creasing the surface of condensation. Between the lower end of body 1 and a shoulder 9 carried by tubular element 19, is held, with the interposition of a packing ring 7, the circular part 8' of a valve body 8. In this body is slidably mounted the safety valve 10, provided with lateral ports 11 and urged against its seat by a spring 13 bearing against shoulder 5. This valve is axially bored so as to constitute, at its upper part, the seat of a valve 15 urged against said seat by a spring 18 bearing against a piece 17 fixed to the end of the valve body 8.

The lower orifice 22 opens into a condensation cup 23 with vent holes 24, further including overflow holes *t* the height of which may vary according to the case, in order to vary the capacity of said cup. This device is completed by a filter *f* and a metallic grid *g*.

This device works in the following manner: When the plug B of the tank is screwed in a fluid-tight manner on said tank and the vehicle is stationary, the engine being stopped, valves 10 and 15 are in contact with respective seats 12 and 14. As soon as the engine is started, the vibrations and oscillations transmitted to the tank produce a disengagement of gasoline vapors. A portion of these vapors is condensed on the wall of the tank, on condensation surfaces 19' and also on the body of cup 23. The gasoline that is thus condensed fills holes 24 and constitutes a hydraulic joint for the air inlet orifice 22.

The flow of gasoline produced by the suction of the engine produces in the tank a depression or suction which causes valve 15 to open. Air enters through channels 3, passes through pipe 1, the bore of valve 15, lateral ports 11 and issues through channels 24, flowing through the hydraulic joint. This air inlet therefore takes place in accordance with the depression created in the tank by the suction of the engine, the hydraulic joint positively preventing any escape of gasoline vapors. Accordingly, I first obtain a considerable reduction of the consumption of fuel. Furthermore, as the gasoline vapors cannot escape from the tank, the mixture that is fed to the carburetter keeps the same composition, which ensures the constancy of the efficiency of the engine. Furthermore, any risk of fire that might result from the presence of volatile vapors in the vicinity of the engine is avoided.

When an overpressure takes place in the tank, a portion of the mixture of air and the gasoline vapors escapes, lifting valve 10. Grid *g* is intended to prevent the outflow of liquid gasoline carried along by the gaseous mixture that passes through the hydraulic joint and to produce a condensation, at least a partial one, of the vapors that are driven along, in such manner as to reduce as much as possible the outflow of volatile vapors, which might weaken the mixture fed to the engine.

The device shown in Fig. 2 includes a main body 25, with a protecting cap 26 and a lower conduit 27, which is fitted with a filter 28, said conduit being threaded externally for permitting its fixation, for instance to the float chamber of a carburetter. In this body 25 there is formed a chamber 30 open at both ends, a conduit 32 connecting these two ends together. Chamber 30, which is connected with the atmosphere, through any suitable number of ports 29, contains a filter 31. It is fitted, at one end, with a valve 33 and at the other end with a safety valve 34, respectively, said valves being connected together by conduit 32. Each valve is suitably spring-loaded and rests, under the action of its own weight, upon its seat.

Valve 33 is lifted under the effect of a depression or partial vacuum in the float chamber of the carburetter. It allows air to enter, while an abnormal overpressure causes safety valve 34 to open and the excess of vapors to escape.

The device shown by Fig. 3 includes a base portion 35, with a conduit 36 fitted with a filter 37 mounted therein, said conduit being externally threaded so as to permit its fixation for instance to the float chamber of a carburetter. This base portion includes an annular threaded projection 38 on which is screwed a plug 39 provided with internal threads and having vent holes 40 formed therein. A valve 42, provided with a central hole at 43, is kept in contact with its seat 41 by a spring 44, while the central orifice 43, forming a valve seat, is closed, under the influence of gravity, by safety valve 45. The device further includes a filter 46. The working of this device is analogous to that above described; it is therefore unnecessary to again describe it.

The device shown in axial section in Fig. 4 includes a main body 47 constituting two juxtaposed cylinders 48, 49. One of these cylinders 48 is open at its upper part and is provided, at its lower part, with a bore 50, forming a valve seat 51. The other cylinder, 49, is open at its lower part and is provided at its upper part with a bore 52 forming a valve seat 53. Cylinder 48 is fitted, at its open end, with a hollow cap 54 fitting therein. Said cap is provided with a hole 55, provided in axial position, at its upper end, and a certain number of notches 56 are formed in its lower edge. This cap is intended, on the one hand, to maintain the spring 57 of a safety valve 58, which it applies against its seat 51, and, on the other hand, to limit the useful displacement of said valve, notches 56 connecting, in this case the holes 50 and 55 together. In a likewise manner, cap 49 is fitted, at its open end, with a hollow cap 59, provided with a central hole at 60 and the open edge of which is provided with notches 61. This last mentioned cap maintains the spring 62 of a valve 63, normally applied against its seat 53 and limits the useful stroke of this last mentioned valve.

The main body 47 is provided, at its upper part, with threads 47' on which can be screwed a cap 64 having vent holes 65 and a central threaded hole 66 formed therein. Said central hole 66 is normally stopped but it may eventually be placed into communication with a condenser as it will be hereinafter explained. In this case, the vent-holes should be stopped. The main body 47 is provided, at its lower part, with a threaded portion 47'' on which can be screwed a cap 67 carrying a tube 68 provided with external threads, so as to permit of fixing it, for instance, to the float chamber of a carburetter. In this tube 68 is mounted a filter 68'.

When a depression, or partial vacuum, occurs in the float chamber of the carburetter, valve 63 is sucked in and compresses its spring 62, while safety valve 58 remains applied against its seat 51. The inflow of air takes place through vent-holes 65, hole 52, the annular space between valve 63 and the wall of chamber 44, eventually notches 51, hole 60 and tube 68. In the case of an abnormal overpressure, safety valve 58 is lifted from its seat and the escape of the vapors in excess takes place through a similar path.

Fig. 5 shows the float chamber C of a carburetter, the float being visible at F. The lid D

of said chamber is fitted thereto in a fluid-tight manner. On this lid is screwed the threaded end 69, provided with a bore 70, of a tubular body 71, provided with external threads 72 at its upper end. On its upper edge, there is applied the flange 73 of the valve guide 74, kept in position by a cap 75 screwed on the whole. This cap is provided with a blind hole 76 into which open the air-holes 78, the open end of said hole forming a valve seat 77. Valve 79 is normally applied against its seat by a spring 80 bearing against the end of valve guide 74. The latter is provided with lateral holes 81 and expansion chambers 82. The tubular body 71 is so shaped as to form, at its lower part, an annular cup 83 intended to receive the condensed gasoline and to form, together with the lower annular portion 85 of valve guide 74, a hydraulic joint. An expansion surface 84 is disposed concentrically with cup 83.

When a certain vacuum exists in the float chamber, valve 79 moves away from its seat and air, flowing through ports 81, passes through the hydraulic joint, carrying along a small amount of gasoline which stays in gutter-shaped part 83, and enters the float chamber. In case of an overpressure, the gases escape through jet *g*. The expansion chambers 82 serve merely to prevent, in this case, gasoline from reaching the valve, where it might interfere with the subsequent working.

In the modification shown by Fig. 6, the body 1 carries a capillary tube 86, fitted with a filter f^1 and provided, at its lower end, with a coil-shaped tube 87. On the body 1 there is screwed a tubular body 88, provided at its lower part with a pointed part 89, carrying threads 90 which permit its fixation to the bottom of a condensation cup 91, said pointed part being provided with air outlet holes 92. A diaphragm 93 with a central orifice 94 prevents the escape of the vapors carried along by the gaseous mixture.

In Fig. 7, the condensation cup is replaced by a chamber 95 provided with partitions 96 which may be either provided with holes 97 disposed in baffle-like manner or made of a porous material.

The operation of both of these devices is analogous to that described in the first case, the coiled capillary tube being intended to brake the inlet of air while the outlet of the gasoline vapors is prevented by the hydraulic joint in the case of Fig. 6 and by the condensation that takes place on the walls 96 in the case of Fig. 7. However, the saving obtained with these two devices is smaller than that obtained with the preceding embodiments.

Fig. 8 diagrammatically shows in axial section an arrangement of shock condenser branched on a carburetter of an internal combustion engine and including an air inlet valve and a safety valve. This condenser is constituted by a vessel 98 thermally insulated by a double wall 99, the interval between the elements of said wall being eventually filled with asbestos. The bottom of vessel 98 is connected, through a conduit 100, with the upper part of the float chamber 101 of the carburetter. The inside of this condenser includes a condensation chamber 102 provided at its upper part with two partitions 103, 104 having formed therein holes arranged in baffle-like arrangement or the like. Next to this chamber, there is provided a chamber 105 filled with a matter in the divided state or having a great number of contact surfaces, such for instance as hammer slag, said chamber being closed by a partition 106 through which extend a certain number of small coiled tubes 107. The upper part of the condenser is connected with the atmosphere through an air inlet valve 108 and a safety valve 109, for instance of one of the types above described. Fixation parts 99' permit of securing the device in suitable position, for instance to the instrument board of an automobile vehicle.

In the case of an overpressure in the float chamber of the carburetter, the excess of vapours escapes through tube 100 and condenses in the condenser, dropping back into condensation chamber 102. These vapours are returned to the carburetter owing to the suction produced therein when the fuel is flowing. The air inlet valve 108 and the safety valve 109 work in the same manner as in the preceding embodiments.

It should be noted that, when they are combined with a carburetter, the devices above described may constitute a portion of the carburetter. The examples above described refer to the adaptation of each of these devices to a carburetter of a known type, but this does not exclude the possibility of devising carburetters including these devices. In a likewise manner, when these devices are combined with a tank plug, they may constitute a portion of said plug without departing from the principle of the invention. In a general way, the condenser should be located above the float chamber of the carburetter and as far as possible from the zones in which air streams are generated.

On the other hand, the air inlet valve and the safety valve may be located either between the float chamber of the carburetter and the condenser, or upon the condenser, as shown. Besides, I may provide a greater number of these valves without departing from the principle of the invention.

The condenser may also be applied in combination with a fuel tank, a pump or a fuel cistern, and in a general way with any tank containing volatile products which are to be protected against evaporation.

It should be noted that, when a device according to the present invention is to be applied to an airplane tank, a special valve must be provided for preventing the fuel from coming into contact with the constitutive elements of said device, especially when the aircraft is turned upside down. This arrangement has also the advantage, when fitted to the tank of an automobile vehicle, of eliminating risks of fire when the vehicle capsizes.

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of the present invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the spirit of the present invention as comprehended within the scope of the appended claims.

What I claim is:

1. In combination with a container, a device for preventing evaporation of a volatile or similar product, present in said container, which comprises, in combination, means for closing said container in a fluidtight manner, check valve means for the inflow of air into said container, a safety valve for the outflow of fluid from said container in case of an overpressure therein, a cup adapted to contain a liquid disposed under said means, and an air inlet tube connected with said check valve means and adapted to dip in

the liquid in said cup so as to form a hydraulic joint.

2. In combination with a container, a device for preventing evaporation of a volatile liquid present in said container, which comprises, in combination, a hollow body adapted to be fixed in a fluidtight manner on said container, said body forming a chamber communicating with the outside, means including an inlet check valve for connecting said chamber with said container for the inflow of air, means, including a safety valve, adapted to connect said chamber with the inside of said container for the outflow of fluid, said safety valve being adapted to open for a predetermined overpressure inside said container, a cup, carried by said body so as to extend inside said container adapted to contain said liquid, and means connected with said check valve for causing the incoming air to pass through the liquid present in said cup, so as to form a hydraulic joint.

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