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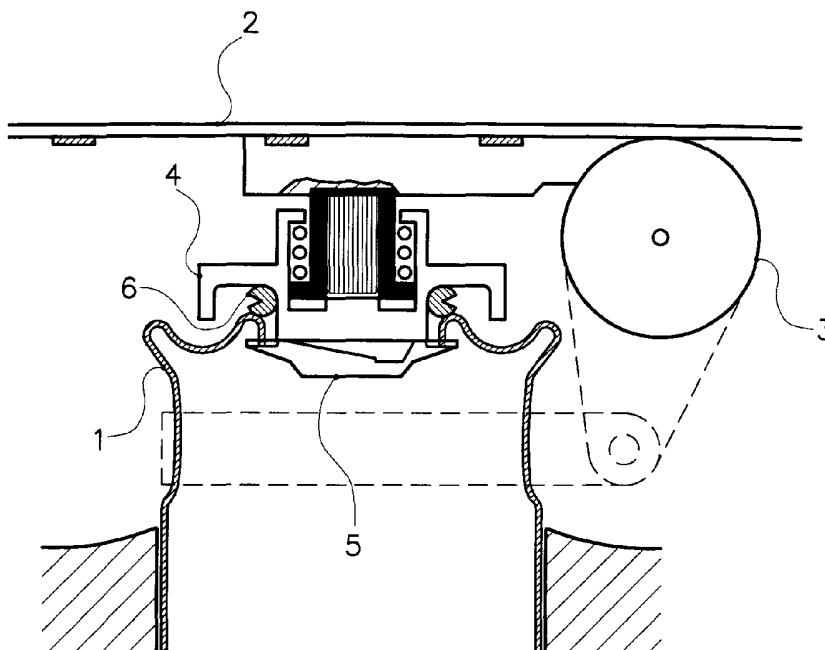
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ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: PLUGGING DEVICE FOR A FUEL TANK FILLER PIPE



(57) Abstract: Device for plugging the top of a fuel tank filler pipe (1) situated under a fuel filler flap (2), the movement of which is controlled by an actuator (3). The device comprises a stopper (4) secured to the fuel filler flap (2) and able to plug the top of the pipe (1) and a locking mechanism (5) for locking the stopper (4). The actuator (3) is able to activate the locking mechanism (5) that locks the stopper (4) independently of the movement of the filler flap (2).

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Plugging device for a fuel tank filler pipe

The present invention relates to a method for plugging a fuel tank filler pipe.

Filler pipes present on fuel tanks, particularly tanks on board motor vehicles, are plugged during normal use of the tank, outside of filling periods.

5 Plugging is generally achieved by means of a cap which is fixed onto the upper part of the pipe by having a rotational movement imparted to it in order to seal the pipe against liquids and gases. Various types of cap may be encountered, made of metal and/or made of plastic, sealing being achieved by compressing a seal, this being achieved by screwing or by turning a key inserted into the middle
10 of the part outside the pipe.

The operations of removing the cap before filling the tank and of replacing this cap and closing off the pipe after filling are usually done manually by the user or by the service station attendant dispensing the fuel. When the tank filling operation is over, the replacing of the cap is sometimes forgotten and this can
15 then give rise to the loss of this cap and to the pipe being left open to the atmosphere for some length of time. During this period, losses of liquid fuel may occur and vapours escape into the ambient atmosphere. Furthermore, the aforementioned manual operations are often awkward and dirty.

With a view to avoiding cap losses and the ensuing atmospheric pollution,
20 built-in plugging devices have been proposed as a replacement for the conventional cap. Further, to palliate the aforementioned disadvantages of awkwardness and dirtiness, automatic (motorized) solutions have also been proposed.

Thus, for example, patent US 6 478 360 describes a device for plugging a
25 filler pipe using a stopper secured to a fuel filler flap by means of a connecting element. The movement of opening the fuel filler flap leads directly to the unlocking of the plug and its disengagement from the top of the pipe or, conversely, the movement of closing the filler flap causes the stopper to be fitted onto the top of the pipe and locks the stopper thereto. In one particular
30 embodiment of the invention, it is also possible for the unlocking of the stopper (controlled remotely, for example, from inside the cabin of the motor car) to lead to the movement of opening the filler flap using a thermal actuator. This

invention does have the disadvantage that, should the connecting element break (which breakage is, incidentally, put forward as an advantage in the event of a crash) it is no longer possible to access the filler pipe easily. In addition, correct locking of the stopper onto the top of the pipe is directly linked with closure of the filler flap: if this is not done completely, locking may be imperfect.

Patent application EP 1 464 529 A2 discloses a device for plugging a filler pipe in which a stopper is actuated by a motor. The stopper is secured to the fuel filler flap but has no locking mechanism of its own (the movement of the filler flap directly governing that of the stopper). The quality of the stopper/top of pipe seal may thereby be adversely affected.

In order to palliate the abovementioned disadvantages, the present invention is therefore intended to provide a simple device for plugging the top of a pipe, in which device a filler flap is secured to a stopper and closure of the filler flap does not influence the locking of the stopper onto the top of the pipe, and vice versa, although both operations are controlled by a single actuator.

To this end, the present invention relates to a device for plugging the top of a fuel tank filler pipe situated under a fuel filler flap, the movement of which is controlled by an actuator, the said device comprising

- a stopper secured to the fuel filler flap and able to plug the top of the pipe; and
- a locking mechanism for locking the stopper;

characterized in that the actuator is able to activate the locking mechanism that locks the stopper independently of the movement of the filler flap.

The term "fuel tank" is intended to denote any type of tank capable of storing a liquid and/or gaseous fuel under varying temperature and pressure conditions. Those more particularly concerned are tanks of the kind found in motor vehicles. The expression "motor vehicle" is intended to include motor cars, motorcycles and trucks.

The filler pipe is a pipe which communicates with the inside of the tank and allows fuel to be introduced via a filling nozzle.

Access to the pipe is generally through an opening made in the bodywork of the motor vehicle. This opening is generally protected by a fuel filler flap, that is to say a part that can move between a closed position and an open position and the profile of which, when closed, is a continuation of the profile of the bodywork at the site of the said opening.

The pipe has a pipe top, that is to say a set of parts which are mounted on or secured to the upper end of the filler pipe and whose purpose is to guide the

nozzle and make filling easier. For this purpose, the top of the pipe comprises a passage communicating with (in the continuation of) the filler pipe.

The tank and the pipe may be made of metal or of plastic.

5 The plugging device according to the invention is well-suited to a tank and filler pipe assembly in which at least one of the two components of the assembly is made of plastic. As a preference, both the tank and the filler pipe are made chiefly of plastic. The device according to the invention is particularly well-suited to an assembly in which the tank and the filler pipe are made of plastic and the top of the pipe is made of metal. As a preference, this plugging device
10 itself comprises at least one part made of plastic.

The term "plastic" is intended to denote any material comprising at least one synthetic resin polymer.

All types of plastic may be suitable. Particularly suitable plastics come from the thermoplastics category.

15 The term "thermoplastic" denotes any thermoplastic polymer, including thermoplastic elastomers, as well as blends thereof. The term "polymer" denotes both homopolymers and copolymers (especially binary or ternary copolymers). Examples of such copolymers are, nonlimitingly, random copolymers, linear block copolymers, other block copolymers and graft copolymers.

20 Any type of thermoplastic polymer or copolymer whose melting point is below the decomposition temperature is suitable. Synthetic thermoplastics that have a melting range spread over at least 10 degrees Celsius are particularly suitable. Examples of such materials include those that exhibit polydispersion in their molecular weight.

25 In particular, polyolefins, polyvinyl halides, thermoplastic polyesters, polyketones, polyamides and copolymers thereof may be used. A blend of polymers or copolymers may also be used, as may a blend of polymer materials with inorganic, organic and/or natural fillers such as, for example, but nonlimitingly, carbon, salts and other inorganic derivatives, natural fibres or
30 polymeric fibres. It is also possible to use multilayer structures consisting of stacked layers bonded together comprising at least one of the polymers or copolymers described above.

The plugging device according to the invention is intended to act as a cap which seals the upper part of the filler pipe, outside periods when the tank is
35 being filled, with a view to avoiding any release and loss of liquid fuel and vapour into the atmosphere when the tanks contains fuel, and any contamination

of the tank by mud, dust and other contaminants coming in from outside.

The plugging device according to the invention comprises a stopper secured to the fuel filler flap. The expression "secured to" is intended to denote any form of physical link between the filler flap and the stopper, particularly
5 through the stopper being fastened to the filler flap.

As a preference, the stopper is fastened to that part of the filler flap that faces towards the filler pipe. Fastening is achieved by any technique known to those skilled in the art.

The stopper, which essentially consists of a part or a set of parts, has a
10 shape compatible with the top of the filler pipe and plugs the passage communicating with the filler pipe when it is in its closed position, thus closing off the passage to gases and liquids in the pipe.

The device according to the invention also comprises a locking mechanism for locking the stopper, which may be fixed either to the filler flap or to the top
15 of the pipe. As a preference, it is situated on the top of the pipe. Locking the stopper also seals it onto the top of the pipe. To do this, a seal (of the O-ring type, for example) is preferably affixed between the stopper and the top of the pipe in the device according to the invention.

As a preference, the locking mechanism imparts a rotational movement
20 (preferably about the axis of the pipe) either directly to the stopper or to a part secured to the stopper, such as a rotary ring for example. Indeed, such a rotational movement is entirely different from and independent of that of the filler flap, which is generally a pivoting or translational movement. Furthermore, such devices (able to turn about the axis of the pipe) do not occupy a great deal
25 of space and can be fitted onto existing tops of pipes, as a replacement for a conventional cap.

Thus, as a preference, the stopper according to the invention has the form of a cap given a rotational movement about the axis of the pipe. In a variant, this cap is provided with a screw thread that complements a screw thread borne by
30 the top of the pipe. In another variant, this cap comprises (at least part of) a bayonet system. This may be embodied in various ways and collaborates with an appropriate profile on the outside or on the inside of the top of the pipe. In general, the cap comprises lugs positioned either on the inside or on the outside of the top of the pipe when the cap is in place and which, by being turned, can
35 either lock onto a relief borne by the top of the pipe or free themselves therefrom (for example by entering corresponding recesses either on the inside or on the

outside of the top of the pipe).

In order to actuate the locking mechanism and therefore lock or unlock the stopper, the device according to the invention comprises an actuator. The term "actuator" is to be understood as meaning a system allowing "automatic" actuation, by simple action on a push-button or switch, of the movement of the filler flap and locking/unlocking of the stopper.

In general, the actuator may be an electrical, electromagnetic or pneumatic actuator. Generally, this actuator comprises a motor which, through the use of appropriate devices (transmission rod, reduction gearing system, etc.) sets the filler flap in motion and actuates the stopper locking mechanism.

In one particular embodiment, the actuator is fixed to the upper part of the pipe.

In another particular embodiment, the actuator is fixed to the fuel filler flap.

As a preference, operation of the actuator is linked to that of the engine of the vehicle. Thus, as a preference, the actuator can be operated only when the vehicle engine is not running. Further, as a quite particular preference, when the vehicle engine is restarted, the actuator automatically returns to the closed position, closes the filler flap and relocks the stopper if necessary.

Alternatively, a monitoring sensor (a luminous or audible indicator) that indicates that the device is correctly locked may be incorporated into the cabin of the vehicle, to improve safety.

In the case of motor vehicles, in order to prevent unauthorized access to the filler pipe (and therefore to the tank) it may prove advantageous to link the operation of the actuator according to the invention to that of an electric actuator secured to the central locking system (controlling the locking of the doors and other parts on the vehicle that open and close). Thus, the device according to the invention can be rendered inactive as long as the central locking system is activated (i.e. locked).

The operation of locking/unlocking the stopper and the motorized opening of the filler flap can be combined with automated filling, that is to say a set of operations in which the user of the vehicle does not participate. In case of automated filling, it may be advantageous to equip the vehicle with a transponder to help a robot to localize the position of the filling orifice.

The invention also relates to a fuel system comprising a fuel tank, a filler pipe and a plugging device as described hereinabove.

The present invention is illustrated nonlimitingly by Figure 1, which depicts an advantageous variant of the device according to the invention.

The stopper (4) is secured to the fuel filler flap (2), the movement of which is activated by the actuator (3). This same actuator (3) activates the locking
5 mechanism (5) which, in this variant, is borne by the stopper (4). A seal (6) is positioned between the stopper (4) and the top of the pipe (1) when the stopper (4) closes off access to the filler pipe.

The device works as follows.

In order to carry out an operation of filling the fuel tank, access to the pipe
10 needs to be granted so that the fuel nozzle can be inserted. To do this, the actuator (3) activates unlocking of the mechanism (5) (for example by turning a bayonet fitting, so as to disengage the bayonet lugs from the recesses formed on the top of the pipe (1)), then activates the opening of the filler flap (2), which, as it moves, causes the stopper (4) to move, thus granting access to the filler pipe.

15 When filling is over and the fuel nozzle has been removed from the filler pipe, the actuator (3) actuates closure of the filler flap (2) such that once this filler flap is in the closed position, the stopper (4) plugs the top of the pipe (1). Next, the actuator (3) actuates the locking mechanism (5) by, for example, turning a bayonet fitting whose lugs enter the recesses provided for that purpose
20 on the top of the pipe (1).

CLAIMS

1. Device for plugging the top of a fuel tank filler pipe (1) situated under a fuel filler flap (2), the movement of which is controlled by an actuator (3), the said device comprising
- 5 ▪ a stopper (4) secured to the fuel filler flap (2) and able to plug the top of the pipe (1); and
- a locking mechanism (5) for locking the stopper (4);
- characterized in that the actuator (3) is able to activate the locking mechanism (5) that locks the stopper (4) independently of the movement of the filler flap (2).
- 10 2. Device according to Claim 1, characterized in that the tank and the filler pipe are made of plastic and the top of the pipe (1) is made of metal.
3. Device according to either one of the preceding claims, characterized in that a seal (6) is affixed between the stopper (4) and the top of the pipe (1).
4. Device according to any one of the preceding claims, characterized in
- 15 that the locking mechanism (5) imparts a rotational movement either directly to the stopper (4) or to a part secured to the stopper (4).
5. Device according to Claim 4, characterized in that the stopper (4) has the form of a cap equipped with a screw thread that complements a screw thread borne by the top of the pipe (1).
- 20 6. Device according to Claim 4, characterized in that the stopper (4) comprises at least part of a bayonet system.
7. Device according to any one of the preceding claims, characterized in that operation of the actuator (3) is linked to that of an engine of a vehicle.
8. Device according to Claim 7, characterized in that the actuator (3) can
- 25 be operated only when the vehicle engine is not running.
9. Device according to Claim 8, characterized in that when the vehicle engine is restarted the actuator (3) automatically returns to the closed position,

- 8 -

closes the filler flap (2) and relocks the stopper (4).

10. Fuel system comprising a fuel tank, a filler pipe and a plugging device according to any one of the preceding claims.

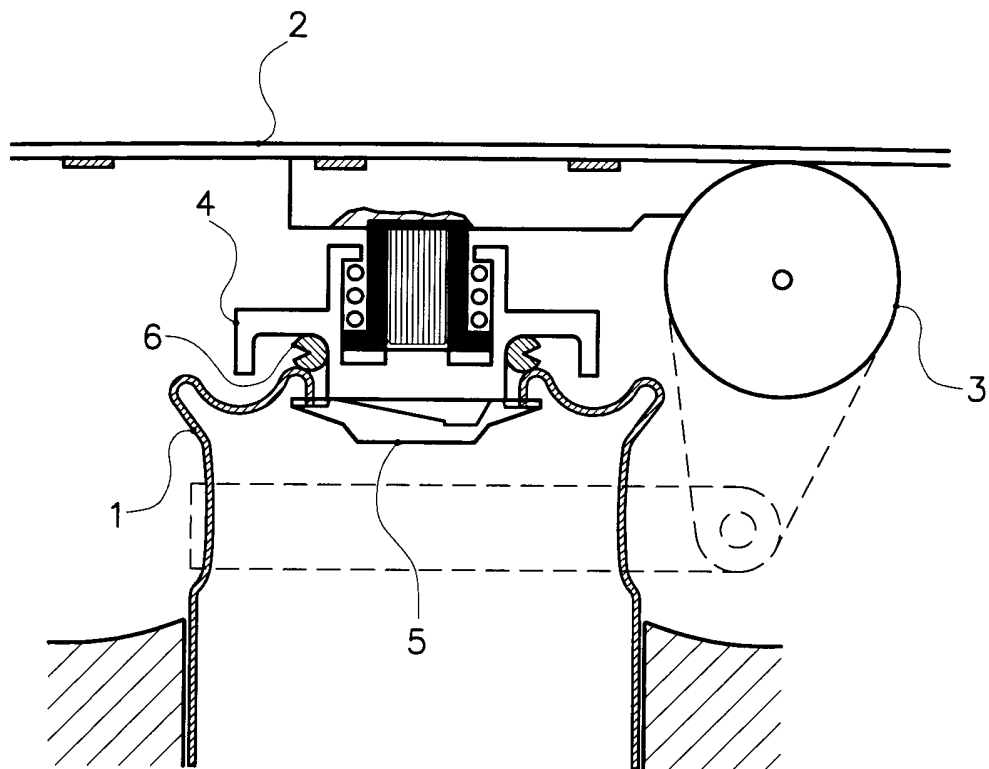


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2005/056748

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60K15/04 B60K15/05

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	DE 299 13 204 U1 (ADWEST KOEHLER GMBH) 7 December 2000 (2000-12-07) page 5, line 8 - line 10; claims ----- -/--	1, 10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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