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(54) Title: RESERVOIR AND ASSOCIATED METHOD FOR FILLING THE RESERVOIR

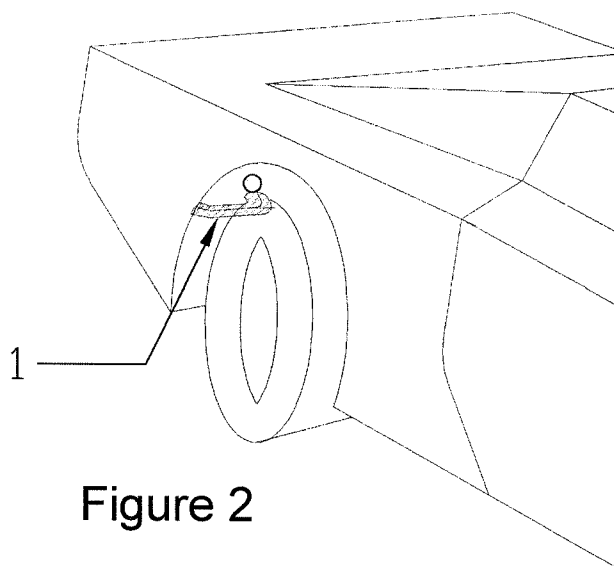


Figure 2

(57) Abstract: Reservoir intended to contain a fluid on board a motor vehicle and equipped with a filling pipe (4), comprising a first end with an opening and a second end to connect to the reservoir, the first end of the filling pipe (4) being furnished with an extension device (8) comprising a first end to receive an attachment device of a reserve cartridge or a nozzle so that it allows the fluid to flow from the reserve cartridge or the nozzle into the filling pipe (4), and a second end to connect to the first end of the filling pipe (4). The extension pipe (8) is stored in the filling pipe (4) when the opening at the first end of the filling pipe (4) is closed, and in that the extension pipe (8) is extended from the filling pipe (4) so as to receive the attachment device of the reserve cartridge or the nozzle for filling the reservoir

when the opening at the first end of the filling pipe (4) is open. Associated method for filling the reservoir.

WO 2009/095477 A1

Reservoir and associated method for filling the reservoir

The invention relates to the filling of reservoirs on board motor vehicles.

In general motor vehicles (cars, light utility vehicles, motorcycles, lorries, etc.) are fitted with reservoirs intended to contain fluids of diverse and varied kinds. So it is possible to list reservoirs containing any type of product that can
5 be used for cleaning (screen-wash liquid), lubrication (engine oil), braking and/or suspension (hydraulic oil), cooling (coolant liquid), depolluting (additive for regenerating the particle filter, urea, ...).

For all these fluids whose service life is often longer than the normal refuelling of the vehicles, it is necessary to top up the levels or, at the extreme, to
10 refill the whole onboard reserve.

The filling operation is not easy and must take account for these fluids of requirements relating to factory or service filling, with extremely tight operating conditions in terms of flows, pressure and time. The fluids may be incorporated into the vehicle in the course of maintenance throughout its life or for example at
15 the moment of a refuelling by an average user and this is done with filling requirements other than those that exist during the assembly of this vehicle on a production line.

Furthermore, the space available on any vehicle is often limited and makes it necessary to arrange interfaces specific to each type of reservoir with the
20 intention to avoid altering the body design of the vehicle.

Different approaches to this problem have been pursued. Known solutions involve a filling interface that either disrupts the vehicle body design or is not accessible without special tools, and more suited for someone skilled in the art than for the average user.

25 It is therefore commonly known to implement solutions where the filling interface is located in a place easily accessible to the user for instance through the use of a funnel. Similar solutions may involve an extension pipe that is connected to a filling pipe, said extension pipe comprising a first end equipped with a fill inlet and a second end comprising a connection means (threaded collar
30 for instance) that may be connected on a corresponding connection means (male thread for instance) on the filling pipe.

- 2 -

In these solutions the extension pipe consists of a separated part that is normally stored in the vehicle, for instance in the trunk, and that is connected to the filling pipe for a refill only.

Such solutions present at least the following disadvantages: the extension
5 pipe may be lost when it is not connected to the filling pipe, the connection of the extension pipe to the filling pipe may comprise several steps and said connection may be of bad quality, leading to liquid spillage.

The idea of the present invention is to provide a solution to the problems previously described, that could be used in any case in which a liquid reservoir is
10 difficult to insert a commercial filling nozzle into, such as those used for the dispensing of urea for Selective Catalytic Reduction (SCR). In such cases a filling interface as convenient as those used for refueling is not necessary, and the benefits of an aesthetic design outweigh such needs. Nevertheless, there must be a refilling interface that can be accessed by the average user and meet
15 interface requirements (eg. ISO/FDIS 22241-4) without the need for special tools.

Accordingly, the present invention relates to a reservoir intended to contain a fluid on board a motor vehicle and which is equipped with a filling pipe, comprising a first end with an opening and a second end to connect to the
20 reservoir, the first end of the filling pipe being furnished with an extension device comprising a first end to receive an attachment device of a reserve cartridge or a nozzle so that it allows the fluid to flow from the reserve cartridge or the nozzle into the filling pipe, and a second end to connect to the first end of the filling pipe, characterized in that the extension pipe is stored in the filling
25 pipe when the opening at the first end of the filling pipe is closed, and in that the extension pipe is extended from the filling pipe so as to receive the attachment device of the reserve cartridge or the nozzle for filling the reservoir when the opening at the first end of the filling pipe is open.

A reservoir intended to contain a fluid means a reservoir capable of storing
30 and delivering a liquid fluid in a system on board a motor vehicle. Motor vehicle means cars, lorries and motorcycles.

The reservoir is an enclosed chamber. An enclosed chamber means a hollow body, of various shapes, usually sealed from the outside, which may be fitted with various internal or external accessories or else accessories passing
35 through the wall of the chamber, such as valves, pipettes, liquid-vapour separators and degassing vessels.

- 3 -

The reservoir according to the invention may be placed in any part of the vehicle, for example in or on a main fuel reservoir, or in the rear of the vehicle.

The reservoir may be made of any material compatible with the fluid that it is likely to contain. It may for example be a plastic or a metal. The reservoir is
5 preferably made of plastic. Plastic means any material comprising at least a polymer made of synthetic resin.

All the types of plastic may be suitable. Plastics that are well suited belong to the category of thermoplastics.

Thermoplastic means any thermoplastic polymer, including thermoplastic
10 elastomers, and their blends. The term "polymer" means both homopolymers and copolymers (particularly binary or ternary). Examples of such copolymers are, in a non-limiting manner, random distribution copolymers, sequenced copolymers, block copolymers and graft copolymers.

Any type of thermoplastic copolymer or polymer whose melting
15 temperature is below the decomposition temperature is suitable. The synthetic thermoplastics that have a melting range extending over at least 10 degrees Celsius are particularly suitable. As an example of such materials, there are those that have a polydispersion of their molecular mass.

In particular, polyolefins, vinyl polyhalides, thermoplastic polyesters,
20 polyketones, polyamides and their copolymers may be used. A blend of polymers or copolymers may also be used, as can a blend of polymeric materials with inorganic, organic and/or natural fillers, such as, for example, but not limitingly, carbon, salts and other inorganic derivatives, natural fibres, glass fibres and polymeric fibres. It is also possible to use multi-layer structures
25 consisting of stacked and fixedly attached layers comprising at least one of the polymers or copolymers described hereinabove.

The vinyl polyhalides and polyolefins are usually preferred. A polymer that is often used is polyethylene. Excellent results have been obtained with high-density polyethylene (HDPE).

30 According to an embodiment of the invention, the reservoir is filled with fluid using a reserve cartridge comprising an attachment device or with a filling nozzle for the said fluid. In particular applications, the reservoir may be filled initially (eg. in a factory) by means of a bottle or a cartridge containing fluid and then filled by means of a nozzle (eg. in stations or during service maintenance in a
35 garage). In other applications fluid reservoirs may be filled only by bottles or cartridges and not nozzles.

- 4 -

According to the invention, the reservoir is equipped with a filling pipe, comprising a first end with an opening and a second end to connect to the reservoir. The first end of the filling pipe is furnished with an extension device whose design is such that it allows the fluid to flow from the reserve cartridge or the nozzle into the filling pipe, said extension device comprising a first end with an opening to receive the attachment device or the nozzle and a second end to connect in a sealed manner to the first end of the filling pipe. The extension device allows to fill in the reservoir in cases where the first end of the filling pipe is situated in a remote and/or inconspicuous location on a car body and where it is not easy for a user to insert the attachment device or the nozzle in the opening at the first end of the filling pipe. Examples of such locations include remote areas of a vehicle's trunk, an engine compartment or a vehicle underbody. With the invention, the location where to allow the fluid to flow from the reserve cartridge or the nozzle into the filling pipe is more accessible to the user.

In the context of the invention, the extension device has a geometry that is adapted so as to take account of the location of the first end of the filling pipe on a car body.

According to the invention, the attachment device or the nozzle is preferably connected in a sealed manner to the first end of the extension device so that the fluid can flow from the nozzle into the filling pipe. In the context of the invention, "in a sealed manner" means "in a leaktight manner" that is to say that no fluid leakage or spillage is allowed at the interface between the attachment device or the nozzle and the extension device.

An example of a reserve cartridge is illustrated in Patent Application WO2006/035013 in the name of the Applicant whereby the cartridge is furnished with an attachment device consisting of a latching device whose design is such that it allows the fluid to flow from the reserve cartridge into the reservoir filling pipe only when the cartridge is attached in a sealed manner to the first end of the filling pipe and the reserve cartridge latching device is unlatched so that the fluid can flow from the reserve cartridge into the filler pipe.

According to the invention, the extension pipe is stored in the filling pipe when the opening at the first end of the filling pipe is closed, and is extended from the filling pipe so as to receive the attachment device of the reserve cartridge or the nozzle for filling the reservoir when the opening at the first end of the filling pipe is open. After the filling of the reservoir the extension pipe is inserted back into the filling pipe without spilling fluid.

- 5 -

Preferably the extension pipe comprises a special feature (eg. a flange) which prevents the extension pipe from being fully removed from the filling pipe near the first end of the filling pipe.

According to a preferred variant of the embodiment above, when the opening at the first end of the filling pipe is closed, a first cap is placed into the fill inlet to seal the extension pipe. In this manner the liquid that fills the filling pipe after the refill can not leak outside the extension pipe and the extension pipe can be re-inserted into the filling pipe without spillage. A second cap (or plug) is installed on the first end of the filling pipe to seal the filling pipe.

In particular the first cap can be screwed on the fill inlet.

Preferably the first cap may include a tether to prevent it from being misplaced during re-filling.

Preferably the extension pipe comprises at its first end a locking ring for locking the extension pipe to the filling pipe when the extension pipe is stored in the filling pipe. The purpose of the locking ring is to maintain the extension pipe inside the filling pipe after filling particularly in case of pressure increase inside the reservoir that may be created after the extension pipe is inserted back in the filling pipe.

More preferably the locking ring comprises a bayonet-type system that locks the extension pipe to the filling pipe by a rotation of the first end of the extension pipe.

The filling pipe can also advantageously be equipped with a means of sealing that is generally located within the filling pipe. Examples of means of sealing are an interference fit or a radial elastomer seal on an inner diameter of the filling pipe.

Preferably the means of sealing consists of a wiper seal that is located between an outer diameter of the extension device and an inner diameter of the filling pipe. The wiper seal has advantageously a substantially disk-type shape and comprises an inner bore and a substantially circular outer periphery. The seal prevents leakage from occurring during re-insertion of the extension pipe in the filling pipe and can be designed so as to withstand a pressure increase that can arise inside the filling pipe and the reservoir during a refill.

More preferably the wiper can be fixed either on the inner diameter of the filling pipe or on the outer diameter of the extension pipe. In the first case, when the extension pipe is extended from the filling pipe or is re-inserted back in the filling pipe, the extension pipe passes through the seal's inner bore. In the second

- 6 -

case, the wiper seal moves along with the extension pipe while the outer periphery of the wiper seal keeps a contact with the filling pipe.

The extension pipe is also preferably made of a flexible material so that the extension pipe can easily be inserted within the filling pipe and fit to the shape of
5 said filling pipe.

The fluid that the reservoir is intended to contain may be used for cleaning, lubrication, braking, suspension, cooling or depolluting in particular.

Preferably the invention is used in the context of depolluting the exhaust gases of motor vehicles. In this case, the fluid may for example be an additive
10 used for regenerating a particle filter or may be injected into the exhaust gases of an internal combustion engine.

The additive concerned is preferably a reducing agent capable of reducing the NO_x present in the exhaust gases. In this context, the additive is a composition, as a solution in a hydrocarbon solvent, of a low-temperature
15 combustion catalyst of solid carbon particles produced by the incomplete combustion of a heavy hydrocarbon in a spontaneous ignition engine. Heavy hydrocarbon means a liquid fuel or a fuel of thick consistency at ordinary temperature whose molecules comprise more than 9 carbon atoms. An example of such a heavy hydrocarbon is a petroleum blend called gasoil that can be used
20 in diesel type engines.

Examples of suitable liquid additives are iron and cerium salts in a hydrocarbon solution.

Also preferably the additive concerned is urea. Specifically, with strict standards coming into force on the exhaust emissions for certain types of motor
25 vehicles (for example lorries), devices for cleansing the nitrogen oxides (NO_x) must be installed. A solution for reducing the NO_x emissions to the required value consists in producing a selective catalytic reaction with urea. To do this, the vehicles must be fitted with a reservoir containing a urea solution, and a device for metering the quantity of urea to be injected into the exhaust line of the
30 motor vehicles.

In particular, the reservoir also comprises a safety device preventing an access to the filling pipe.

The invention also relates to a method for filling a reservoir as described in the preferred embodiment above and which comprises the following steps:

- 35
- the filling pipe is opened;
 - the extension pipe is extended from the filling pipe;

- 7 -

- the extension pipe is open;
- an attachment device of a reserve cartridge or a nozzle is inserted in the fill inlet;
- the reservoir is filled with fluid;
- 5 • the attachment device or the nozzle is removed from the fill inlet;
- the fill inlet is closed;
- the extension pipe is inserted back in the filling pipe;
- the filling pipe is closed.

The above described concept is illustrated in a non limitative way by
10 Figures 1 to 3, wherein:
– Figure 1 represents 2 side views (a) and (b) of a filling pipe of a reservoir according to one embodiment of the invention;
– Figure 2 is a view of a filling pipe opening located in a wheel well;
– Figure 3 is a view of a filling pipe opening mounted behind a license plate of
15 a vehicle.

In these figures, identical numbers designate similar or identical parts.

Figure 1 (a) illustrates one embodiment of the invention, in which a
corrugated tube (8) is stored within a filling pipe (4) and is sealed from the
atmosphere via a threaded cap (7). The filling pipe (4) also comprises a first end
20 and a second end (not pictured) connected to a liquid reservoir. The cap (7)
mates with a male thread (3) at the first end (4') of the filling pipe (4). The
corrugated tube (8) comprises a first end equipped with an interface (6) suitable
for the refilling of the liquid reservoir via a commercial nozzle or a bottle spout.
In the event that refilling of the liquid reservoir is required (as illustrated in
25 Figure 1 (b)), the corrugated tube (8) is extended from the filling pipe (4) which
is only accessible by hand's reach, to create a means for filling the liquid
reservoir. The first end (4') of the filling pipe (4) is equipped with a means of
sealing within the filling pipe (4), via an interference fit, or use of a radial
elastomer seal (not pictured) on the inner diameter of the filling pipe (4). This
30 radial seal also serves as a wiper to the outer diameter of the corrugated tube (8)
of the liquid stored in the reservoir.

In a variant (not illustrated) of the embodiment of Figure 1, the tube (8)
comprises a fill inlet (6') and a plug is screwed on the fill inlet (6') and seals the
tube (8) so that the tube (8) can re-inserted into the filling pipe (4) without
35 spillage. A second cap (similar to cap (7) described in Figure 1) is the installed
on the first end (4') of the filling pipe (4) to seal the filling pipe (4).

- 8 -

Figure 2 shows one instance where the filling pipe opening pictured in Figure 1, is located in a wheel well of a vehicle. The extension pipe (1) is depicted to show how it allows refilling of the liquid reservoir from outside the wheel well. The embodiment in Figure 1 could also be used in this application.

5 Figure 3 shows another instance, in which the filling pipe opening is mounted behind a license plate (9) of a vehicle. In this instance the filling pipe opening is too low for an ergonomic refilling of the liquid reservoir.

Other locations could include, remote areas of the vehicle's trunk, the engine compartment, and the vehicle underbody.

CLAIMS

1. – Reservoir intended to contain a fluid on board a motor vehicle and which is equipped with a filling pipe, comprising a first end with an opening and a second end to connect to the reservoir, the first end of the filling pipe being
5 furnished with an extension pipe comprising a first end to receive an attachment device of a reserve cartridge or a nozzle so that it allows the fluid to flow from the reserve cartridge or the nozzle into the filling pipe, and a second end to connect to the first end of the filling pipe, characterized in that the extension pipe is stored in the filling pipe when the opening at the first end of the filling pipe is
10 closed, and in that the extension pipe is extended from the filling pipe so as to receive the attachment device of the reserve cartridge or the nozzle for filling the reservoir when the opening at the first end of the filling pipe is open.

2. – Reservoir according to Claim 1, characterized in that the extension pipe comprises a special feature which prevents the extension pipe from being
15 fully removed from the filling pipe near the first end of the filling pipe.

3. – Reservoir according to any one of the preceding claims, characterized in that, when the opening at the first end of the filling pipe is closed, a first cap is placed into the fill inlet to seal the extension pipe and a second cap is installed on the first end of the filling pipe.

20 4. – Reservoir according to any one of the preceding claims, characterized in that the extension pipe comprises at its first end a locking ring for locking the extension pipe to the filling pipe when the extension pipe is stored in the filling pipe.

25 5. – Reservoir according to any one of the preceding claims, characterized in that the filling pipe is equipped with a means of sealing that is located within the filling pipe.

6. – Reservoir according to any one of the preceding claims, characterized in that the fluid may be used for cleaning, lubrication, braking, suspension, cooling or depolluting.

30 7. – Reservoir according to Claim 6, characterized in that the fluid is an additive used for the regeneration of a particle filter.

- 10 -

8. – Reservoir according to Claim 6, characterized in that the fluid is urea.

9. – Reservoir according to any one of the preceding claims, characterized in that it also comprises a safety device preventing an access to the filling pipe.

5 10. – Method for filling a reservoir according to Claim 1, characterised in that

- the filling pipe is opened;
- the extension pipe is extended from the filling pipe;
- the extension pipe is open;
- an attachment device of a reserve cartridge or a nozzle is inserted in the fill
- 10 inlet;
- the reservoir is filled with fluid;
- the attachment device or the nozzle is removed from the fill inlet;
- the fill inlet is closed;
- the extension pipe is inserted back in the filling pipe;
- 15 • the filling pipe is closed.

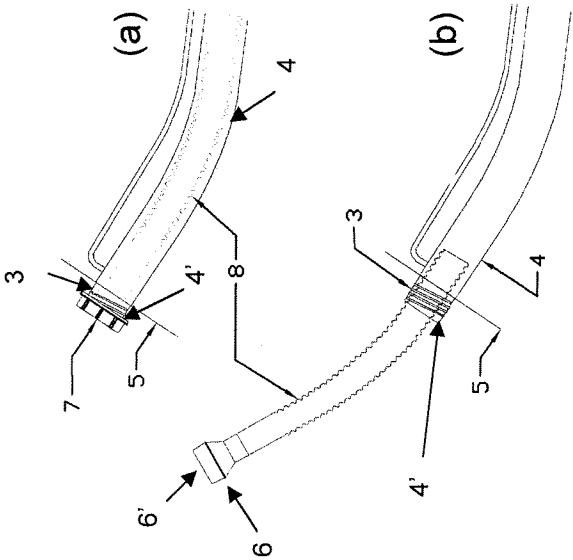


Figure 1

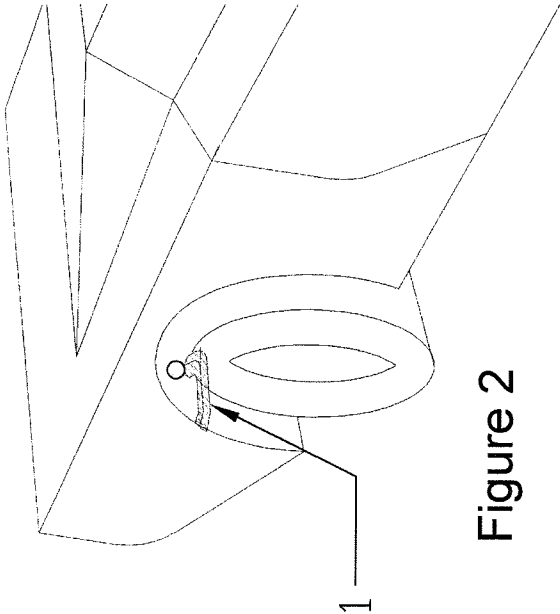


Figure 2

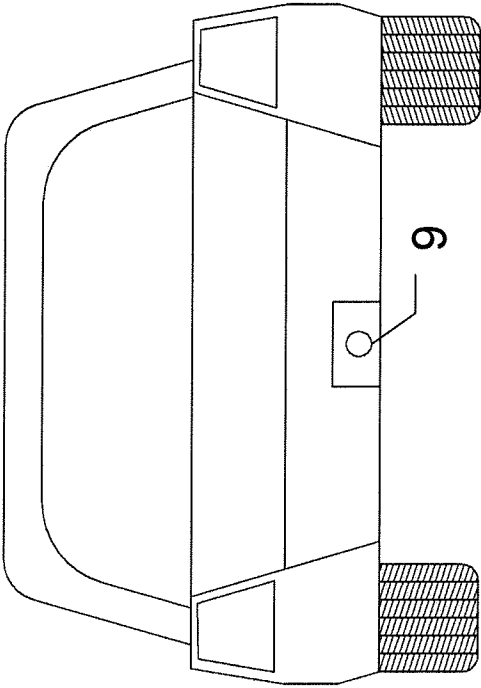


Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/051077

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60S1/50 B60K15/04

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)
B60S 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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 223 793 B1 (DONOUGHE MICHAEL F [US] ET AL) 1 May 2001 (2001-05-01) the whole document	1-6,9,10
Y	-----	7,8
X	DE 101 05 494 A1 (BAYERISCHE MOTOREN WERKE AG [DE]) 29 November 2001 (2001-11-29) paragraph [0015] - paragraph [0025]; figures	1-4,7,8
X	DE 100 50 214 A1 (VOLKSWAGEN AG [DE]) 11 July 2002 (2002-07-11) the whole document	1,2,4-6, 9,10
Y	US 6 374 868 B1 (CHANNING DEREK ALBERT [US]) 23 April 2002 (2002-04-23) column 1, line 24 - line 31; figure 1	7,8

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

☒ See patent family annex.

* Special categories of cited documents:

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6223793	B1	01-05-2001	NONE
DE 10105494	A1	29-11-2001	NONE
DE 10050214	A1	11-07-2002	NONE
US 6374868	B1	23-04-2002	DE 10214556 A1 05-12-2002
		GB 2376940 A	31-12-2002
		GB 2376941 A	31-12-2002
		GB 2380471 A	09-04-2003
		US 2002170621 A1	21-11-2002
		US 6390147 B1	21-05-2002