(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 952 820 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.12.2015 Bulletin 2015/50

(51) Int Cl.:
F24D 17/00 *(2006.01)* ***E03B 1/04*** *(2006.01)*
F24D 19/10 *(2006.01)*

(21) Application number: **15170872.4**

(22) Date of filing: **05.06.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(30) Priority: **06.06.2014 IT FI20140140**

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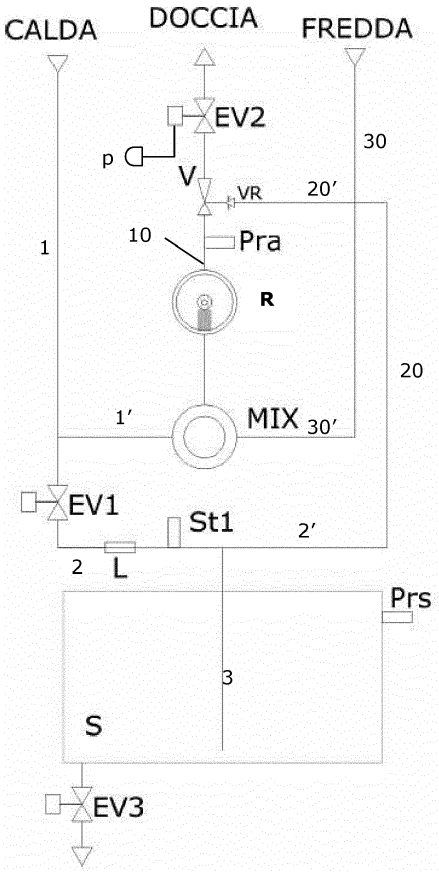
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(54) Sanitary water recovery system

(57) The present invention concerns a hydraulic system for the recovery of the waters destined to one or more bathroom fixtures and comprising:
- A conduit (1, 1', 2) for the circulation of the water and connectable to a water heating apparatus;
- A tank (S) placed in fluid communication with said conduit (1, 1', 2) in such a way as to collect the water coming from said conduit (1, 1', 2);
- A valve **(EV1)** selectively activable between an open position and a close position in such a way as to allow the passage of the liquid along said conduit (1, 1', 2) towards the tank **(S)** when said valve is open and to interrupt the passage of the liquid when said valve is closed;
- A temperature sensor **(St1)** arranged in such a way as to measure the temperature of the liquid circulating in the conduit (1, 2', 2);
- And wherein the valve **(EV1)** is controlled in open position, allowing the filling of the tank **(s),** for temperatures of the liquid circulating in the conduit (1, 1', 2) that are below a pre-established threshold temperature.

FIG 1



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Description

Technical field

[0001] The present invention concerns the technical field relative to bathroom fixtures, in particular showers, toilets, faucets and the like.

[0002] In particular way, the invention refers to a hydraulic apparatus, for bathroom fixture, capable of economizing water waste and consumption in general.

Background art

[0003] Bathroom fixtures are of common use and each construction, be it for residential or office use, foresees bathroom fixtures with relative hydraulic system for the water delivery, among them showers, toilets, etc. A boiler is also foreseen for obtaining hot water.

[0004] Taking the shower as a non-limiting example, it is noted that the hydraulic system of water delivery, together with the water heating system at adjustable temperature, does not allow to optimize the consumptions as it will be explained below.

[0005] In all houses there exists the boiler which bases its functioning on the automatic lighting of a bed of flame that heats a conduit of passage of the water, thus allowing to obtain hot water for consumption.

[0006] Naturally, whatever the type of boiler used, at the activation of the bathroom fixture, a certain lapse of time will be necessary before the water reaches the desired temperature during the normal operation.

[0007] In particular, as soon as the flame of the boiler is activated, there will be a certain quantity of liquid flow of passage in the conduit, lapped by the flame, which does not heat because the conduit where it circulates is still cold.

[0008] We experiment this event basically everyday when, for example, we make a shower. We set the temperature but we always have to wait a variable quantity of time from some tens of seconds to some minutes before the water reaches the user at the pre-set temperature. In this lapse of time, for obvious comfort reasons, we do not use the water to make the shower but we make it flow freely waiting that it reaches the pre-set temperature and trying to perceive the temperature reached thereof with the fingers or the hand. When we perceive a temperature that is considered acceptable, we start to make the shower, using the waster for the aim that we had in mind.

[0009] Naturally, in the first moments necessary for the reaching of the temperature there is a useless waste of water which is freely made to flow to the plughole without using it. The quantities of waste are obviously very high, above all it we consider the entire mass of population.

[0010] In order to solve said technical problems, a solution has been proposed, for example, in publication WO2012/001683.

[0011] Such a publication describes a conduit where water for the shower circulates which is connected to a collection tank. The collection tank has inside it a floating piston provided with a magnet that is coupled, in a first embodiment of figure 1, with two sensors placed at two different heights and corresponding to a vacuum and full position of the tank. In this way, it is possible to read the level of liquid contained in the tank in correspondence of the position of the piston. A temperature sensor is then foreseen so that, below a certain threshold temperature and when the tank is not completely full, the water is directed towards the collection tank, thus avoiding that cold water comes out from the shower, being wasted in vain. As soon as the threshold temperature is reached, or the tank becomes full, then the water flows normally towards the shower, interrupting the filling of the tank. To that aim, two specific valves are foreseen that are controlled in opening/closing by a specific control unit on the basis both of the signal of position of the piston and of the temperature detected through the specific temperature sensor.

[0012] The same thing takes place in the second embodiment described in figure 5, whose difference consists in the presence of a single valve rather than two valves and in a single full sensor.

[0013] This solution, though functional, is not optimal. The time necessary for reaching the threshold temperature is such that there is a significant quantity of water delivery that derives in the quick filling of the tank. Once such a condition of full tank is reached, the system controls the delivery of the water from the tank towards the bathroom fixture, even when the temperature is below that of threshold, therefore causing an exit of water from the bathroom fixture that is not comfortable and that will be even wasted.

Disclosure of invention

[0014] It is therefore the aim of the present invention to provide an innovative hydraulic system that solves said technical inconveniences.

[0015] In particular, it is the aim of the present invention to provide a system that allows to recover the liquid that does not come out at the pre-set temperature and that is not generally used, going directly into the plughole.

[0016] These and other aims are therefore obtained with the present system as per claim 1.

[0017] The system, object of the invention, comprises a conduit (1, 1', 2) for the circulation of the water and connectable to a water heating apparatus, for example a classic boiler.

[0018] In accordance with the invention, a tank (S) is foreseen, placed in fluid communication with said conduit (1, 1', 2) in such a way as to be able to collect the water coming from said conduit (1, 1', 2) and therefore from the boiler.

[0019] Naturally, the water that is collected is that that is below the pre-set temperature and that therefore, generally, is made to flow without using it.

[0020] To that aim, a valve (**EV1**) is foreseen, selectively activable between an opening position and a closing position in such a way as to allow the passage of the liquid along said conduit (1, 1', 2) towards the tank (S) when it is open and interrupt the passage of the liquid when it is closed.

[0021] The valve (**EV1**) is, to that aim, controlled in opening, allowing the filling of the tank (S), for temperatures of the liquid circulating in the conduit (1, 1', 2) that result to be below a pre-set threshold temperature.

[0022] In this manner, the water that would generally be made to flow freely without being used can now be collected and re-used at need.

[0023] In accordance with the invention, a delivery limiter (L) is further foreseen.

[0024] The delivery limiter allows a much lower water delivery which, above all, heats and reaches the threshold temperature much before. This allows a much more limited and controlled filling of the tank, avoiding the risk of filling it too quickly and therefore contributing to the waste.

[0025] Advantageously, the list limiter delivers three liters per minute.

[0026] Advantageously, the hydraulic system is further configured in such a way that below said pre-set threshold temperature the water flows exclusively towards the tank (S) and, when it reaches or exceeds said threshold temperature, the water flows towards the bathroom fixture, interrupting the filling of the tank (S).

[0027] Advantageously, the tank (S) further comprises an exhaust valve (EV3) in combination with a pressure switch (Prs) arranged in such a way that said pressure switch (Prs) controls the opening of said valve (EV3) when it exceeds inside the tank (S) of a pre-set pressure value, allowing the emptying thereof outside of the conduit.

[0028] This solution is further advantageous since, also when the tank is full and the water at its opening was below the threshold temperature, then the water is equally directed into the tank which can now exhaust through the valve (EV3) thanks to the control of the pressure switch (Prs). In this way, in the event that the tank is full and the temperature is below the pre-set threshold, it is avoided to deliver cold water to the bathroom fixture, therefore creating a situation of poor comfort for the user, as instead takes place in WO2012/001683.

[0029] The pressure switch could also be substituted by an equivalent solution consisting in a floater, for instance.

[0030] Advantageously, the tank is connected to the conduit in such a way that the liquid collected in it can be re-inserted in the conduit towards said bathroom fixture.

[0031] Advantageously, a temperature sensor (**St1**) is foreseen, arranged in such a way as to measure the temperature of the liquid circulating in the conduit (1, 2', 2).

[0032] Advantageously, said temperature sensor (**St1**) is placed upstream the tank (**S**).

[0033] Advantageously, a Venturi system (**V**) can be foreseen to allow the aspiration of the liquid contained in the tank (**S**) or, alternatively, a pump to allow the aspiration of the liquid contained in the tank (**S**).

[0034] Advantageously, a valve (E**V2**) is foreseen, arranged in the branch circuit (10) of the liquid that converges to the bathroom fixture.

[0035] Advantageously, an electric controller is foreseen that controls in opening/closing said valves (EV1, EV2).

[0036] Advantageously, the controller is programmed in such a way that, at the activation of request of water to the bathroom fixture, it controls in closure the valve (EV2), impeding the flow of water to the bathroom fixture and opening the valve (EV1) to control the filling of the tank (S) until the reaching of said pre-set threshold temperature.

[0037] It is also described here the use of a hydraulic system, as per one or more of the preceding claims, in a shower, a bath or a washbasin.

Brief description of drawings

[0038] Further features and advantages of the present system, according to the invention, will result to be clearer with the description that follows of some of is embodiments, made to illustrate but not to limit, with reference to the annexed drawings, wherein:

- Figure 1 shows a diagram of the system that is the object of the present invention.

Description of one preferred embodiment

[0039] Figure 1 describes in a schematic way the system that is the object of the present invention.

[0040] The scheme shows a tank (**S**) which serves as a recovery chamber for the liquid.

[0041] The system foresees a first branch circuit 1.

[0042] Such a branch circuit converges to the boiler, therefore it is suitable for the transport of the hot water.

[0043] Such a branch 1 intercepts a first valve (**EV1**) normally closed (for example, an electro-valve). Such a valve, as clarified below, opens immediately at the activation of request of hot water, therefore allowing the flow directly in the tank. To that aim, in the branch 2 downstream the valve (**EV1**) a first temperature probe (**St1**) is foreseen. At the activation of request of hot water, the valve (**EV1**) opens and makes liquid converge in the branch 2 where the temperature probe (**St1**) is found that intercepts such a liquid, detecting the temperature thereof.

[0044] The branch 3 branches off from the branch 2 into the tank (**S**) and allows to send this quantity of water inside the tank (**S**) that collects it.

[0045] Once a pre-settable temperature is reached, for example 40°C, the probe (**St1**) sends a consensus for the closure of the valve (**EV1**), therefore interrupting the filling flow of the tank (**S**) and allowing the activation of

the other part of circuit described below.

[0046] In order to limit the filling of the tank and reducing the times of reaching of the temperature of water regime, also a delivery limiter (**L**) is installed that permits a transit of water not superior to three liters per minute, enough anyway for guaranteeing the correct functioning of the generator of hot water. In such a manner, being the delivery reduced, the boiler can heat more efficiently and in quicker times the circulating water.

[0047] Generally, without delivery limiters, the normal water flow is of about twelve liters per minute, therefore a much greater quantity with respect to the case in which the use of the limiter is foreseen.

[0048] Going on with the structural description of the scheme of figure 1, a branch circuit 10 is highlighted that converges, for example, to the shower. Such a branch is provided with a valve (E**V2**), for instance an electrovalve, which works in normally open condition. When such a valve is open it allows the water flow towards the nozzle of the shower.

[0049] Upstream the electro-valve (**EV2**) a Venturi system (V) and a pressure switch (**Pra**) are foreseen of which the functioning will be described in detail below.

[0050] Always in the branch 10, the faucet (R) (for example of the open/close type) is then foreseen through which the user controls the coming out of the flow from the nozzle of the shower in an absolutely traditional way.

[0051] To the Venturi system (**V**) the branch conduit (20, 20') converges that through the branch (2', 3), to which it is connected, is capable (with **EV2** open) to aspire the liquid present in the collection tank (**S**).

[0052] The branch 10 starts with the classic mixer (**MIX**) to which the hot water (coming from the branch 1-1') and the cold water (coming from the branch 30-30') converge in such a way as to mix the water at the desired temperature.

[0053] In that sense, in an absolutely known way according to the state of the art, the user adjusts the temperature to a desired one and the mixer (**MIX**) mixes cold and hot water in order to obtain the value set by the user.

[0054] A control unit, or a CPU, is suitable for the electronic control of all the components.

[0055] Having said that, we now pass onto a description of functioning of the present system.

[0056] As soon as the user makes the water comes out of the shower, through the activation of the open faucet (**R**), selected a certain temperature, the pressure switch (**Pra**) (for example, a membrane pressure switch) feels the pressure and sends the signal to the control unit or CPU that, once the pressure value is detected, controls electrically the valve (**EV2**) to be set in a closure configuration, therefore impeding the shower to deliver water. Simultaneously, the control unit controls the valve (**EV1**) to be set in an open configuration. In such a manner, the water that comes from the branch 1, connected to the boiler, intercepts the valve (**EV1**) arranged in opening. The water, thanks to the opening of the valve (**EV1**) flows through the branch 2 and 3 inside the collection tank (**S**), filling it progressively.

[0057] In this condition, the water that is collected inside the tank (**S**) is obviously the water that has not reached the regime temperatures and that would flow through the shower without being used. In this manner, it is instead directed inside the collection tank (**S**) and can then be re-used at the moment required, as described below.

[0058] In particular, the probe (**St1**) monitors and measures the temperature of the water that comes into the tank (**S**) through the branch 3 (the probe **St1** is in fact placed upstream the branch off 3 but could be placed in another position useful for the purpose). When the temperature of the water reaches a pre-set value, the probe (**St1**) controls the closure of the valve (**EV1**) and controls the opening of the valve (**EV2**). For example, the probe **St1** sends the temperature detected to the CPU that, once the value thereof is detected, controls the closure of the valve (**EV1**) and the opening of the valve (**EV2**). In this way, the filling of the tank (**S**) is interrupted and the water flows normally to the shower, mixing hot and cold water in the (**MIX**) on the basis of the pre-set temperature.

[0059] In particular, once the valve (**EV1**) is closed, the hot water arrives to the **MIX** through the branch 1-1' as the cold water arrives to the **MIX** through the branch 30-30'.

[0060] From here the water goes up towards the shower and is delivered normally.

[0061] The tank **S** has been filled with water that would have been otherwise wasted.

[0062] In accordance with the invention, it is also possible to use the water present in the tank **S** immediately.

[0063] Though usable at any time and in any way, it has been surprisingly found out that its immediate use is possible without implying a decrease of the temperatures in the mixed water.

[0064] In particular, the Venturi system V, during the passage of the mixed water along the branch 10 going up towards the shower, creates an aspiration effect by depression that makes also the water go up from the tank S along the branches 3-2'-20-20'.

[0065] The water going up from the tank mixes with the water at temperature coming from the mixer (**MIX**) (or branch 1-1' and branch 30-30') but, though the water of the tank (**S**) is at a lower temperature, the difference of temperature and the quantity of liquids at stake are not such as to beat in a significant way the temperature selected by the user.

[0066] In this way, it is possible to re-use immediately the water collected avoiding that the user perceives a significant difference of temperature, the whole with a significant saving.

[0067] Naturally, in a possible variant of the invention, it would be possible to use instead of the Venturi system (**V**) a normal pump that directs at need the water of the tank (**S**) along the conduit 3- 2'-20-20'.

[0068] In phase of use of the shower and always in the

optics of the "hydric and energetic saving", the user can have at disposal a pneumatic button (**P**) that, if activated, controls the valve in closure, interrupting the water flow of the shower. The operation can be rendered useful and necessary for the user when, for example, he has been forgotten the soap, when he has to answer an urgent phone call or when he has to wash himself without a shower jet. Acting again on the button the valve is re-opened and the flow of the shower is re-activated with the eventual recovery of the water of the tank (S).

[0069] At the end of the use of the shower, with the closure of the diverter, the pressure switch (Pra) measures pressure equal to zero and therefore the control unit can re-set the system.

[0070] As shown in figure 1, the discharge valve (EV3) is also present which is in normally closing condition. It is arranged in such a way as to be able to allow the emptying of the tank (**S**) when necessary. It is controlled in opening by the control unit at the end of the cycle to discharge the last residues of water that could otherwise become stagnant at the bottom of the tank (**S**).

[0071] It is then foreseeable, as a further safety measure, the presence of a further pressure switch (Prs) applied to the tank (S) to control that the pressure inside it does not exceed a safety threshold: in case of excess, the valve (EV3) is kept open for the discharge.

[0072] Naturally, the system described can be applied to any bathroom fixture and can control also more than one bathroom fixture simultaneously.

Claims

1. A hydraulic system for the recovery of the waters destined to one or more bathroom fixtures and comprising:

- A conduit (1, 1' 2) for the circulation of the water and connectable to a water heating apparatus and to one or more bathroom fixtures;
- A tank (**S**) placed in fluid communication with said conduit (1, 1', 2) in such a way as to collect the water coming from said conduit (1, 1', 2);
- A valve (**EV1**) selectively activable between an open position and a close position in such a way as to allow the passage of the liquid along said conduit (1, 1', 2) towards the tank (**S**) when said valve is open and to interrupt the passage thereof when it is closed;
- And wherein the valve (**EV1**) is controlled in opening, allowing the filling of the tank (**S**), for temperatures of the liquid circulating in the conduit (1, 1', 2) that are below a pre-established threshold temperature;
- **Characterized in that** a delivery limiter (L) is further foreseen.

2. A hydraulic system, as per claim 1, wherein said delivery limiter delivers 3 liters per minute.

3. A hydraulic system, as per claim 1 or 2, wherein said hydraulic system is further configured in such a way that below said temperature of pre-established threshold the water flows exclusively towards the tank (S) and, when it reaches or exceeds said threshold temperature, the water flows towards the bathroom fixture, interrupting the filling of the tank (S).

4. A hydraulic system, as per one or more of the preceding claims, wherein the tank (S) further comprises an exhaust valve (EV3) in combination with a pressure switch (Prs) arranged in such a way that said pressure switch (Prs) controls the opening of said valve (EV3) when it exceeds inside the tank (S) of a pre-set pressure value, allowing the emptying thereof outside of the conduit.

5. A hydraulic system, as per one of more of the preceding claims, wherein said tank is connected to the conduit in such a way that the liquid collected in it can be re-inserted in the conduit towards said bathroom fixture.

6. A hydraulic system, as per claim 1, wherein a temperature sensor (**St1**) is foreseen arranged in such a way as to measure the temperature of the liquid circulating in the conduit (1, 2', 2).

7. A hydraulic system, as per claim 6, wherein the temperature sensor (**St1**) is placed upstream the tank (**S**).

8. A hydraulic system, as per one or more of the preceding claims from 1 to 3, wherein a Venturi system (**V**) is foreseen to allow the aspiration of the liquid contained in the tank (**S**).

9. A hydraulic system, as per one of more of the preceding claims from 1 to 3, wherein a pump is foreseen to allow the aspiration of the liquid contained in the tank (**S**).

10. A hydraulic system, as per one of more of the preceding claims, wherein a valve (**EV2**) is foreseen arranged in the circuit branch (10) of the liquid that converges in the bathroom fixture.

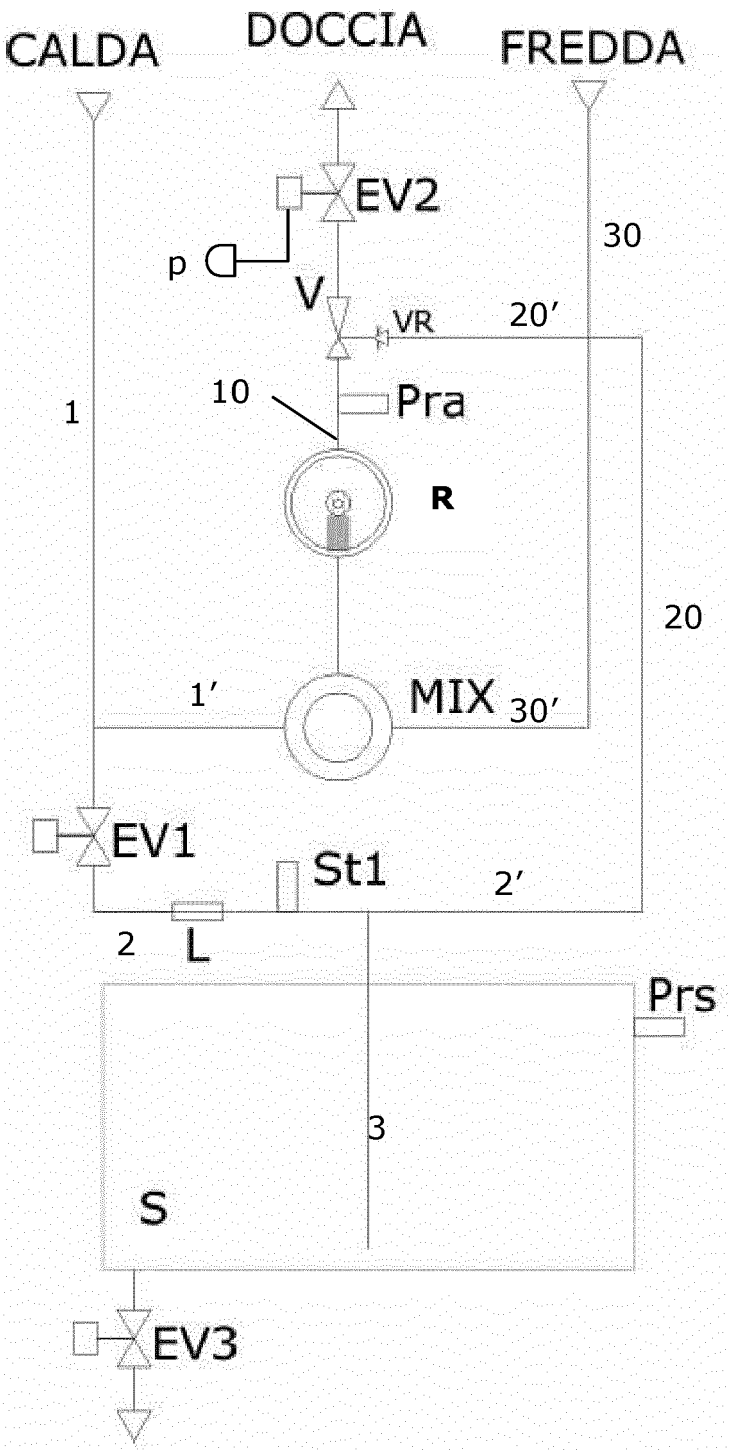
11. A hydraulic system, as per one of more of the preceding claims, wherein an electronic controller is foreseen that controls in opening/closure said valves (EV1, EV2).

12. A hydraulic system, as per one of more of the preceding claims, wherein a controller is programmed in such a way that, when the request of water to the bathroom fixture is operated, it controls in closure

the valve (EV2), impeding the flow of water to the bathroom fixture, and opening the valve (EV1) to control the filling of the tank (S) until the reaching of said pre-established threshold temperature.

13. The use of a hydraulic system, as per one of more of the preceding claims, in a shower, a bath or a washbasin.

FIG 1


CALDA
DOCCIA
FREDDA
EV2
p
V
VR
20'
30
1
10
Pra
R
20
1'
MIX
30'
EV1
St1
2'
2
L
Prs
3
S
EV3

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 0872

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2012/118414 A1 (MCMURTRY JOHN L [US]) 17 May 2012 (2012-05-17) * paragraphs [0007], [0009]; figures 1,2,4,5,6,7,8 * * paragraphs [0027], [0028], [0038] *	1-13	INV. F24D17/00 E03B1/04 ADD. F24D19/10
X	US 6 098 213 A (CHU LI-TSAN [TW]) 8 August 2000 (2000-08-08) * column 3, line 27 - column 4, line 2; figure 2 *	1-7, 10-13	
X	AU 2013 206 041 A1 (INNOVATIVE ENVIRONMENTAL SOLUTIONS PTY LTD) 25 July 2013 (2013-07-25) * claims 1,11,13; figures 1,3 *	1,2,5, 8-10,13	

TECHNICAL FIELDS SEARCHED (IPC)

F24D
B05B
E03B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 October 2015	Degen, Marcello

CATEGORY OF CITED DOCUMENTS

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02-10-2015

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AU 2013206041 A1	25-07-2013	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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