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(54) MACHINE AND METHOD OF INHIBITING FLOW OF WATER INTO A MACHINE

(57) A machine (100) comprises a pump (122) for drawing water into the machine (100) through a water intake pipe (118); and a device (126) for causing flow of water into the machine (100) to be inhibited. The device (126) comprises a container (130) which contains a material (132) that coalesces when it absorbs water. The device (126) is configured to discharge at least some of the material (132) into the water intake pipe (118). This prevents water being drawn into the machine (100), thereby preventing flooding in the machine (100).

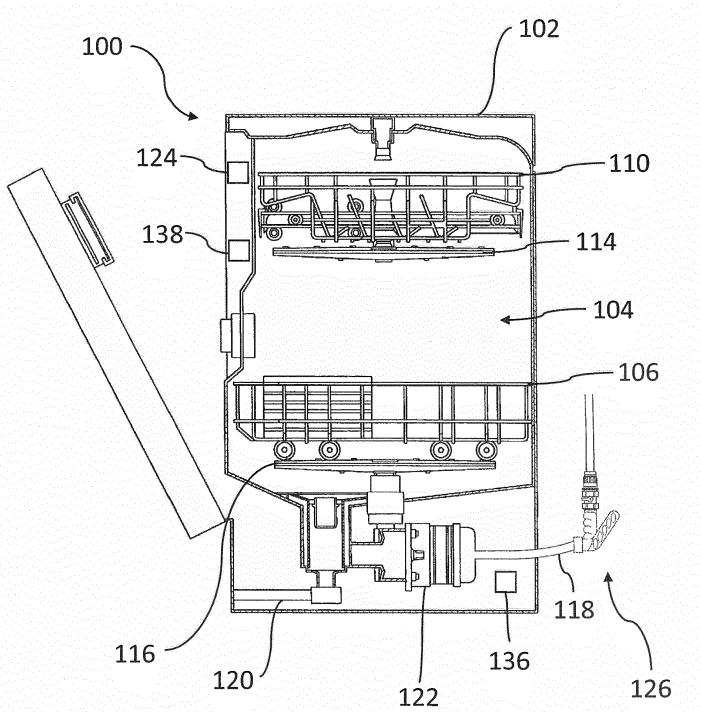

Figure 1

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Description

Technical Field

[0001] The present disclosure relates to a machine and a method of inhibiting flow of water into a machine.

Background

[0002] Some machines, such as dishwashing machines and (clothes) washing machines, use water in combination with a detergent to wash items that have been placed inside the machine. Such machines have a pump to draw water into a washing compartment though a water inlet, and expel water out of the washing compartment through a water outlet using either the same pump or an additional dedicated pump. Such machines are liable to flood because for example water cannot drain out, or cannot drain out quickly enough, and/or because water continues to be pumped into the machine when not required because of some malfunction.

Summary

[0003] According to a first aspect disclosed herein, there is provided a machine comprising: a pump for drawing water into the machine through a water intake pipe; and a device for causing flow of water into the machine to be inhibited, the device comprising a container which contains a material that coalesces when it absorbs water; the device being configured to discharge at least some of the material into the water intake pipe such that the material coalesces so as to prevent water being drawn into the machine, thereby to prevent flooding in the machine.

[0004] In an example, the device comprises a valve which is openable to allow at least some of the material to be discharged from the container into the water intake pipe.

[0005] In an example, the container is an elastic container arranged such that the container compresses to discharge the material out of the container when the valve is opened.

[0006] In an example, the device comprises an actuator, the actuator being operable to discharge the material out of the container.

[0007] In an example, the material is a hydrophilic material.

[0008] In an example, the material is stored in the container as a powder.

[0009] In an example, the material is stored in the form of a plurality of capsules in the container.

[0010] In an example, the machine comprises a sensor configured determine whether the pump has malfunctioned and to cause the device to discharge at least some of the material into the water intake pipe in the case that the pump has malfunctioned.

[0011] In an example, the machine comprises a sensor configured detect a water level in the machine and to cause the device to discharge at least some of the material into the water intake pipe when the water level in the machine exceeds a predetermined value.

[0012] In an example, the machine is a washing machine, a washing and drying machine, or a dishwashing machine.

[0013] According to a second aspect disclosed herein, there is provided a method of inhibiting flow of water into a machine, the method comprising: discharging a material into a water intake pipe of the machine, the material being of a type that coalesces when it absorbs water such that the material coalesces after being discharged into the water intake pipe, thereby preventing water entering the machine and preventing flooding in the machine.

[0014] In an example, the method comprises opening a valve to allow the material to be discharged into the water intake pipe.

[0015] In an example, the method comprises operating an actuator to discharge the material into the water intake pipe of the machine.

[0016] In an example, the method comprises discharging the material into the water intake pipe in response to a sensor detecting that a pump of the machine has malfunctioned.

[0017] In an example, the method comprises discharging the material into the water intake pipe in response to detecting that the water level in the machine has exceeded a predetermined value.

Brief Description of the Drawings

[0018] To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

Figure 1 shows schematically a side cross sectional view of a machine according to an according to an aspect described herein, the machine including a device with a container within which material is stored;

Figure 2 shows schematically a side cross sectional view of the device shown Figure 1; and

Figure 3 shows schematically a side cross sectional view of the machine shown in Figure 1, with the material discharged into the water intake pipe to form a blockage

Detailed Description

[0019] As mentioned, some machines, such as dishwashing machines and (clothes) washing machines and the like, use water in combination with a detergent to wash items that have been placed inside the machine. Such machines have a pump to draw water into a washing compartment though a water inlet, and expel water

out of the washing compartment through a water outlet using either the same pump or an additional dedicated pump. Such machines are liable to flood because for example water cannot drain out, or cannot drain out quickly enough, and/or because water continues to be pumped into the machine when not required because of some malfunction.

[0020] Typically, the machine includes an arrangement that can detect when the water level inside the machine has exceeded a certain threshold value, and then cause the pump to stop drawing water into the machine. The arrangement may include, for example, an electronic sensor and/or a mechanical float valve. Once the pump has been stopped, the excess water in the washing compartment can drain out of the machine through a water outlet and/or an overflow outlet.

[0021] There is a problem when the water level inside the washing compartment increases beyond a certain threshold value, but cannot be drained. This may occur, for example, when the pump malfunctions so that it cannot be shut down, or when the water outlet or overflow outlet are blocked, or when a system for shutting down the pump fails. In this situation, the flow rate of water into the washing compartment by the pump exceeds the flow rate of water out of the washing compartment, which causes the washing compartment to gradually fill up with water. This can result in flooding of the machine, which is very inconvenient for a user. Conventional arrangements attempt to control the water inlet pump to stop water being drawn into the machine, but this may not always be possible or effective for some reason.

[0022] Figure 1 shows schematically an example of a machine 100 according to the present disclosure. In this example, the machine 100 is a dishwashing machine 100. In other examples, the machine may be another type of machine that may be susceptible to flooding, such as a washing machine or a combined washing and drying machine.

[0023] The dishwashing machine 100 has a main body 102, within which there is a washing compartment 104. The washing compartment 104 houses a lower rack 106 and an upper rack 110, each for holding one or more items to be washed.

[0024] The dishwashing machine 100 also includes a washing mechanism for cleaning the items to be washed. The washing mechanism in this example has a first spray arm 114 and a second spray arm 116. Each spray arm 114, 116 has a series of holes or nozzles through which water is ejected upwardly towards the items to be washed.

[0025] The first and second spray arms 114, 116 are connected to a water inlet which allows water to be fed into the dishwashing machine 100 from a mains water supply. In this example, the water inlet includes a water intake pipe 118. A water outlet 120 is also provided for enabling water to be drain so as to be removed from the dishwashing machine 100. A mains power connection (not shown) enables the dishwashing machine 100 to be connected to mains electrical power for powering the dishwashing machine 100.

[0026] The dishwashing machine 100 also includes a water pump 122 for drawing water into the dishwashing machine 100 through the water intake pipe 118. The water pump 122 also circulates water around the dishwashing machine 100. For example, the water pump 122 can pump water to the spray arms 114, 116. Water that has been sprayed out of the spray arms 114, 116 falls back down to the bottom of the washing compartment 104, where it can be removed by the water pump 122 or a separate dedicated water outlet pump through the water outlet 120.

[0027] When the pump 122 is functioning normally, it is responsive to being activated or deactivated in response to a signal sent from e.g. a controller or a circuit or the like. However, when the pump 122 malfunctions, it may become unresponsive to being activated or deactivated by a signal. This can result in the pump 122 being active and drawing water into the dishwashing machine 100 when it should be switched off.

[0028] In this example, the dishwashing machine 100 includes a controller 124 (such as a processor, a microprocessor, or the like). The controller 124 is configured to control operations of the dishwashing machine 100.

[0029] The dishwashing machine 100 also includes a device 126 for inhibiting flow of water into the dishwashing machine through the water intake pipe 118. The device 126 is shown in particular detail in Figure 2. In this example, the device 126 is positioned and arranged such that it can operate to inhibit flow of water to the pump 122 through the water intake pipe 118. The device 126 of this example includes a container 130. The container 130 contains a material 132. In one example, the material 132 coalesces when it absorbs water. That is, the material 132 solidifies to become a solid mass when it absorbs water.

[0030] The device 126 of this example also has a valve 128, which acts as a gate, controlling access to the internal volume of the container 130 through a discharge opening 134 in the container 130. The valve 128 can be closed into a closed configuration that seals the opening 134 and prevents the material 132 being discharged from the container 130 (see Figure 2 showing the valve 128 in a closed configuration). The valve 128 can also be opened into an open configuration to permit the material 132 to be allowed to be discharged from the container 130 through the opening 134 and into the flowing water of the water intake pipe 118. In this example, the valve 128 is a solenoid-operated valve or switch.

[0031] In this example, the container 130 is formed such that it can resiliently expand when the material 132 is inserted into the internal volume of the container 130. Therefore, in this example, when the material 132 is stored in the container 130 and the valve 128 is in a closed configuration, the container 130 exerts a constant biasing force on the material 132, which presses the material 132 against the valve 128. Accordingly, once the valve 128

is switched into an open configuration, the material 132 is automatically ejected through the opening 134 and out of the container 130 by the force of the container 130 compressing back to its original relaxed shape. This avoids the need for a separate discharging mechanism. In one example, the container 130 is formed from, or includes a part that is formed from, an elastic material. The container 130 can be located at a position that easily allows the material 132 to move into the water intake pipe 118 towards the pump 122. For example, as shown, the container 130 of this example is angled upwards, with the opening 134 to the water intake pipe 118 being lowermost, which assists in driving the material 130 into the water intake pipe 118.

[0032] Alternatively or additionally, in another example, the device 126 includes an actuator that can be activated to discharge the material 132 from the container 130 by pushing it out through the opening 134 once the valve 128 has been opened into its open configuration. The actuator may be in the form of a piston or the like and may be driven by a motor or be solenoid-operated, etc.

[0033] In another example, the device 126 does not include any specific mechanism for discharging the material 132 out of the container 130. The material 132 may be allowed the discharge from the container 130 under the force of gravity only. In an example of this, the inclined angle of the container 130 may be sufficient to allow the material 132 to easily exit the container 132 into the water intake pipe 118.

[0034] In an example, the material 132 can easily absorb water and then coalesce to form a larger single mass, and solidify whilst still in the presence of water. In one example, the material 132 is a hydrophilic material. In one example, the material 132 is a polymer. In another example, the material 132 is a hydrophilic polymer.

[0035] In one example, the material 132 is stored in the container 130 as a powder. Storing the material 132 as a powder is advantageous because it allows the material to be stored in the container 130 for a very long time. As an alternative, the material may be stored in other form, such as a gel. Either way, in an example, the material 132 is stored in the container 130 in the form of a plurality of capsules 142. Each of the plurality of capsules 142 may have an outer sheath within which the material 132 is stored. The outer sheath can be dissolved by water, which then exposes the material 132 to the water.

[0036] In one example, the device 126 can be configured to eject all of the material 132 out of the container 132 in one operation when activated. In another example, the device 126 can be configured to eject a predetermined amount of material 132, or a predetermined number of capsules 142 of material 132, such as just one or two capsules 142 at a time. The predetermined amount of material 132 and/or the predetermined number of capsules 142 may be dependent on, for example, the diameter of the water intake pipe 118 and/or the typical expected flow rate of water through the water intake pipe 118.

[0037] The device 126 is configured to discharge at least some of the material 132 stored in the container 130 into the water intake pipe 118 in the case that the washing compartment 104 has become flooded. Flooding occurs as a result of the flow rate of water into the machine 100 through the water intake pipe 118 being greater than the flow rate of water out of the machine 100 through the water outlet 120 for a period of time. This imbalance is usually corrected by deactivating the water inlet pump 122 to stop drawing water into the machine 100 through the water inlet. Water in the washing compartment 104 is then allowed to drain out through the water outlet 120. However, sometimes the pump 122 cannot be deactivated and so it continues to draw water into the washing compartment 104. For example, it the pump 122 malfunctions then it may not be possible to shut it down to stop water being drawn into the washing compartment 104. As another example, if a part of the system for shutting down the pump 122, such as a sensor or a controller, malfunctions, then the signal to shut down the pump 122 may not reach the pump 122, and so the pump 122 stays activated, drawing water into the washing compartment.

[0038] In example, the device 126 is configured to discharge at least some of the material 132 stored in the container 130 into the water intake pipe 118 in the case that the pump 122 has malfunctioned.

[0039] In an example, the dishwashing machine 100 includes a pump sensor 136. The pump sensor 136 is configured to cause the valve 128 to open so as to allow the material 132 to be discharged from the container 130 into the water intake pipe 118 when the pump sensor 136 detects that one or more characteristics of the pump 122 have exceeded a predetermined threshold value, which may indicate that the pump 122 has malfunctioned. The one or more characteristics of the pump 122 may include the temperature of the pump 122 and the flowrate of water through the pump 122 from the water intake pipe 118.

[0040] If the pump 122 has malfunctioned then its temperature may increase due to the malfunction. Therefore, in one example, the pump sensor 136 may include a temperature sensor that detects the temperature of the pump 136. The pump sensor 136 may be configured to cause the material 132 to be discharged from the container 130 into the water intake pipe 118 when the temperature of a surface of the pump 122 increases beyond a predetermined threshold value.

[0041] In an example, the dishwashing machine 100 includes a water level sensor 138. The water level sensor 138 is configured to cause the valve 128 to open so as to allow the material 132 to be discharged from the container 130 into the water intake pipe 118 when the water level sensor 138 detects that the water level within the washing compartment 104 has exceeded a predetermined threshold value, which may indicate that the washing compartment 104 is overfilled with water. The water

level sensor 138 may be configured to cause the pump 122 to switch off when the water level sensor 138 detects that the water level within the washing compartment 104 has exceeded the first predetermined threshold value.

[0042] The water level sensor 138 may be configured to cause the valve 136 to be opened so as to allow the material 132 to be discharged from the container 130 into the water intake pipe 118 when the water level sensor 138 indirectly detects that the pump 122 has malfunctioned. In one example, the water level sensor 138 is configured to cause the valve 128 to open if the water level inside the washing compartment 104 exceeds a first predetermined threshold value and has not returned below the first predetermined threshold value within a predetermined time period. In a variant of this example, the water level sensor 138 is configured to cause the valve 128 to open if the water level sensor 138 detects that the water level within the washing compartment 104 has exceeded a second predetermined threshold value which is higher than the first predetermined threshold value.

[0043] In another example in which the dishwashing machine 100 includes a controller 124, the controller 124 is configured to cause the material 132 to be discharged from the container 138 and into the water intake pipe 118 to prevent water being drawn into the machine 100 by the pump 122. For example, the controller 124 may be configured to cause the valve 128 to open when the pump 122 has malfunctioned. In another example, the controller 124 may be configured to cause the valve 128 to open when the water level within the washing compartment 104 has exceeded a first predetermined threshold value. The controller 124 is configured to cause the valve 128 to open based on information received from one or more sensors, such as a pump sensor 136 and a water level sensor 138 as discussed for the example above. For example, when the water level sensor 138 detects that the water level within the washing compartment 104 is too high (i.e. the water level within the washing compartment 104 has exceeded a predetermined threshold value), the controller 124 sends a signal to the pump 122 to deactivate the pump 128. If the pump sensor 136 then detects that the pump remains active (e.g. water is still flowing through the pump 122) then the controller 124 causes the valve 128 to open so as to allow the material 140 to be discharged out of the container 130 and into the water intake pipe 118.

[0044] When the valve 128 is opened into an open configuration, the container 130 compresses to return to its original relaxed shape and/or the material 132 in the container 130 is driven by an actuator. This action ejects the plurality of capsules 142 containing stored within the container 130 out through the opening 134 and into the water intake pipe 118. The plurality of capsules 142 contact with the water flowing through the water intake pipe 118, which dissolves the outer sheath of each capsule and exposes the material 132 to the water. The material 132 then absorbs water, enlarges, and coalesces into a single, solid mass 140 whilst in the water intake pipe 118 (see Figure 3). This solid mass 140 forms a blockage within the water intake pipe 118, which stops the flow of water, thereby preventing water from being drawn into the machine 100 by the pump 122. As a consequence, the blockage caused by the solid mass 140 of material 132 within the water intake pipe 118 allows the washing compartment 104 to drain, which prevents the machine 100 from flooding.

[0045] Once the pump 122 has been repaired so that it is no longer in a malfunctioning state, the solid coalesced material 132 can be removed from the water intake pipe 118 so that the pump 122 can once again draw water into the machine 100 through the water intake pipe 118. In one example, the material 132 is removed from the water intake pipe 118 by dissolving it through adding a solute into the water intake pipe 118, for example a saline solution. In another example, the material 132 is manually removed from the water intake pipe 118.

[0046] After the material 132, or some of the material 132, has been discharged from the container, the container 130 can then be replenished by a user or by authorised service staff.

[0047] An advantage of the device 126 is that it can prevent flooding of a machine 100 that requires a water input, such as a dishwashing machine or a washing machine, when the machine 100 malfunctions so that the pump 122 cannot be deactivated.

[0048] It will be understood that the processor or processing system or circuitry referred to herein may in practice be provided by a single chip or integrated circuit or plural chips or integrated circuits, optionally provided as a chipset, an application-specific integrated circuit (ASIC), field-programmable gate array (FPGA), digital signal processor (DSP), graphics processing units (GPUs), etc. The chip or chips may comprise circuitry (as well as possibly firmware) for embodying at least one or more of a data processor or processors, a digital signal processor or processors, baseband circuitry and radio frequency circuitry, which are configurable so as to operate in accordance with the exemplary embodiments. In this regard, the exemplary embodiments may be implemented at least in part by computer software stored in (non-transitory) memory and executable by the processor, or by hardware, or by a combination of tangibly stored software and hardware (and tangibly stored firmware).

[0049] Although at least some aspects of the embodiments described herein with reference to the drawings comprise computer processes performed in processing systems or processors, the invention also extends to computer programs, particularly computer programs on or in a carrier, adapted for putting the invention into practice. The program may be in the form of non-transitory source code, object code, a code intermediate source and object code such as in partially compiled form, or in any other non-transitory form suitable for use in the implementation of processes according to the invention. The carrier may be any entity or device capable of car-

rying the program. For example, the carrier may comprise a storage medium, such as a solid-state drive (SSD) or other semiconductor-based RAM; a ROM, for example a CD ROM or a semiconductor ROM; a magnetic recording medium, for example a floppy disk or hard disk; optical memory devices in general; etc.

[0050] The examples described herein are to be understood as illustrative examples of embodiments of the invention. Further embodiments and examples are envisaged. Any feature described in relation to any one example or embodiment may be used alone or in combination with other features. In addition, any feature described in relation to any one example or embodiment may also be used in combination with one or more features of any other of the examples or embodiments, or any combination of any other of the examples or embodiments. Furthermore, equivalents and modifications not described herein may also be employed within the scope of the invention, which is defined in the claims.

Claims

1. A machine comprising:

a pump for drawing water into the machine through a water intake pipe; and
a device for causing flow of water into the machine to be inhibited, the device comprising a container which contains a material that coalesces when it absorbs water;
the device being configured to discharge at least some of the material into the water intake pipe such that the material coalesces so as to prevent water being drawn into the machine, thereby to prevent flooding in the machine.

2. A machine according to claim 1, wherein the device comprises a valve which is openable to allow at least some of the material to be discharged from the container into the water intake pipe.

3. A machine according to claim 2, wherein the container is an elastic container arranged such that the container compresses to discharge the material out of the container when the valve is opened.

4. A machine according to any of claims 1 to 3, wherein the device comprises an actuator, the actuator being operable to discharge the material out of the container.

5. A machine according to any of claims 1 to 4, wherein the material is a hydrophilic material.

6. A machine according to any of claims 1 to 5, wherein the material is stored in the container as a powder.

7. A machine according to any of claims 1 to 6, wherein the material is stored in the form of a plurality of capsules in the container.

8. A machine according to any of claims 1 to 7, comprising a sensor configured determine whether the pump has malfunctioned and to cause the device to discharge at least some of the material into the water intake pipe in the case that the pump has malfunctioned.

9. A machine according to any of claims 1 to 8, comprising a sensor configured detect a water level in the machine and to cause the device to discharge at least some of the material into the water intake pipe when the water level in the machine exceeds a predetermined value.

10. A machine according to any of claims 1 to 9, wherein the machine is a washing machine, a washing and drying machine, or a dishwashing machine.

11. A method of inhibiting flow of water into a machine, the method comprising:
discharging a material into a water intake pipe of the machine, the material being of a type that coalesces when it absorbs water such that the material coalesces after being discharged into the water intake pipe, thereby preventing water entering the machine and preventing flooding in the machine.

12. A method according to claim 11, comprising opening a valve to allow the material to be discharged into the water intake pipe.

13. A method according to claim 11 or claim 12, comprising operating an actuator to discharge the material into the water intake pipe of the machine.

14. A method according to any of claims 11 to 13, comprising discharging the material into the water intake pipe in response to a sensor detecting that a pump of the machine has malfunctioned.

15. A method according to any of claims 11 to 14, comprising discharging the material into the water intake pipe in response to detecting that the water level in the machine has exceeded a predetermined value.

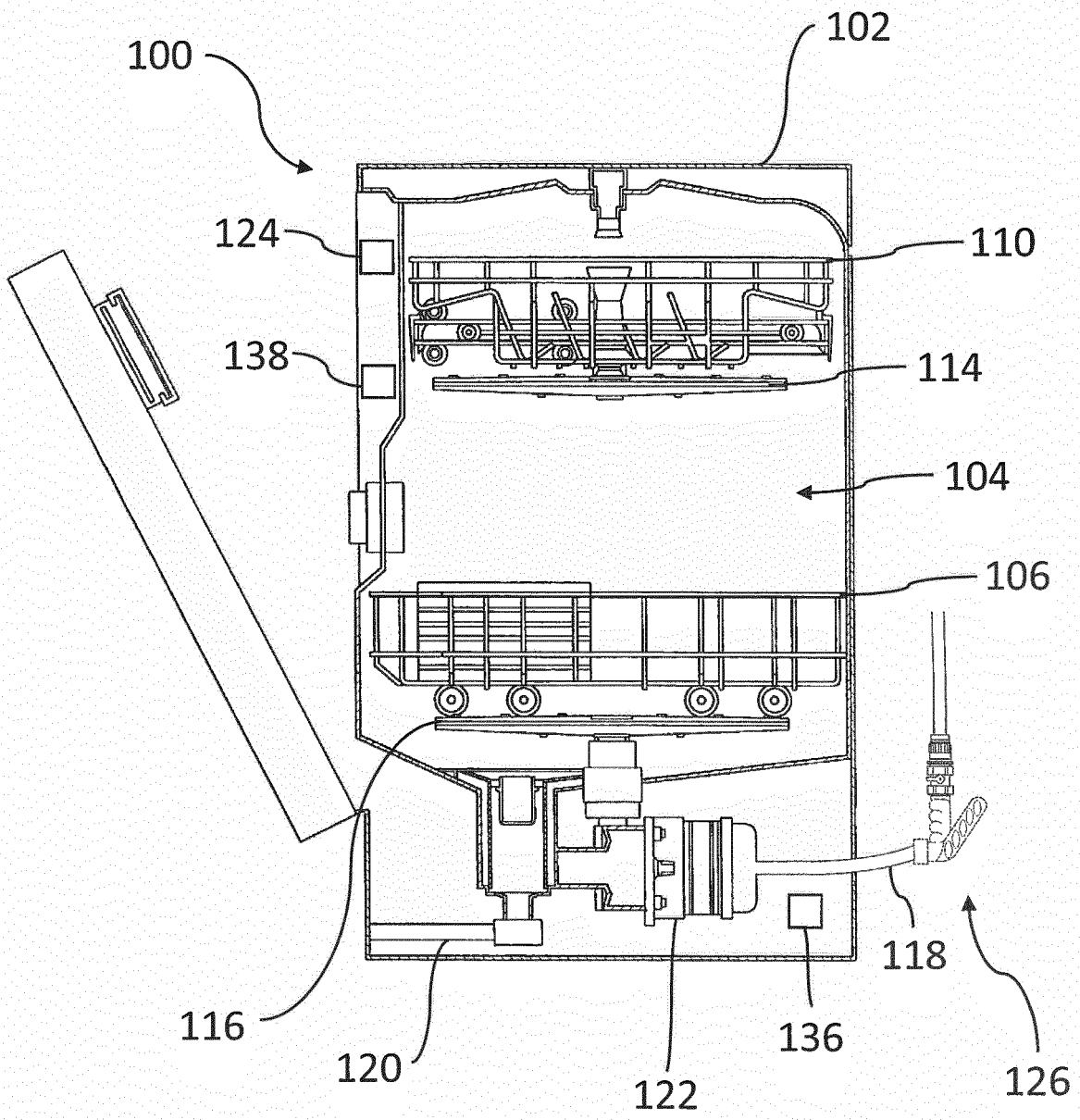

Figure 1

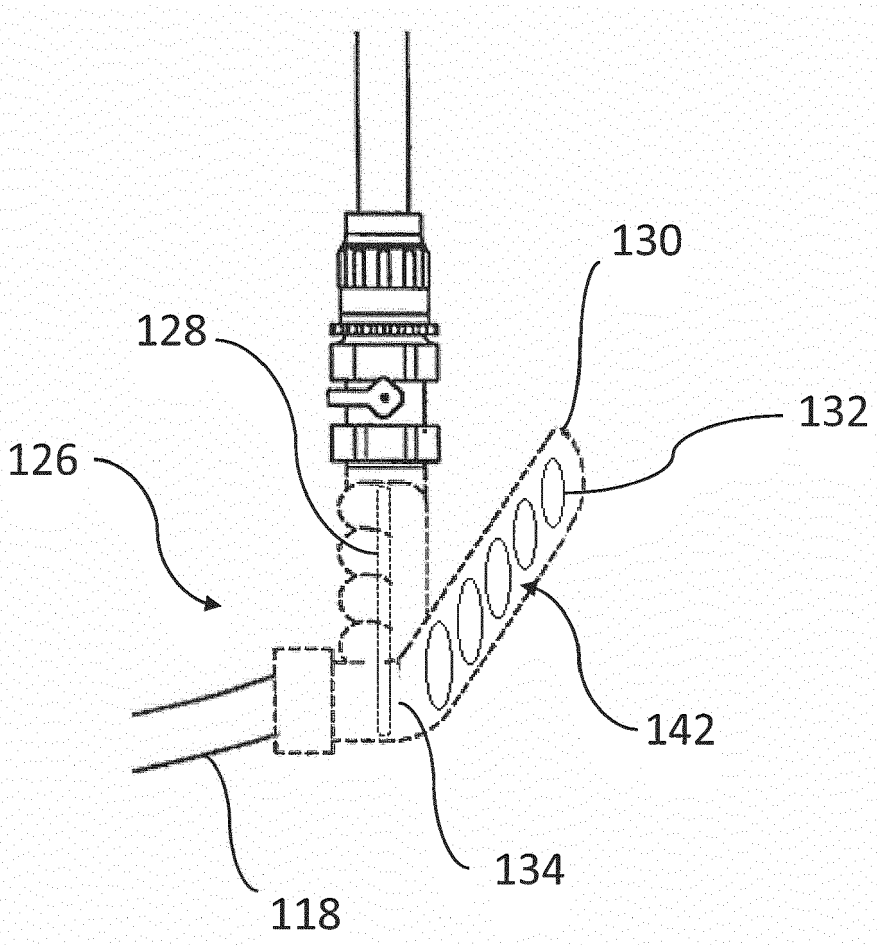

Figure 2

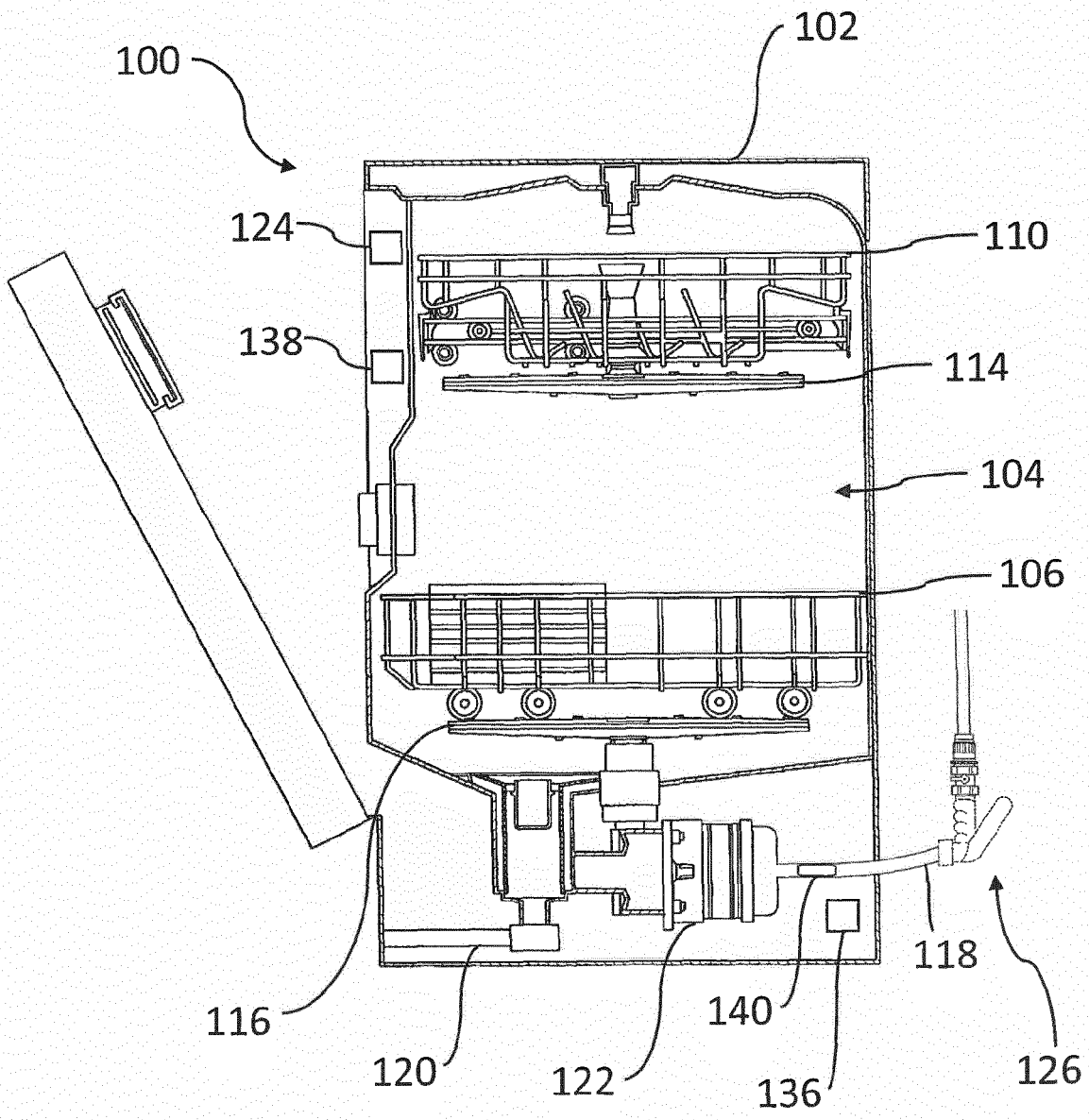

Figure 3

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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 5574

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 36 18 258 A1 (ELTEK SPA [IT]) 5 February 1987 (1987-02-05) * column 2 - column 6; figures 1-5 * -----	1-15	INV. A47L15/42 D06F39/08
A	EP 0 555 679 A1 (RE FLEX SRL [IT]) 18 August 1993 (1993-08-18) * column 1 - column 3; figures 1,2 * -----	1-15	
A	EP 2 290 152 A1 (RESTELLI ANDREA DR [IT]) 2 March 2011 (2011-03-02) * column 1 - column 6; figure 1 * -----	1-15	
A	DE 198 25 222 C1 (TUBIFLEX LOMBARDA [IT]) 9 March 2000 (2000-03-09) * the whole document * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

D06F
A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 July 2019	Spitzer, Bettina

CATEGORY OF CITED DOCUMENTS

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10-07-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3618258 A1	05-02-1987	DE 3618258 A1	05-02-1987
		IT 1208823 B	10-07-1989
EP 0555679 A1	18-08-1993	AT 136956 T	15-05-1996
		DE 69302189 D1	23-05-1996
		DE 69302189 T2	07-11-1996
		EP 0555679 A1	18-08-1993
		IT 1257369 B	15-01-1996
EP 2290152 A1	02-03-2011	AT 544898 T	15-02-2012
		EP 2290152 A1	02-03-2011
DE 19825222 C1	09-03-2000	DE 19825222 C1	09-03-2000
		IT MI991254 A1	04-12-2000

EPO FORM P0459

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