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(54) **DISHWASHING MACHINE AND METHOD**

(57) There is disclosed a dishwashing machine (100). The dishwashing machine (100) comprises a controller (234), and a pump (250) for pumping water to a spray arm assembly (221). The spray arm assembly (221) comprises a spray arm (224) having one or more spray holes (260) for spraying a washing load with water (262). The spray arm assembly (221) comprises an aperture (237) which is constructed and arranged to be in an open state or a closed state dependent upon a rota-

tional position of the spray arm (224). Water from the pump 250 is able to exit the aperture (237) of the spray arm assembly (221) when the aperture (237) is in the open state. A power consumption of the pump (250) is dependent at least in part on whether the aperture (237) is in the open state or the closed state. The controller (234) is configured to monitor the power consumption of the pump (250) so as to determine rotational information of the spray arm (224).

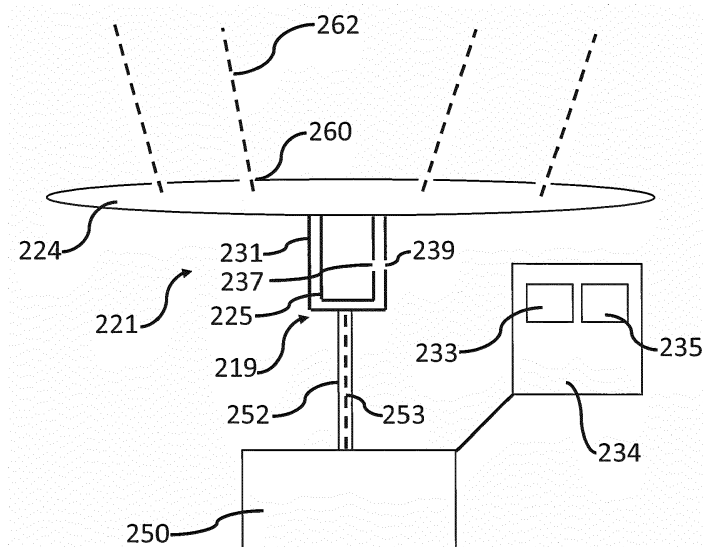


Fig. 2

Description

Technical Field

[0001] The present disclosure relates to a dishwashing machine and a method of operation of a dishwashing machine.

Background

[0002] Dishwashing machines (also referred to as dishwashers) are used for washing items such as crockery and cutlery. A known dishwashing machine comprises a washing compartment for holding one or more items to be washed, and a washing mechanism for washing those items. Typically a user can select from a plurality of pre-defined washing cycles via a user interface on a front face of the dishwashing machine.

Summary

[0003] According to a first aspect disclosed herein, there is provided a dishwashing machine comprising: a controller; a pump for pumping water to a spray arm assembly of the dishwashing machine, the spray arm assembly comprising a spray arm having one or more spray holes for spraying a washing load with water; the spray arm assembly comprising an aperture which is constructed and arranged to be in an open state or a closed state dependent upon a rotational position of the spray arm, water from the pump being able to exit the aperture of the spray arm assembly when the aperture is in the open state, a power consumption of the pump being dependent at least in part on whether the aperture is in the open state or the closed state; and the controller configured to monitor the power consumption of the pump so as to determine rotational information of the spray arm.

[0004] According to an example, the aperture is comprised in a shaft assembly supporting the spray arm.

[0005] According to an example, the shaft assembly comprises a shaft which is fixed for rotation to the spray arm, and a housing substantially surrounding the shaft.

[0006] According to an example, the aperture is comprised in the shaft, the housing comprising an opening positioned to coincide with the aperture to provide the open state of the aperture.

[0007] According to an example, there is a single aperture on the shaft and a single opening on the housing, the single aperture and the single opening constructed and arranged to coincide with each other once per rotation of the shaft.

[0008] According to an example, the power consumption of the pump is higher when the aperture is in the open state than when the aperture is in the closed state.

[0009] According to an example, the rotational information of the spray arm comprises a determined rate of rotation of the spray arm, the controller arranged to compare the determined rate of rotation to an expected rate

of rotation.

[0010] According to an example, when the determined rate of rotation of the spray arm differs from the expected rate of rotation, the controller is configured to cause an alert to be output to a user.

[0011] According to a second aspect there is provided a method comprising: monitoring a power consumption of a water pump for delivering water to a spray arm assembly of a dishwashing machine, a power consumption of the pump being dependent at least in part on whether an aperture of the spray arm assembly is in an open state in which water can exit the aperture or a closed state in which water is prevented from exiting the aperture; and determining rotational information of the spray arm using information of the monitored power consumption.

[0012] According to an example, the determining rotational information of the spray arm comprises monitoring an interval between increases in power consumption of the pump.

[0013] According to an example, the method comprises comparing a determined rate of rotation of the spray arm to an expected rate of rotation of the spray arm.

[0014] According to an example, the method comprises causing an alert to be output to a user when the determined rate of rotation of the spray arm differs from the expected rate of rotation.

[0015] According to an example, the method comprises halting a washing cycle of the dishwasher when the determined rate of rotation of the spray arm differs from the expected rate of rotation.

[0016] According to an example, the method comprises automatically re-starting the washing cycle when it is determined that the alert has been cleared.

Brief Description of the Drawings

[0017] 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 dishwashing machine according to an example.

Figure 2 shows schematically certain aspects of a dishwashing machine according to an example.

Figures 3A and 3B show schematically certain aspects of a dishwashing machine according to an example.

Figure 4 shows schematically a plot of power against time of a pump, according to an example.

Figure 5 shows schematically a method according to an example.

Detailed Description

[0018] The present disclosure has applicability to dishwashing machines or dishwashers. Dishwashing machines are used to automate the washing of items associated with food preparation and/or cooking and/or eating. Such items include crockery such as plates, bowls, cups, mugs etc. Such items may also include cutlery such as knives, forks, spoons, or indeed any other cooking or eating utensil. Other items that may be washed include glassware, food containers etc.

[0019] Figure 1 schematically shows an example of a dishwashing machine 100. The dishwashing machine 100 comprises a main body 102, within which there is a washing compartment or chamber 104. In this example the washing compartment 104 comprises a lower portion 106 and an upper portion 108. The lower portion 106 comprises a tray or rack 110 for holding items to be washed, and the upper portion 108 comprises a tray or rack 112 for holding items to be washed. The racks 110 and 112 can be moved in and out of the washing compartment 104 on roller assemblies.

[0020] Items to be washed are schematically shown at 114. In this case the items to be washed are schematically represented by plates 116 and 118 on rack 112, and plates 120 and 122 on rack 120. Of course there may alternatively be any other type of item to be washed or combination of items to be washed. In the example of Figure 1a washing mechanism 123 comprises spray arm 124 in lower portion 106, and spray arm 126 in upper portion 108. In other examples the upper spray arm 126 is omitted. Each spray arm comprises a series of holes or nozzles which can spray water upwardly towards the items to be washed 114, while the spray arms 124 and 126 rotate. Rotation of the spray arms 124 and 126 helps to clean all the items in a washing load. If rotation of one or more of the spray arms 124 and 126 is impeded then this may result in an unsatisfactory wash. Sometimes poorly placed items in the dishwasher, or items that are too tall, or items that have fallen from one of the racks 110 and 112 (or fallen from a basket on one of the racks) may block and/or impede rotation of one or more of the spray arms.

[0021] In the example of Figure 1 the spray arm 124 is connected to shaft 125. The shaft 125 enables rotation of spray arm 124 about a central axis of the shaft 125. The shaft 125 and spray arm 124 may be considered to be comprised in a spray arm assembly 121. The shaft 125 and spray arm 124 may be considered to be fixed for rotation. In the example of Figure 1 the spray arm 126 is connected to shaft 127. The shaft 127 enables rotation of spray arm 126 about a central axis of the shaft 127. The shaft 127 and spray arm 126 may be considered to be comprised in a spray arm assembly 129. The shaft 127 and spray arm 126 may be considered to be fixed for rotation.

[0022] The dishwashing machine 100 further comprises water inlet schematically shown at 128 and water out-

let schematically shown at 130, for enabling water to be fed to and taken away from the dishwashing machine respectively. In some examples a heater element (not shown) is provided for heating water as necessary. In other examples hot and cold water is drawn from a building's supply as required. A power connection is schematically shown at 132, which enables the dishwashing machine to be connected to mains electrical power for powering the dishwashing machine.

[0023] A water pump is schematically shown at 150. The water pump 150 is constructed and arranged to distribute water around the dishwashing machine 100. For example, the water pump 150 can pump water to spray arms 124 and 126. Water that has been sprayed falls back down to a base or sump 152 of the dishwashing machine 100, from where that water can be recycled (after filtering, in some examples) by the pump 150.

[0024] In some examples rotation of the spray arms 124 and 126 is effected by the force of water being ejected from spray holes of the spray arms. Additionally or alternatively one or more motors, shown schematically at 148 may be provided for powering rotation of the spray arms 124 and 126.

[0025] A controller is schematically shown at 134 for controlling operations of the dishwashing machine. The controller may comprise at least one memory and at least one processor. The controller 134 can, for example, cause the dishwashing machine to operate according to one or more pre-determined washing cycles selected via a user interface 136. The available washing cycles may differ from each other by temperature and/or duration, for example. Via the user interface 136 a user may also be able to select whether the washing cycle is for a full or half load. A display 138 is also provided which can display information to the user. This may include information such as confirming a user's washing cycle selection, as well as information such as time remaining of a washing cycle that is in progress. The display 138 may also display one or more alarm states to a user, for example by use of a flashing light. A speaker may also be provided in some examples, so that an audible alarm can be provided to a user (for example a buzzer). An alarm state may, for example, indicate an end of a wash. An alarm state may indicate a malfunction. For example, an alarm state may indicate improper rotation of a spray arm.

[0026] A door of the dishwashing machine 100 is schematically shown at 140. The door 140 is connected to main body 120 via hinges 142 and 144. In Figure 1 the door is in an open position enabling access to washing compartment 104. The door 140 may be moved to a closed position so that the washing compartment 104 is then substantially enclosed. The door 140 may also include a receptacle for holding dishwashing detergent (e.g. a detergent cube) which can be released in to the dishwashing machine during a wash. The receptacle for holding washing detergent may of course also be positioned elsewhere within the dishwashing machine. The dishwashing machine may also include one or more fur-

ther receptacles for containing dishwashing machine salt and/or rinse aid, for example.

[0027] A washing cycle generally comprises three main stages: (i) wetting; (ii) injection of detergent, (iii) rinsing. In some examples one or more of these steps may be omitted. For example a rinse wash may include just a rinsing cycle. Whichever steps are included or not included, the washing of the washing load may be generally termed a washing cycle.

[0028] Figure 2 is a side view schematically showing a spray arm 224. The spray arm 224 comprises one or more spray holes or openings 260 for spraying water 262. In this example four spray holes 260 are provided, but in other examples more or fewer may be provided.

[0029] The spray arm 224 is mounted on rotatable shaft 225. Water may be delivered to the spray arm 224, and spray hole(s) 260 via shaft 225. The shaft 225 may also be considered a spout. In this example rotation of rotatable shaft 225 causes rotation of spray arm 224, and vice versa. In other words spray arm 224 and shaft 225 are rotatably fixed to each other. Together, the shaft 225 and spray arm 224 may be considered part of a spray arm assembly 221. In this example the shaft 225 is located within a housing or sleeve 231. Together, the shaft 225 and housing 231 may be considered part of a shaft assembly 219. In this example the housing 231 is fixed. That is the shaft 225 may rotate within housing 231 while housing 231 remains stationary. Housing 231 may also be considered part of spray arm assembly 221.

[0030] In this example the shaft 225 comprises an aperture or opening 237, and the housing 231 comprises an aperture or opening 239. The aperture 237 and opening 239 may comprise, for example, round holes. The aperture 237 and opening 239 may be, for example, 5mm or about 5mm in diameter. In this example the aperture 237 and opening 239 are constructed and arranged so as to align once per rotation of the shaft 225.

[0031] Water pump 250 supplies water, shown schematically at 253, to shaft assembly 219. The water pump 250 may be the same water pump that supplies water to spray holes 260 of spray arm 224. Water 253 from water pump 250 may enter an interior of shaft 225. Once in the interior of the shaft 225, the pumped water may build up water pressure. When the aperture 237 of shaft 225 and opening 239 of housing 231 align, the water can be ejected or squirted out of the aligned aperture 237 and opening 239. When the aperture 237 and opening 239 are not aligned, then water cannot be or is prevented from being ejected or squirted out of the aperture 237. When the aperture 237 and opening 239 are aligned, it may be considered that the aperture 237 is in an open state. When the aperture 237 and opening 239 are not aligned, it may be considered that the aperture 237 is in a closed state. When the aperture 237 is in the open state then the power draw or power consumption of pump 250 temporarily increases, compared to when the aperture 237 is in the closed state. This can be explained by Pascal's law, whereby when the radius of a pipe increases, the

force or power required to force liquid through that pipe increases (in this case the aligning aperture 237 and opening 239 may be considered analogous to a pipe).

[0032] Controller 234 is in communication with, and may monitor, pump 250. The controller 234 comprises a memory 233 and a processor 235. For example the controller 234 may monitor the power consumption of the pump 250 so as to monitor when the aperture 237 is in the open state i.e. when there are temporary power increases or "spikes". By obtaining power consumption information of the pump 250 (i.e. by monitoring the power spikes), rotational information of spray arm 224 can be obtained. The rotational information may comprise, for example, a rate of rotation of the spray arm 224.

[0033] This is explained further by way of the examples of Figures 3A and 3B. Figure 3A is a plan view showing a spray arm 324 comprising one or more spray holes 360 (in this example four spray holes). Shaft 325 which rotates with spray arm 324 is located within housing 331. The rotational position of housing 331 is fixed. Shaft 325 comprises aperture 337, and housing 331 comprises opening 339. In the example of Figure 3A the rotational position of shaft 325 is such that aperture 337 is aligned with opening 339. That is aperture 337 is considered to be in an open state. Thus water 353 which has been pumped to shaft 325 is ejected through aperture 337 and opening 339, as shown schematically by the dashed line. That is water 353 is ejected from shaft assembly 319.

[0034] In Figure 3B the rotational position of shaft 325 is such that the aperture 337 and opening 339 are not aligned. Accordingly the aperture 337 is considered to be in a closed state. Accordingly water 353 is not ejected from or is prevented from being ejected from aperture 337. That is water is not ejected from shaft assembly 319.

[0035] It will be understood that the Figures are schematic in nature and not necessarily to scale. In some examples a gap between the shaft 325 and housing 331 is smaller, and in some cases considerably smaller, than that shown in the Figures. In some example the housing or sleeve 331 is a close fit to the shaft 325, such that when the aperture 337 and opening 339 are not aligned then no water is ejected out of aperture 337.

[0036] In examples where there is a gap between the shaft 325 and housing 331, then when the aperture 337 and opening 339 are not aligned then some water may be able to enter this gap, but it may still be considered that water cannot exit the shaft assembly 319. In such examples there will still be a detectable increase or spike in power consumption of the pump when the aperture 337 and opening 339 are aligned (i.e. the aperture 337 is considered to be in an open state).

[0037] Figure 4 is a schematic plot of power consumption of a pump (e.g. pump, 150, 250, 350) over time. The peaks 470, 472, 474, 476 in power consumption represent the times where a spray arm is in a position such that the aperture (e.g. aperture 237, 337) is in the open state, and water is ejected from the aperture (and shaft assembly). The troughs (or steady states) 480, 482, 484

represent a position of the spray arm where the aperture is in a closed position, and water is not ejected from the aperture (or shaft assembly). Therefore in examples the controller 234 can monitor a rate of rotation of a spray arm by measuring an interval between increases or spikes in power consumption of the pump.

[0038] The slanted portions of the plot, for example portions 486 and 488 represent positions where an aperture (e.g. aperture 237, 337) of an associated spray arm is between fully open and fully closed states, such that some water can be ejected out of the aperture and the shaft assembly, but less than when the aperture is in a fully open state (e.g. where aperture 337 and opening 339 are fully aligned).

[0039] As discussed above, and by way of example with reference to Figure 2, the power consumption information of the water pump 250 obtained by the controller 234 may be used by the controller 234 in order to determine information of rotation of the spray arm 224. For example by counting or monitoring a rate of the power consumption increases or spikes then a rate of rotation of the spray arm 224 can be determined. For example each power consumption increase or spike may equate to one revolution of the spray arm 224. The rate of rotation could be, for example, in revolutions per minute (RPM). In some examples the controller compares the determined or actual rate of rotation of the spray arm 224 with an expected or target rate of rotation. The expected rate of rotation may be a predetermined rate of rotation. Information of expected rate of rotation may be stored in memory 233, for example in a look-up table. In some examples, if an actual or determined rate of rotation of the spray arm 224 is determined to differ from an expected rate of rotation of the spray arm 224, then the controller 234 may determine that there is a fault or a malfunction associated with the spray arm 224. The fault may be, for example, that an item in the dishwasher is blocking or impeding movement of the spray arm 224. When such a fault is detected then an alarm may be output to a user. The alarm may be a visual alarm, such as a flashing light, provided for example via display 138. Additionally or alternatively the alarm may be an audible alarm such as a buzzer which is provided via a speaker. The alarm may alert or prompt the user to fix the fault e.g. to move the item that is blocking the spray arm 224.

[0040] In some examples, determining whether the actual rate of rotation of the spray arm differs from the expected rate of rotation comprises determining whether the actual rate of rotation of the spray arm differs from the expected rate of rotation by more than a threshold amount. By way of example only, the threshold amount may be 10% of the expected rate. For example, an expected rate of rotation of a spray arm may be 50 revolutions per minute. Therefore if the rate of rotation falls below 45 revolutions per minute then this will be deemed a fault and an appropriate alarm will be output. In some examples the spray arm 224 may be completely blocked, such that its rate of rotation falls to zero RPM. This will

also be identified as a fault since it is below the expected rate of rotation, and outside the threshold tolerance.

[0041] In some examples, when the determined rate of rotation of the spray arm 224 differs from the expected rate (and in some examples the threshold tolerance amount) then the controller 234 is configured to halt the washing cycle. Halting the washing cycle may include halting power and/or water to the spray arm(s). In some examples the washing cycle is only resumed after the door of the washing machine has been opened and closed (i.e. indicative that a user has cleared the obstruction), and/or after a certain user input on the user interface 136 (e.g. pressing an "OK" button), and/or after one or more test rotations of the spray arm(s). In some examples the washing cycle may be automatically restarted after it has been determined that an alert state (e.g.) blockage of spray arm, has been cleared.

[0042] Figure 5 is a flow chart of a method according to an example described with respect to the features of Figures 1 and 2.

[0043] At S 1 the process is started, by a user initiating a washing cycle, for example by pressing a button on user interface 136.

[0044] At S2, the controller 234 monitors power consumption of pump 250. For example, and as described with respect to Figure 4, the monitoring of the power consumption comprises monitoring for intervals between increases or spikes in power consumption of the pump.

[0045] At S3, rotational information of the spray arm 224 is determined by the controller 234, using information of the monitored power consumption. In this example the determined rotational information comprises a rate of rotation of the spray arm 224.

[0046] At S4, the determined rate of rotation of the spray arm 224 is compared with an expected value of rate of rotation of spray arm 224.

[0047] When the determined rate of rotation of the spray arm 224 differs from the expected rate of rotation of the spray arm 224, then the controller 234 causes an alert to be output to a user, as shown at S5. The alert may be a visual and/or audible alarm, for example.

[0048] In some examples, when the determined rate of rotation of the spray arm 224 differs from the expected rate of rotation of the spray arm 224, then the washing cycle may be halted. This is shown at S6.

[0049] In the Figures the same reference numeral may be used to designate a same or equivalent component albeit labelled 100 series higher e.g. spray arm 124, 224, 324. It will be understood that aspects from the different examples or Figures can be combined unless stated otherwise.

[0050] 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).

[0051] Reference is made herein to data storage for storing data, such as memory. This may be provided by a single device or by plural devices. Suitable devices include for example a hard disk and non-volatile semiconductor memory.

[0052] 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 carrying 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.

[0053] 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 dishwashing machine comprising:

a controller;
a pump for pumping water to a spray arm assembly of the dishwashing machine, the spray arm assembly comprising a spray arm having

one or more spray holes for spraying a washing load with water;

the spray arm assembly comprising an aperture which is constructed and arranged to be in an open state or a closed state dependent upon a rotational position of the spray arm, water from the pump being able to exit the aperture of the spray arm assembly when the aperture is in the open state, a power consumption of the pump being dependent at least in part on whether the aperture is in the open state or the closed state; and

the controller configured to monitor the power consumption of the pump so as to determine rotational information of the spray arm.

2. A dishwashing machine according to claim 1, the aperture being comprised in a shaft assembly supporting the spray arm.

3. A dishwashing machine according to claim 2, the shaft assembly comprising a shaft which is fixed for rotation to the spray arm, and a housing substantially surrounding the shaft.

4. A dishwashing machine according to claim 3, the aperture comprised in the shaft, the housing comprising an opening positioned to coincide with the aperture to provide the open state of the aperture.

5. A dishwashing machine according to claim 4, there being a single aperture on the shaft and a single opening on the housing, the single aperture and the single opening constructed and arranged to coincide with each other once per rotation of the shaft.

6. A dishwashing machine according to any of claims 1 to 5, the power consumption of the pump being higher when the aperture is in the open state than when the aperture is in the closed state.

7. A dishwashing machine according to any of claims 1 to 6, the rotational information of the spray arm comprising a determined rate of rotation of the spray arm, the controller arranged to compare the determined rate of rotation to an expected rate of rotation.

8. A dishwashing machine according to claim 7, wherein when the determined rate of rotation of the spray arm differs from the expected rate of rotation, the controller is configured to cause an alert to be output to a user.

9. A method comprising:

monitoring a power consumption of a water pump for delivering water to a spray arm assembly of a dishwashing machine, a power con-

sumption of the pump being dependent at least in part on whether an aperture of the spray arm assembly is in an open state in which water can exit the aperture or a closed state in which water is prevented from exiting the aperture; and
determining rotational information of the spray arm using information of the monitored power consumption.

10. A method according to claim 9, wherein the determining rotational information of the spray arm comprises monitoring an interval between increases in power consumption of the pump.
11. A method according to claim 9 or claim 10, comprising comparing a determined rate of rotation of the spray arm to an expected rate of rotation of the spray arm.
12. A method according to claim 11, comprising causing an alert to be output to a user when the determined rate of rotation of the spray arm differs from the expected rate of rotation.
13. A method according to claim 11 or claim 12, comprising halting a washing cycle of the dishwasher when the determined rate of rotation of the spray arm differs from the expected rate of rotation.
14. A method according to claim 13, comprising automatically re-starting the washing cycle when it is determined that the alert has been cleared.

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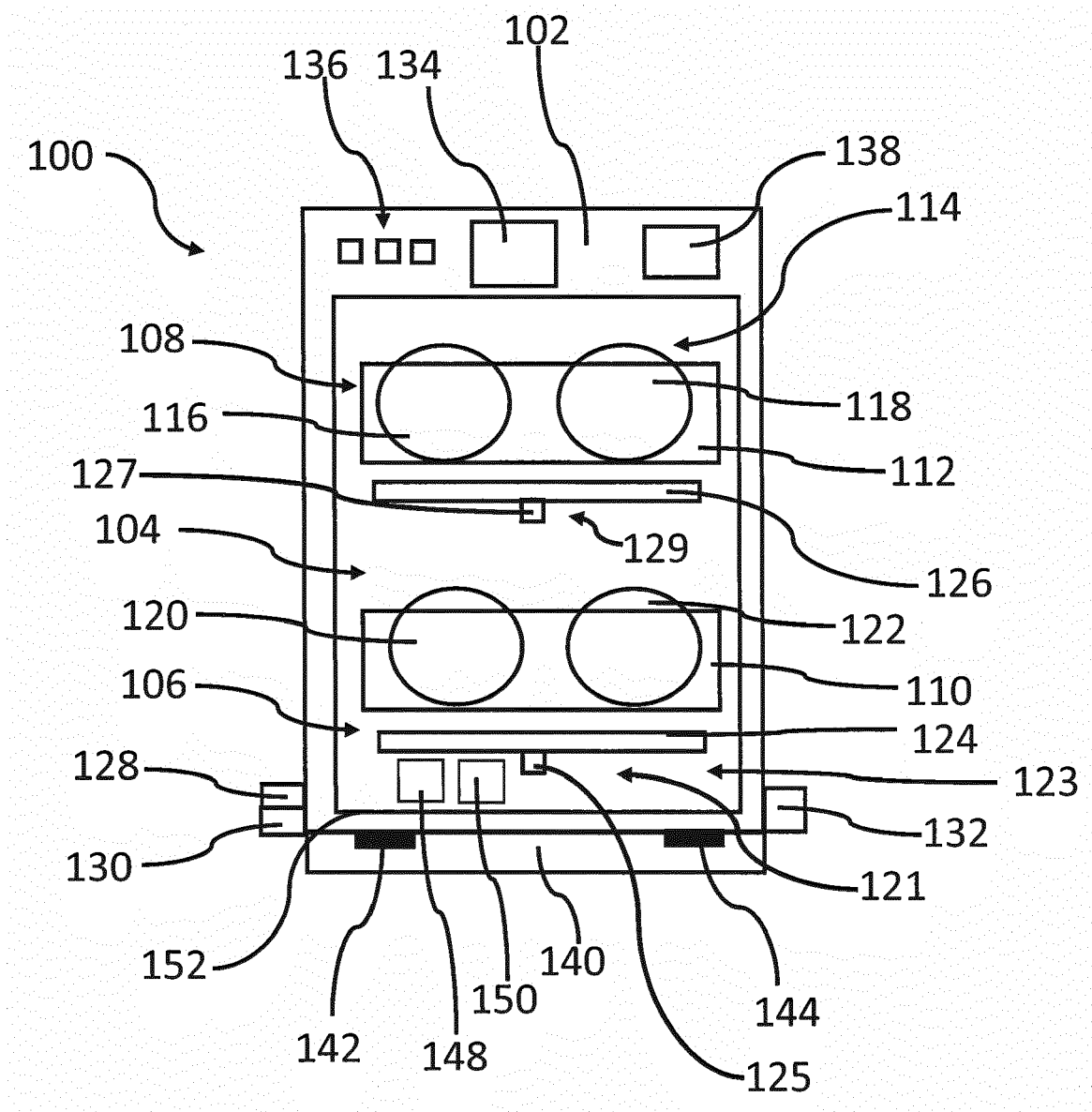


Fig. 1

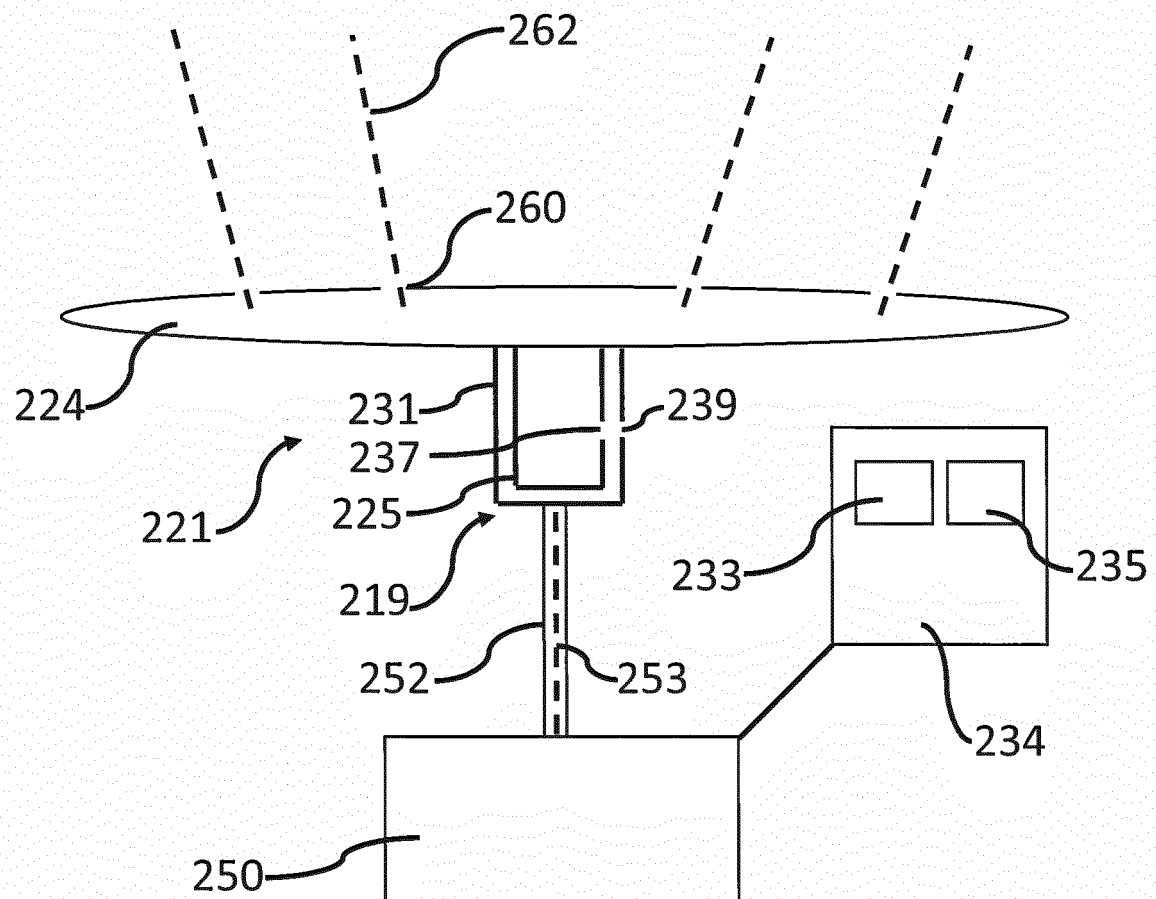


Fig. 2

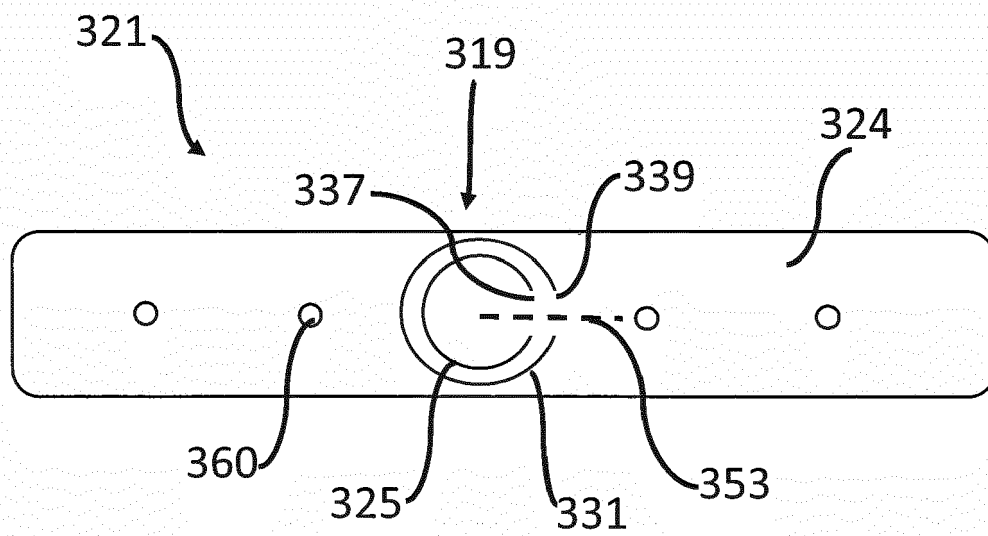


Fig. 3A

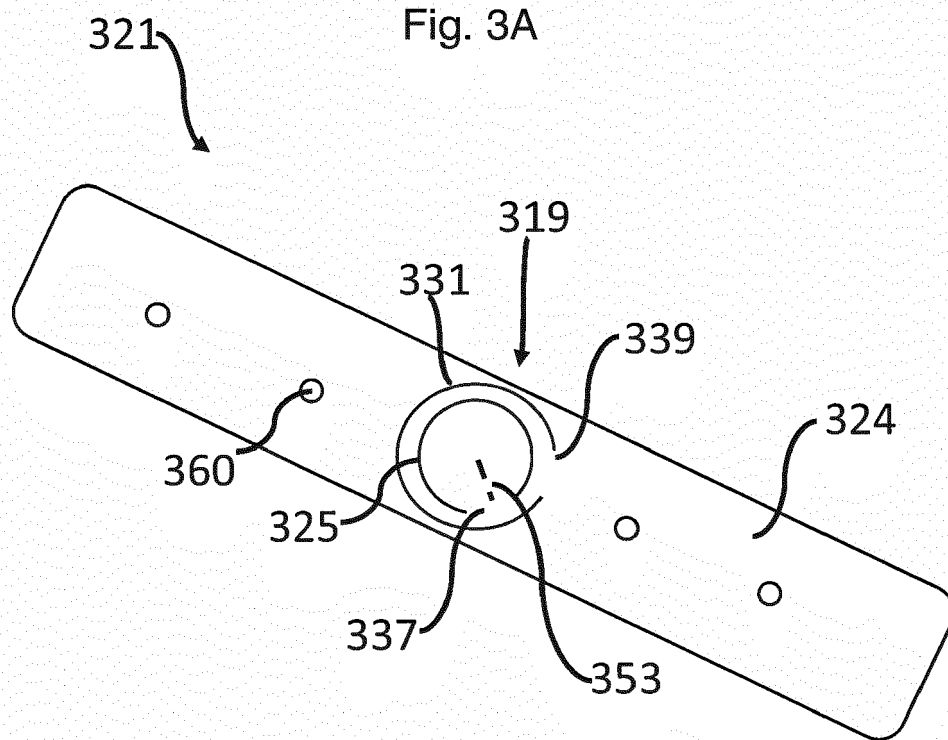


Fig. 3B

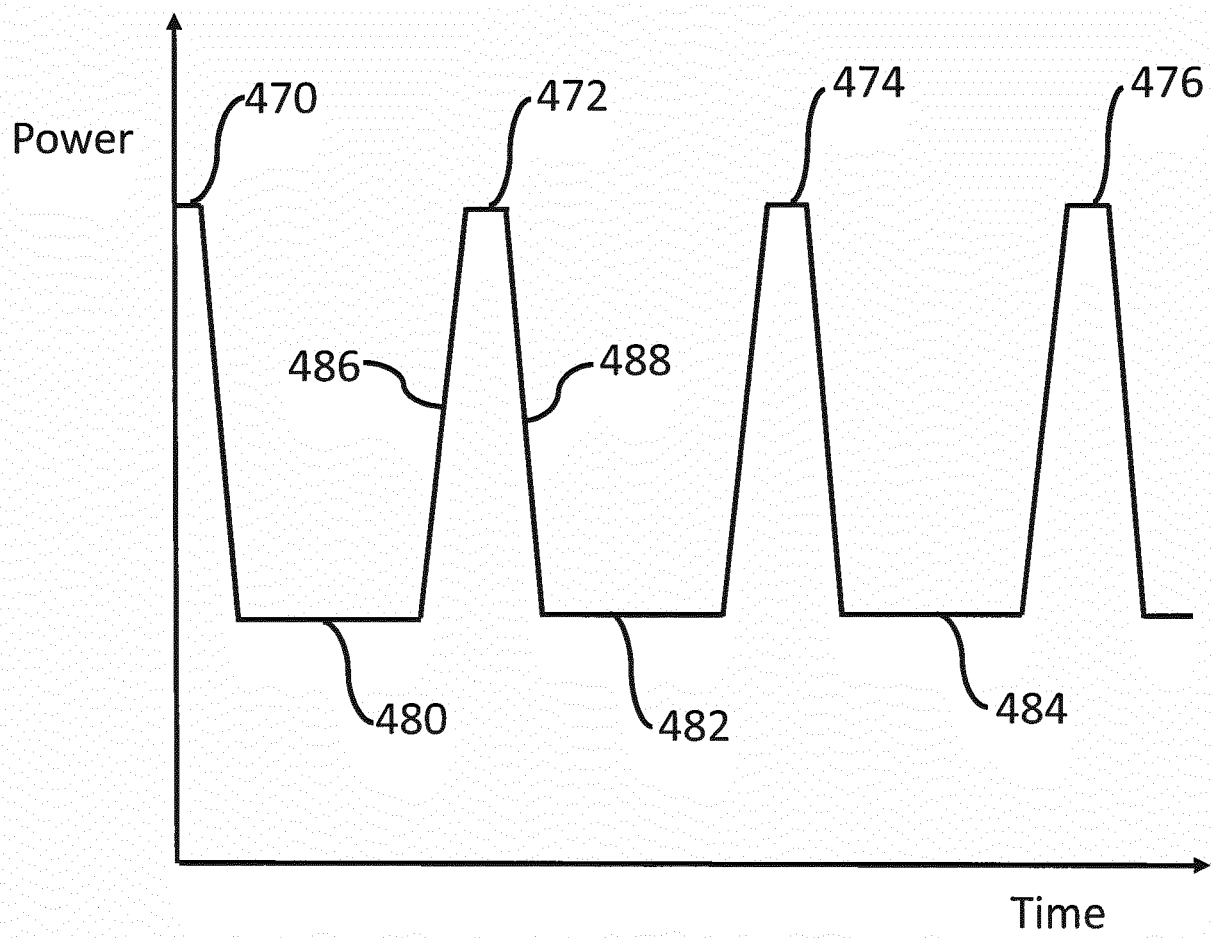
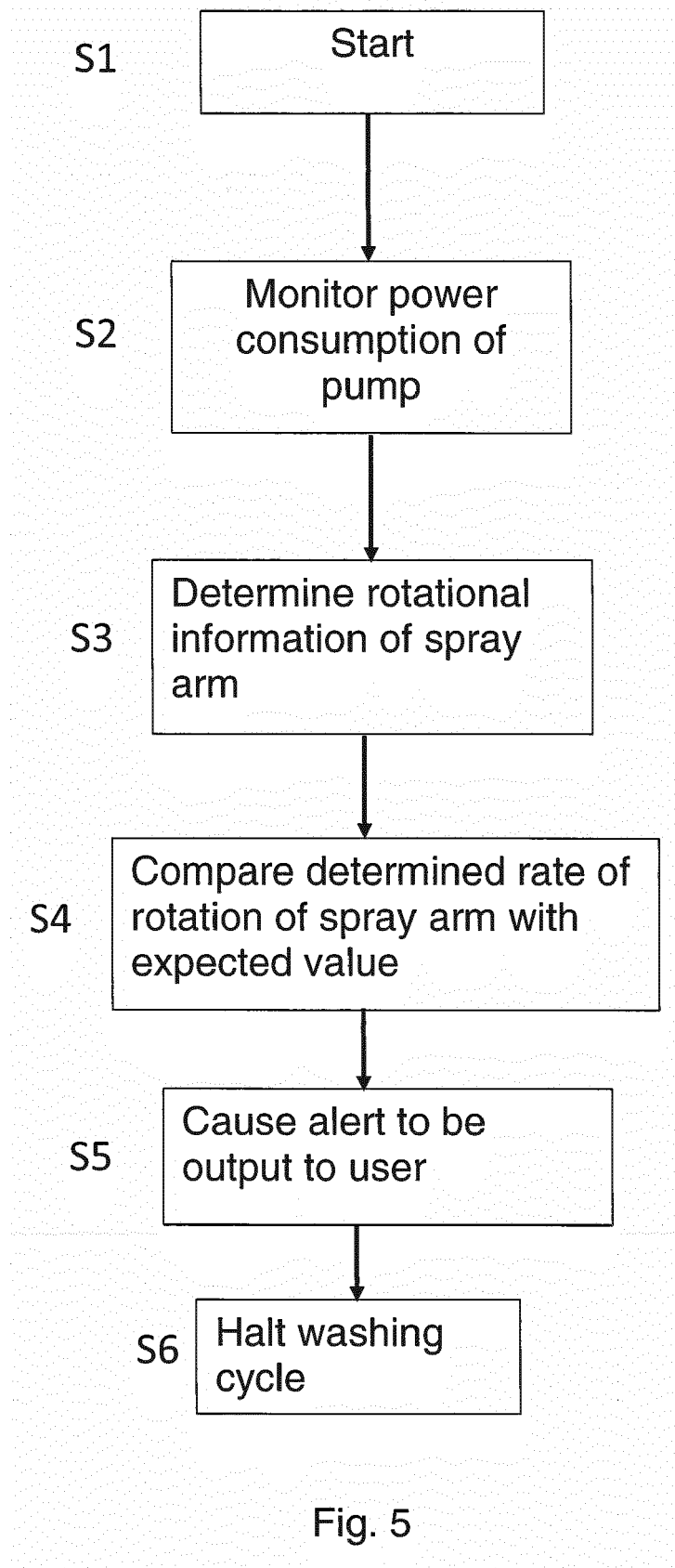


Fig. 4





EUROPEAN SEARCH REPORT

Application Number
EP 17 20 3582

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 2 614 763 A1 (ELECTROLUX HOME PROD CORP [BE]) 17 July 2013 (2013-07-17) * paragraph [0007] - paragraph [0037] *	1-14	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 December 2017	Examiner Jezierski, Krzysztof
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 20 3582

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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