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(54) SPRAY ARM ASSEMBLY FOR DISHWASHING MACHINE, DISHWASHING MACHINE AND CONTROL METHOD THEREOF

(57) There is disclosed a spray arm assembly (221) for a dishwashing machine comprising (100). The spray arm assembly (221) comprises a controller (282). The spray arm assembly (221) further comprises a spray arm (224) having a plurality of spray holes (260, 262, 264, 266) for spraying water in the dishwashing machine. Each spray hole (260, 262, 264, 266) has a first configuration which permits ejection of water and a second configuration which prevents ejection of water. The spray arm assembly (221) comprises a sensor (272) configured to sense position information of one or more items to be washed in the dishwashing machine. The controller (282) is configured to selectively arrange each of the plurality of spray holes (260, 262, 264, 266) in the first configuration or the second configuration in dependence on the position information received from the sensor (272).

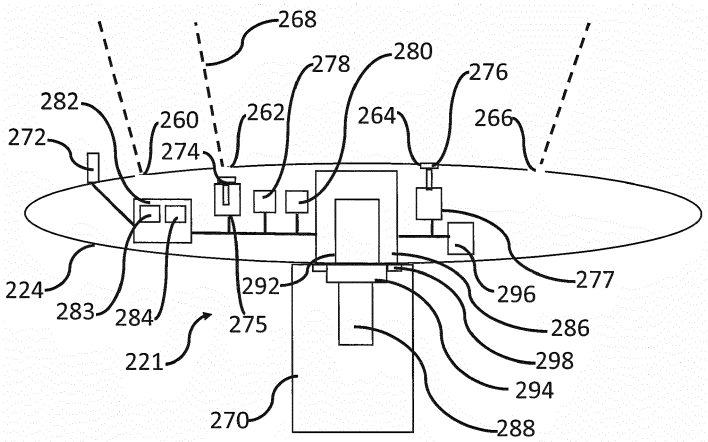

Fig. 2

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Description

Technical Field

[0001] The present disclosure relates to a spray arm assembly for a dishwashing machine, a dishwashing machine comprising such a spray arm assembly, and a method of controlling such a spray arm assembly

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. Such a washing mechanism typically comprises one or more spray arms. 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 spray arm assembly for a dishwashing machine comprising: a controller; a spray arm having a plurality of spray holes for spraying water in the dishwashing machine, each spray hole having a first configuration which permits ejection of water and a second configuration which prevents ejection of water; and a sensor configured to sense position information of one or more items to be washed in the dishwashing machine; and the controller configured to selectively arrange each of the plurality of spray holes in the first configuration or the second configuration in dependence on the position information received from the sensor.

[0004] According to an example, the controller is configured to rotate the spray arm while the sensor senses the position information of the one or more items to be washed.

[0005] According to an example, the sensor is located on the spray arm and the sensor comprises a light emitter and a light receiver.

[0006] According to an example, the controller is configured to selectively change the open or closed configuration of each of the spray holes multiple times during a washing cycle.

[0007] According to an example, the controller is configured to set open or closed configurations of each of the plurality of spray holes, and then to maintain the open or closed configurations for a plurality of rotations of the spray arm.

[0008] According to an example, the spray arm assembly comprises a plurality of movable elements, each movable element associated with a respective spray hole, each movable element being movable between a first position which provides the first configuration and a second position which provides the second configuration.

[0009] According to an example, each movable element comprises a solenoid.

[0010] According to an example, the spray arm assembly comprises an electricity generator arranged to generate electricity from rotation of the spray arm and to provide electricity to the spray arm assembly.

[0011] According to an example, the spray arm assembly comprises an electricity storing unit for storing electricity generated by the electricity generator.

[0012] According to an example, the spray arm assembly comprises a water pressure sensor, the controller configured to use information from the water pressure sensor to predict a trajectory of water from the spray holes.

[0013] According to an example, the spray arm assembly comprises a speed sensor for sensing rotational speed of the spray arm, the controller configured to use rotational speed information obtained from the speed sensor in selectively arranging each of the plurality of spray holes in the first configuration or the second configuration.

[0014] According to a second aspect there is provided a dishwashing machine comprising a spray arm assembly according to any of the first aspects.

[0015] According to a third aspect there is provided a method of controlling a spray arm assembly of a dishwashing machine comprising: sensing by a sensor one or more items to be washed in a dishwashing machine, so as to generate position information of the one or more items to be washed; and selectively arranging each of a plurality of spray holes of the spray arm in a first configuration or a second configuration in dependence on the position information, the spray holes for spraying water in the dishwashing machine and the first configuration permitting ejection of water and the second configuration preventing ejection of water.

[0016] According to an example, the method comprises rotating the spray arm while the sensor senses the position information of the one or more items to be washed.

[0017] According to an example, the method comprises selectively changing the open or closed configuration of each of the spray holes multiple times during a washing cycle.

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 dishwashing machine according to an example.

Figure 2 shows schematically a spray arm assembly according to an example.

Figures 3 shows schematically a flow chart of a method according to an example.

Detailed Description

[0019] The present disclosure has applicability to spray arm assemblies for dishwashing machines or dishwashers, as well as to dishwashing machines comprising such spray arm assemblies. 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.

[0020] 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.

[0021] 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 1 a 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. These are commonly referred to as spray holes. They may also be referred to as water outlets. Rotation of the spray arms 124 and 126, whilst ejecting water therefrom, helps to clean the items in a washing load. A problem which has been recognised by the present inventors is that a dishwasher may be only partially filled when a dishwashing cycle is begun, and the items in a partially filled dishwashing machine may not be evenly distributed in the racks of the machine. Therefore at least some of the water ejected from the spray arms may be wasted if that water does not contact any items in the machine during a washing cycle. This can lead to a waste of resources e.g. a waste of water, a waste of power used to eject that water etc.

[0022] 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. 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.

[0023] The dishwashing machine 100 further comprises water inlet schematically shown at 128 and water outlet 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.

[0024] 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.

[0025] 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. In such examples the spray holes may be arranged and/or oriented so as to facilitate such rotation. Additionally or alternatively one or more motors, shown schematically at 148, may be provided for powering rotation of the spray arms 124 and 126.

[0026] 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.

[0027] 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 further receptacles for containing dishwashing machine salt and/or rinse aid, for example.

[0028] 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.

[0029] Figure 2 is a side view schematically showing a spray arm assembly 221, according to an example. The spray arm assembly 221 comprises a spray arm 224. The spray arm 224 comprises a plurality of spray holes or openings 260, 262, 264, 266 for spraying water 262 as schematically shown by the dashed lines e.g. at 268. In this example four spray holes 260 are provided, but in other examples more or fewer may be provided.

[0030] The spray arm 224 is in fluid communication with, and in the example of Figure 2, mounted on water inlet pipe 270 which feeds water to the spray arm 224 e. g. from the base of an associated dishwashing machine.

[0031] A sensor is schematically shown at 272. The sensor 272 is arranged to sense a presence of one or more items to be washed in the dishwashing machine. In the example of Figure 2 the sensor 272 is mounted on a top surface of the spray arm 224. In the example of Figure 2 one sensor 272 is shown. In other examples two or more such sensors may be provided. Where two or more sensors are provided, they may be spaced apart on the spray arm. The sensing presence of items to be washed in the dishwashing machine comprises sensing a position or relative position of the items to be washed in the dishwashing machine. For example the sensor may sense how items to be washed e.g. dishes, bowls etc are arranged or placed in the dishwashing machine. According to some examples the sensor comprises a transmitter and a receiver. According to some examples the sensor comprises an optical sensor. According to some examples the sensor comprises a laser transmitter and a laser receiver. In other examples a different type of sensor could be used, for example a camera.

[0032] Each spray hole is selectively arranged to be in a first configuration which permits ejection of water from a respective spray hole, or a second configuration which prevents ejection of water from a respective spray hole. The first configuration may be considered an open configuration, and the second configuration may be considered a closed configuration. In the example of Figure 2 one or more movable elements is provided in order to enable the first and second configurations. For example in Figure 2 a movable element 274 is provided in order to selectively provide open and closed configurations of the spray hole 262. The movable element 274 is movable between a first position in which it is spaced from the spray hole so that the spray hole is open (i.e. first configuration of the spray hole), and a second position in which the movable element 274 closes off the spray hole 262 so that the spray hole is closed (i.e. second configuration of the spray hole). In the example of Figure 2 the movable element 274 is comprised in a solenoid unit 275. In the example of Figure 2 the movable element 274 is in its first position (spaced from spray hole 262), so that water can be ejected from the spray hole 262 as shown at 268. A second movable element is shown at 276. The movable element 276 is shown in its second position where it closes off spray hole 264, so that water cannot be ejected from spray hole 264. The movable element 276 is comprised in solenoid 277.

[0033] According to some examples, every spray hole on the spray arm 224 can be selectively switched between open and closed configurations. In some examples a plurality (but not all) spray holes can be selectively switched between open and closed configurations e.g. some may simply be open at all times. It will of course be understood that one or more spray holes may be configured in their open configurations whilst one or more other spray holes are configured in the closed configuration. In some examples each spray hole is independently controllable between open and closed configurations.

[0034] A sensor 278 is provided for determining a rotational speed of the spray arm 224. In one example the sensor 278 comprises an accelerometer. In another example the sensor 278 comprises an encoder e.g. an optical encoder such as an encoder wheel. The sensor 278 may be considered a speed or velocity sensor. Controller 282 may use rotational speed information obtained from the speed sensor 278 in selectively arranging each of the plurality of spray holes in the first configuration or the second configuration.

[0035] A sensor 280 is provided for sensing a pressure of water. For example the sensor 280 may sense a pressure of water being ejected from the spray holes 260, 262, 264 and 266. The sensor 280 may be considered a water pressure sensor. Information from the water pressure sensor 280 may be used by the controller 282 to predict a trajectory of water from the spray holes.

[0036] A controller is schematically shown at 282. In this example the controller 282 is provided as part of the spray arm assembly 221. That is the controller 282 may be provided in addition to a main controller of the dishwashing machine (e.g. controller 134 in Figure 1). In another example the functionality described with respect to controller 282 may be provided by or in conjunction with a main controller of the dishwasher e.g. controller 134 in Figure 1. The controller 282 comprises a memory 283 and a processor 284. In the example of Figure 2 the controller 282 is in communication with sensor 272, the plurality of movable elements 274 and 276 (which in this example may be via communication with respective solenoid units 275 and 277), speed sensor 278 and pres-

sure sensor 280. According to an example the controller 282 comprises a microcontroller unit (MCU). According to some examples the controller 282 comprises control circuitry.

[0037] Using information from the sensor 272 the controller 282 can establish position information of items to be washed in a dishwasher. This position information may be stored in memory 284. In some examples the spray arm 224 is controlled so as to perform one or more scanning rotations prior to a start of a washing cycle, so as to enable the positional information of the items to be washed to be obtained using the sensor 272. In some examples a washing cycle is started only once the positional information of the items to be washed has been obtained. This minimises wastage of water. The controller 282 may store an image recognition or machine learning algorithm enabling the controller to distinguish between sensed items according to type. For example the controller 282 may be able to distinguish between an item to be washed and a rack which is for holding items to be washed. Therefore the controller will not mistake a washing rack for an item to be washed, and may therefore avoid unnecessarily spraying an empty rack with water. The controller may also be able to distinguish different sizes and shapes of items to be washed e.g. plates, bowls etc. using information from the sensor 272, and control the ejection of water from the spray holes accordingly. For example the controller may determine that a larger plate will require more water for cleaning than a smaller plate, and configure one or more of the spray holes accordingly.

[0038] As discussed above, the controller 282 configures the open and closed configurations of the spray holes based on the position information received from the sensor 272. In some examples a configuration of a respective spray hole is set, and then maintained constantly during a washing cycle or stage of a washing cycle. For example a spray hole will be open or closed throughout a washing cycle or stage of a washing cycle. In some examples a configuration of a respective spray hole may be changed one or more times, for example multiple times, during a washing cycle. That is it may be considered that the open or closed configuration can be dynamically changed during a washing cycle. In some examples an open or closed configuration of a spray hole may be dependent upon a rotational position of the spray arm 224. Therefore a configuration (open or closed) of a spray hole may change one or more times during a rotation of spray arm 224, and this may be repeated for each rotation. That is a spray hole may be configured in its open or closed configuration based on a rotational position of the spray arm. This allows a spray hole to eject water when the spray hole is in the vicinity of an item to be washed, and to be closed when in a position where there are no items to be washed. In some examples information from the speed sensor 278 is used in order to detect a rotational position of spray arm 224. Another mechanism, such as an encoder or position sensor (e.g. optical sensor) may be used to detect a rotational position of the spray arm, and supply that position information to the controller 282.

[0039] In the example of Figure 2 the spray arm assembly 221 comprises an electricity or power generator shown schematically at 286. The electricity generator 286 is arranged to convert mechanical rotation of the spray arm 224 in to electrical power for powering one or more items of the spray arm assembly 221. For example the electricity generator 286 is constructed and arranged to power one or more or any combination of: sensor 272; controller 282; the one or more movable elements 274 and 276; speed sensor 278; water pressure sensor 280. According to some examples the electricity generator 286 comprises a direct current (DC) motor.

[0040] According to some examples the internal mechanism of the generator 286 comprises one or more permanent magnets and corresponding coil windings to generate electricity. According to some examples the electricity generator 286 comprises a stator and a rotor. In one example the stator comprises an element or axle 288 about which the spray arm 224 rotates. In this example the axle 288 remains stationary as the spray arm 224 rotates about it. A rotor is schematically shown at 292. In this example the rotor 292 rotates as the spray arm 224 rotates. It may therefore be considered that the rotor 292 is fixed for rotation to the spray arm 224. In the example of Figure 2 a bearing 294 enables the relative rotation between the axle 288 and the spray arm 224. According to some examples an electrical regulator and filter is provided to regulate the generated electricity. In the example of Figure 2 a power or energy storing unit 296 is provided for storing energy or power (e.g. electrical power) generated by the power generator 286. According to some examples the energy storing unit 296 comprises a capacitor or capacitor array.

[0041] In other examples the electricity generator 286 may comprise another form of electromagnetic wireless energy generator, or a brush mechanism.

[0042] The spray arm assembly 221 may comprise one or more features to keep at least some of the components (e.g. controller 282) dry. To this end one or more waterproof casings may be provided. For example the controller 282 and/or sensor 272 may be encased in waterproof casings. A seal 298 may be provided between the inlet 280 and the spray arm 224 to prevent unwanted leakage of water out of inlet 270 and/or in to spray arm 224 (of course while still allowing water to pass to the spray holes).

[0043] In some examples the spray arm assembly 221 may be retrofitted in to existing dishwashing machines. Since in some examples the spray arm assembly 221 is self-contained and comprises its own sensors, controller and electrical generator unit, then no additional hardware or software would be required in an existing dishwashing machine to include the spray arm assembly 221. This enables existing dishwashing machines to benefit from improved water efficiency. Of course, in other examples

the spray arm assembly 221 may be installed in new dishwashers to provide such dishwashers with a water efficient spray arm assembly.

[0044] Figure 3 is a flow chart schematically showing a method according to an example. This will be explained in more detail with cross-referencing to Figure 2.

[0045] At S1 a washing compartment of a dishwashing machine is scanned or monitored, for example by sensor 272. In some examples the scanning operation occurs as the spray arm 224 is rotated in the dishwashing machine. The scanning process may require one or more rotations of the spray arm 224. In some examples the scanning operation may take place without rotation of the spray arm 224.

[0046] The scanning operation of S1 enables one or more items to be washed in the dishwashing machine to be sensed. This is shown at S2.

[0047] Then, using information obtained at S2, position information is generated as shown at S3. The position information may include, for example, information of a position of one or more items to be washed in the washing compartment of the dishwashing machine.

[0048] Then, using the position information, spray holes 260, 262, 264 and 266 may be selectively arranged in first (open) or second (closed) configurations during a washing cycle or part of a washing cycle. This is shown at S4. As explained above, the open and closed configurations may be dynamically changed during a washing cycle.

[0049] 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).

[0050] 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.

[0051] 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.

[0052] 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 spray arm assembly for a dishwashing machine comprising:

   a controller;
   a spray arm having a plurality of spray holes for spraying water in the dishwashing machine, each spray hole having a first configuration which permits ejection of water and a second configuration which prevents ejection of water; and
   a sensor configured to sense position information of one or more items to be washed in the dishwashing machine; and
   the controller configured to selectively arrange each of the plurality of spray holes in the first configuration or the second configuration in dependence on the position information received from the sensor.

2. A spray arm assembly according to claim 1, the controller configured to rotate the spray arm while the sensor senses the position information of the one or more items to be washed.

3. A spray arm assembly according to claim 1 or claim 2, the sensor being located on the spray arm and the sensor comprising a light emitter and a light receiver.

4. A spray arm assembly according to any of claims 1 to 3, the controller configured to selectively change the open or closed configuration of each of the spray holes multiple times during a washing cycle.

5. A spray arm assembly according to any of claims 1 to 3, the controller configured to set open or closed configurations of each of the plurality of spray holes, and then to maintain the open or closed configurations for a plurality of rotations of the spray arm.

6. A spray arm assembly according to any of claims 1 to 5 comprising a plurality of movable elements, each movable element associated with a respective spray hole, each movable element being movable between a first position which provides the first configuration and a second position which provides the second configuration.

7. A spray arm assembly according to any of claims 1 to 6, each movable element comprising a solenoid.

8. A spray arm assembly according to any of claims 1 to 7, comprising an electricity generator arranged to generate electricity from rotation of the spray arm and to provide electricity to the spray arm assembly.

9. A spray arm assembly according to claim 8, comprising an electricity storing unit for storing electricity generated by the electricity generator.

10. A spray arm assembly according to any of claims 1 to 9, comprising a water pressure sensor, the controller configured to use information from the water pressure sensor to predict a trajectory of water from the spray holes.

11. A spray arm assembly according to any of claims 1 to 10, comprising a speed sensor for sensing rotational speed of the spray arm, the controller configured to use rotational speed information obtained from the speed sensor in selectively arranging each of the plurality of spray holes in the first configuration or the second configuration.

12. A dishwashing machine comprising a spray arm assembly according to any of claims 1 to 11.

13. A method of controlling a spray arm assembly of a dishwashing machine comprising:

sensing by a sensor one or more items to be washed in a dishwashing machine, so as to generate position information of the one or more items to be washed; and

selectively arranging each of a plurality of spray holes of the spray arm in a first configuration or a second configuration in dependence on the position information, the spray holes for spraying water in the dishwashing machine and the first configuration permitting ejection of water and the second configuration preventing ejection of water.

14. A method according to claim 13, comprising rotating the spray arm while the sensor senses the position information of the one or more items to be washed.

15. A method according to claim 13 or claim 14, comprising selectively changing the open or closed configuration of each of the spray holes multiple times during a washing cycle.

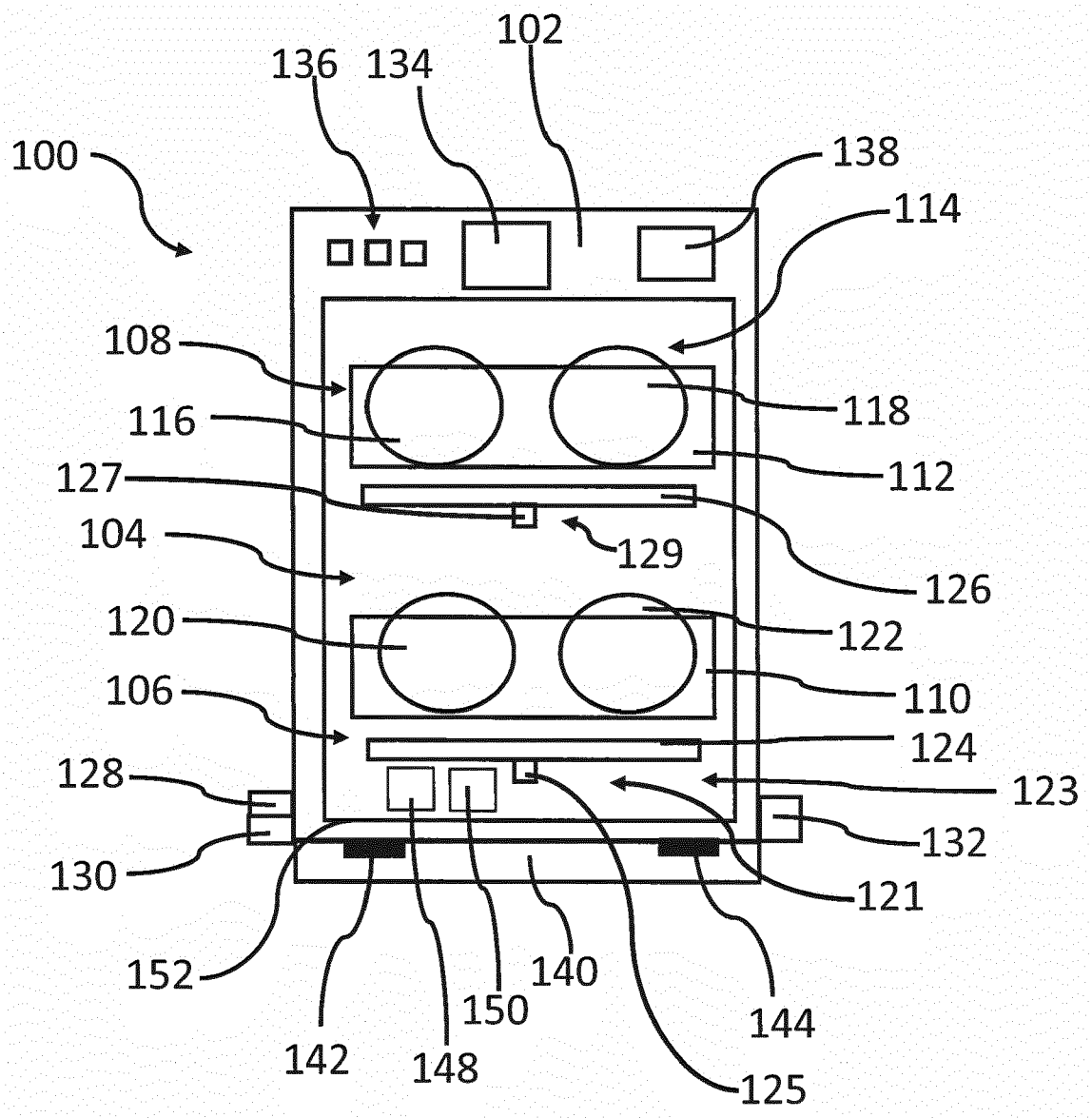
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Fig. 1

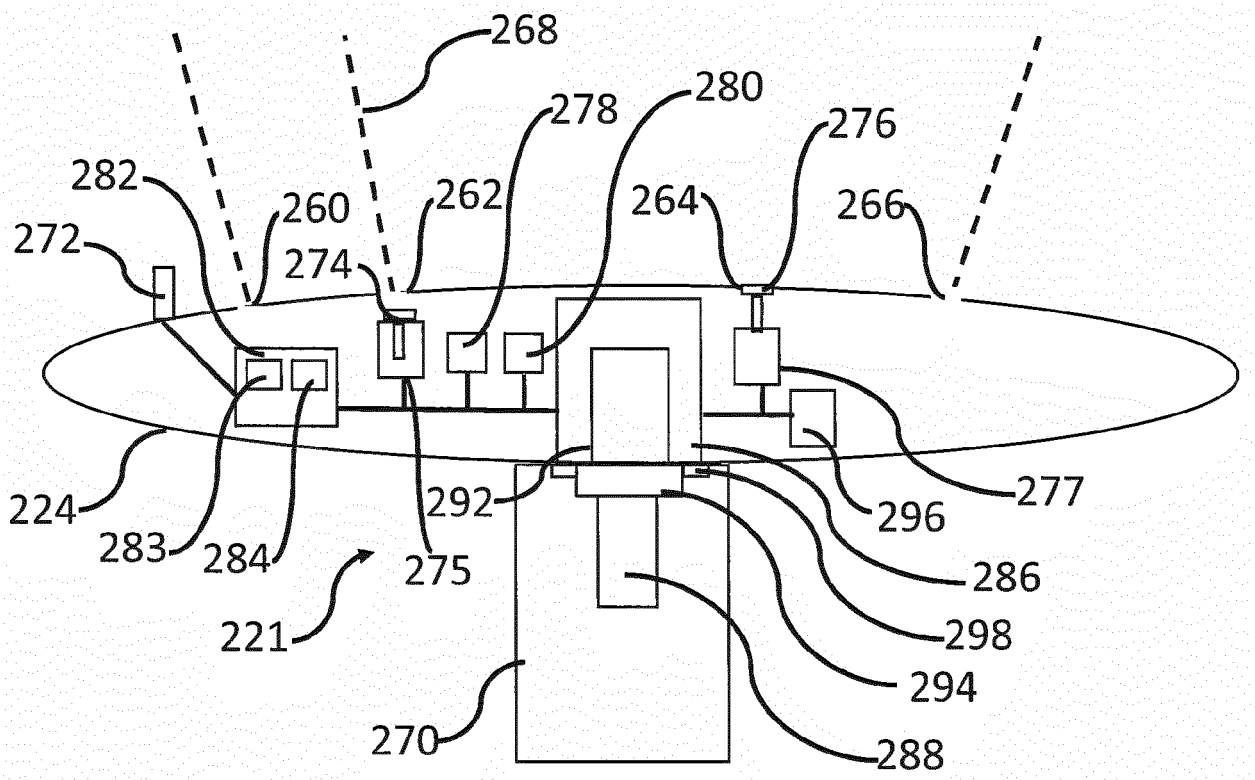
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Fig. 2

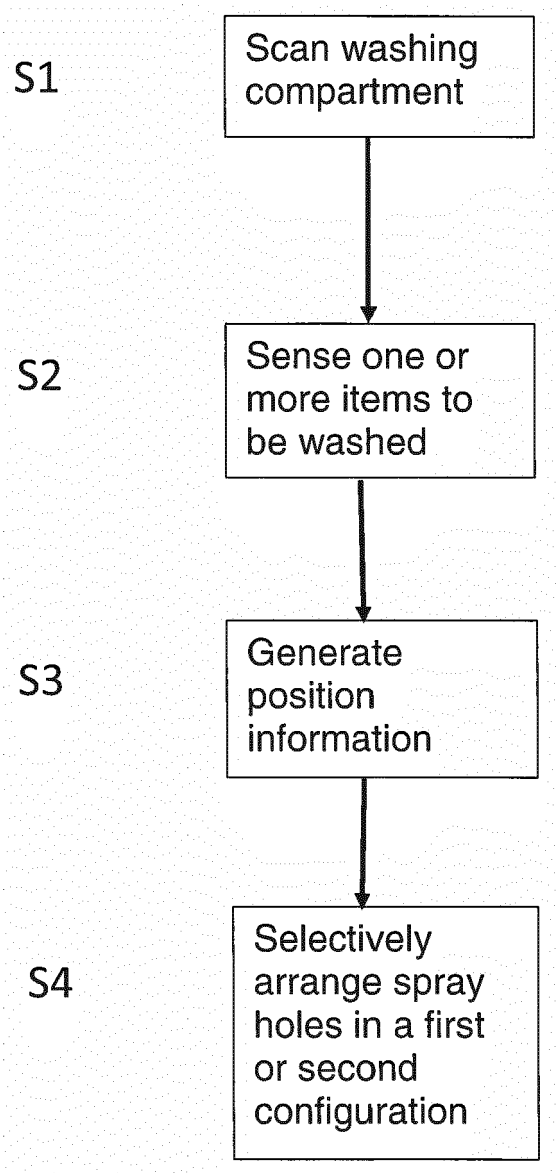
S1
Scan washing compartment
S2
Sense one or more items to be washed
S3
Generate position information
S4
Selectively arrange spray holes in a first or second configuration

Fig. 3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 20 7424

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 A	WO 2015/121469 A1 (MEIKO MASCHINENBAU GMBH & CO [DE]) 20 August 2015 (2015-08-20) * page 30, line 35 - page 31, line 7 * * page 33, line 25 - page 35, line 39; figures 1,2 *	1-7, 12-15 8-11	INV. A47L15/22 A47L15/23 A47L15/42
X A	EP 3 090 674 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 9 November 2016 (2016-11-09) * column 6, paragraph 37-40 * * column 7, paragraph 46 * * column 8, paragraphs 52,55 * * column 11, paragraph 84 - column 14, paragraph 104 * * column 23, paragraph 155-160 * * column 25, paragraph 169-170; figures 1,2,8,9,10b,14a,14b,15 *	1-6, 12-15 7-11	
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