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(54) WASHING AND/OR DRYING MACHINE

(57) A washing and/or drying machine (202) comprises: a drum (206) arranged for rotation within a main body portion (204) of the machine (20). The machine (202) includes at least one movable element (216, 218, 220, 222, 224, 226, 228, 230) movable between a first position and a second position. When in the second position the movable element extending into the drum (206). The machine (202) includes at least one sensor (238, 240, 242, 244, 246, 248, 250, 252) and a controller (254). The controller (254) is configured to, in response to obtaining information from the at least one sensor indicating that one or more items of a washing load (256, 258) are stuck to an inside surface (232) of the drum (206), cause the movable element to move from the first position to the second position for separating one or more items of a washing load (256, 258) from an inside surface (232) of the drum (206).

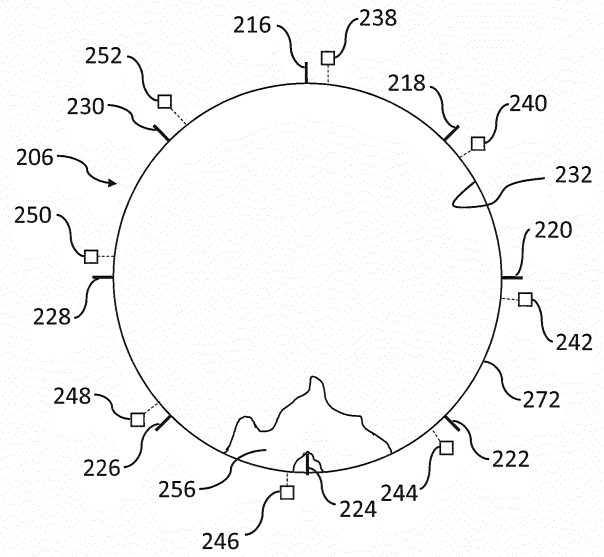

Figure 4

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Description

Technical Field

[0001] The present disclosure relates to a washing and/or drying machine.

Background

[0002] Washing machines are used for washing washable items, including garments such as clothes. Typically a user can select a suitable washing cycle via an interface on a front face of the washing machine. The interface usually includes a number of control knobs and/or buttons. A drying machine, also known as a tumble dryer, is operable to dry items such as garments placed therein. Some washing machines have both washing and drying functionality.

Summary

[0003] According to a first aspect disclosed herein, there is provided a washing and/or drying machine comprising: a drum arranged for rotation within a main body portion of the machine; at least one movable element movable between a first position and a second position, when in the second position the movable element extending into the drum; at least one sensor; and a controller configured to, in response to obtaining information from the at least one sensor indicating that one or more items of a washing load are stuck to an inside surface of the drum, cause the movable element to move from the first position to the second position for separating one or more items of a washing load from an inside surface of the drum.

[0004] By using the at least one movable element to dislodge and release items of clothing that are stuck to an inside surface of the drum, the weight of the drum can be balanced. This is particularly useful if carried out before a spin cycle because an unbalanced drum may cause excessive vibrations, which may result in a high level of noise being output during the spin cycle. Therefore, using the at least one movable element can reduce noise output during the spin cycle. It can also increase energy efficiency because less energy is wasted as vibrations and noise during the spin cycle.

[0005] In an example, when in the first position the movable element extends into the drum and when in the second position the movable element extends further into the drum than when in the first position.

[0006] In an example, when in the first position the movable element is retracted outside of the drum.

[0007] In an example, the washing and/or drying machine comprises at least one actuator for causing movement of the at least one movable element.

[0008] In an example, the actuator comprises a rack and pinion assembly.

[0009] In an example, the actuator comprises one or more magnets.

[0010] In an example, the at least one actuator is constructed and arranged to move with the drum as the drum rotates.

[0011] In an example, the at least one sensor comprises a plurality of sensors and the at least one movable element comprises a plurality of movable elements, each sensor associated with one or more of the plurality of movable elements.

[0012] In an example, the controller is configured to, in response to obtaining information from a sensor of the plurality of sensors that one or more items of the washing load are stuck to the inside surface of the drum, cause each movable element associated with that sensor to move from the first position to the second position.

[0013] In an example, the plurality of movable elements are arranged such that they are evenly spaced around the drum.

[0014] In an example, the controller is configured to compare information obtained from a first sensor of the plurality of sensors and a second sensor of the plurality of sensors, and when a value obtained from the first sensor is greater than a value obtained from the second sensor by at least a predetermined threshold, cause each movable element associated with the first sensor to move from the first position to the second position.

[0015] In an example, the least one sensor is selected from a group comprising: a pressure sensor, a weight sensor, and a force sensor.

[0016] In an example, the controller is configured to initiate a measurement cycle prior to causing a movable element to move from the first position to the second position.

[0017] In an example, the controller is configured to obtain the information from the at least one sensor only during the measurement cycle.

[0018] According to a second aspect disclosed herein, there is provided a method of controlling a washing and/or drying machine, the method comprising: in response to obtaining information from at least one sensor indicating that one or more items of a washing load are stuck to an inside surface of a drum of the machine, causing a movable element to move from a first position to a second position, wherein, when in the second position the movable element extends into the drum of the machine for separating one or more items of a washing load from the inside surface of the drum.

Brief Description of the Drawings

[0019] 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 perspective view of a washing machine according to an example;

Figure 2 shows schematically a front view of a drum of a washing machine according to an example;

Figure 3 shows schematically a front view of a drum of a washing machine according to an example;

Figure 4 shows schematically a front view of a drum of a washing machine according to an example;

Figure 5 shows schematically a front view of a drum of a washing machine according to an example;

Figure 6 shows schematically a perspective view of a drum of a washing machine according to an example;

Figure 7 shows schematically a cross section view of part of a movable element according to an example; and

Figure 8 shows schematically some aspects of a washing machine according to an example.

Detailed Description

[0020] The present disclosure has applicability to clothes washing and/or drying machines.

[0021] When a user places a washable item such as a garment or garments in a washing machine the user then usually selects a washing cycle from a variety of available washing cycles. For delicate clothes a user may select a hot washing cycle, possibly with additional rinse and soak stages. Each selectable washing cycle typically has one or more fixed parameters, such as duration and temperature. Some washing machines also have a tumble drying function, and such machines are sometimes referred to as washer-dryers or combined washing and drying machines. The final stage of a washing cycle, before a drying cycle is begun, is often a spin cycle where a drum of the washing machine is rotated at high speed to remove excess water from garments in the washing machine. This rotation can be clockwise or anti-clockwise, or cycle between clockwise and anticlockwise spin cycles. The centrifugal force of the spin cycle pushes the garment(s) on to an inside surface of the drum. At least some of these garments may accordingly become stuck to the drum. The moisture on these stuck garments may not easily be removed during the spin cycle. Furthermore, these garments may remain stuck during a subsequent drying cycle and thus prevent air circulation between the garments, which may reduce the effectiveness of the drying cycle. Moreover, garments stuck to an inside surface of the drum may unbalance the drum, resulting in excessive vibration during the spin cycle, and thus excessive noise. Stuck garments may also cause these same problems in tumble dryers. In a tumble dryer a user can typically select duration of a drying cycle, and in some examples a user can also select heating intensity of a drying cycle.

[0022] Figure 1 schematically shows a washing machine 102 according to an example. The washing machine 102 includes a main body portion 104 and a drum 106 which is arranged to hold one or more garments or items of a washing load to be washed. Washing detergent and/or fabric softener may also be placed directly in to the drum 106. Alternatively washing detergent and/or fabric softener may be placed in to a tray or holder 112 arranged for this purpose. A user interface 108 is provided which enables a user to select one or more washing parameters and/or settings. A display 110 is also provided which outputs information to a user of the washing machine. For example information displayed on the display 110 may be information regarding options selected via user interface 108, information regarding a washing cycle in progress such as time remaining etc. The washing machine 102 also includes a controller 154 shown schematically at 154. The controller 154 includes a memory and a processor. The controller 154 is arranged for controlling operations of the washing machine 102.

[0023] The washing machine 102 also includes a suitable power connection enabling the washing machine 102 to be connected to an electricity supply such as mains electricity, as well as a suitable inlet and outlet for water. These aspects are known per se and, for conciseness, are not discussed further.

[0024] Figures 2 to 6 shows a drum 206 of a washing machine 202 according to an example. The drum 206 is arranged for rotation within a main body portion 204 of the washing machine 202. The drum 206 may be a metal or a non-metal. In another example, the machine is a drying machine e.g. a tumble dryer.

[0025] The washing machine 202 includes one or more movable elements which can move relative to the drum 206. In an example, the washing machine 202 includes a plurality of movable elements. In this particular example, the washing machine 202 includes eight movable elements 216, 218, 220, 222, 224, 226, 228, 230. It will be understood that more or fewer movable elements may be provided. In this example the movable elements are arranged so that they are evenly spaced around the drum 206. A purpose of the movable elements is to try to dislodge items of a washing load that are stuck to an inside surface 232 of the drum 206 by lifting the items away from the inside surface 232.

[0026] Each movable element can move between a first position and a second position. In some examples, when a movable element is in its first position, which may be referred to as its non-extended position, it does not protrude or extend into the interior of the drum 206. That is, it is retracted out of the drum 206. In such examples the movable elements do not interfere or interact with items of a washing load within the drum 206 when in the first position. When a movable element is in its second position, which may be referred to as its extended position, the movable element protrudes or extends into the interior of the drum 206 so that the movable element can

contact or interact with one or more items of a washing load within the drum 206 so as to separate one or more items from the inside surface 232 of the drum 206, as is explained in further detail below. In some examples, when a movable element in its first position the movable element extends into the drum 206, and when the movable element is in the second position the movable element extends further into the drum 206 than when in the first position.

[0027] In an example, as is shown in Figure 6, an actuator shown schematically at 236 is arranged for driving one or more movable elements. In this example the actuator 236 can drive a first movable element 234 and a second movable element 235. The movable elements 234 and 235 can be caused to move together or independently. In this example each movable element is in the form of a pin. Each movable element is arranged to pass through a respective aperture 260 in to the drum 206. In this example, when actuated by actuator 236, the movable elements 234 and 235 both protrude through their respective apertures 260 and into the internal volume of the drum 206, so that they can interact with one or more items of a washing load within the drum 206. In some examples, the actuator 236 is attached to an outside surface 272 of the drum 206.

[0028] An example actuator 236 is shown in more detail in Figure 7. As explained, the actuator 236 is constructed and arranged to cause movement of a movable element. Therefore, in examples, each movable element is connected to a respective actuator 236. The actuator 236 can move a movable element between its non-extended position and its extended position. Each actuator 236 may comprise a housing 237 for housing an actuator mechanism shown generally at 239. In this example, the mechanism 239 comprises an electric motor 266 operatively connected to a rack and pinion mechanism 264. Although in Figure 7 the movable elements 234 and 235 are formed with a rack to engage with the pinons, in some examples, a movable element may instead be connected to a rack for engaging with a pinion. In another example, each actuator 236 comprises a magnet or electromagnet and each movable element comprises a magnetic material or is connected to a magnet.

[0029] The washing machine 202 includes one or more sensors. In an example, the washing machine 202 includes a plurality of sensors. In one example shown in Figures 2 to 5, the washing machine 202 includes eight sensors 238, 240, 242, 244, 246, 248, 250, 252. It will be understood that more or fewer sensors may be provided. A purpose of the sensors is to obtain information on whether one or more items of the washing load are stuck to the inside surface 232 of the drum 206.

[0030] In an example each sensor is constructed and arranged to obtain a measure of a force acting on a particular portion of the inside surface 232 of the drum 206, for example whilst the drum 206 is rotating. A garment or item of a washing load that is stuck to the inside surface 232 of the drum 206 whilst it is rotating will exert a force against the inside surface 232 of the drum 206 due to the centrifugal force of the rotating drum 206. In one example, each sensor comprises a force sensor such as a force sensing resistor. In another example, each sensor comprises a pressure sensor or a weight sensor.

[0031] In some examples (e.g. as shown in Figures 2 to 5), each sensor 238, 240, 242, 244, 246, 248, 250, 252 is associated with a particular movable element 216, 218, 220, 222, 224, 226, 228, 230. For example sensor 238 is associated with movable element 216, sensor 240 is associated with movable element 218 etc. In some examples a sensor may be associated with a respective movable element that is located adjacent or in the region of a portion of the inside surface 232 of the drum 206 that the particular sensor in question is measuring force acing against. To this end, the washing machine 202 may comprise a data storage for storing information on the associations between the sensors and the movable elements. In some examples, a particular sensor may be associated with one or more movable elements. In some examples a particular movable element may be associated with one or more sensors. It will be understood that associating a sensor with a particular movable element means that the sensor is constructed and arranged on/in the drum 206 to detect force acting on a region of the drum 206 at which the movable element is located.

[0032] The washing machine 202 includes a controller 254 (see Figure 8). The controller 254 includes a memory 268 and a processor 270. The controller 254 is configured to control operations of the washing machine 202. The controller 254 is electrically connected to the one or more sensors (e.g. a first sensor 246) and the one or more movable elements (e.g. a first movable element 224). In this example, the first sensor 246 senses force acting on a portion of the inside surface 232 of the drum 206 adjacent the first movable element 224.

[0033] The controller 254 is configured to obtain information from the one or more sensors on whether one or more items of the washing load are stuck to the inside surface 232 of the drum 206. To this end, in some examples the controller 254 obtains information from each sensor whilst the drum 206 is rotating. In some examples the information comprises a reading or a measure of a force acting on a portion of the inside surface 232 of the drum 206. If one or more items are stuck to a portion of the inside surface 232 of the drum 206 then the weight of these items increases the force acting on the adjacent portion of the inside surface 232 of the drum 206. A heavier weight of items stuck to a particular portion of the drum 206 causes a larger force to be detected compared to a relatively lighter weight.

[0034] In some examples where there are two or more sensors, the controller 254 is configured to compare a force sensed by each sensor. If a force sensed by a first sensor exceeds a force sensed by a second sensor by a predetermined threshold amount or more than a predetermined threshold amount, then the controller 254 is configured to move at least one movable element asso-

ciated with the first sensor from its non-extended position to its extended position. As explained, moving a movable element to its extended position pushes an item of a washing load away from the inside surface 232 of the drum 206 in a region of that movable element. This dislodges the item from the inside surface of the drum 206, resulting in a more balanced drum 206 and thus less vibration and noise output during a washing or drying cycle or a stage of a washing or drying cycle (e.g. a spin cycle).

[0035] An example of use of the movable elements in the washing machine 202 will now be described.

[0036] The final stage of a washing cycle of the washing machine 202, before a drying cycle is begun, is a spin cycle where the drum 206 is rotated at high speed to remove excess water from items in the washing machine 202. Prior to beginning the spin cycle, and/or periodically throughout the spin cycle, the controller 254 carries out a process to use the movable elements to prevent or reduce imbalance in the drum 206, which may otherwise cause excessive vibration and/or noise.

[0037] To this end, after the washing cycle has finished, but prior to the spin cycle and the drying cycle, the controller 254 automatically switches the washing machine 202 into a measurement phase in which it determines whether the drum 206 is unbalanced.

[0038] During the measurement phase the controller 254 causes the drum 206 to rotate at a constant speed. In some examples the rotation speed during the measurement phase is less than a normal rotation speed during a spin cycle. In an example, the rotation speed during the measurement phase may be, for example, between 100 and 1000 revolutions per minute (rpm). In another example, the rotation speed during the measurement phase may be, for example, between 400 rpm and 1000 rpm. In another example, the rotation speed during the measurement phase may be, for example, 600 rpm. Such rotation speeds are sufficient to maintain items of the washing load against the inside surface 232 of the drum 206 so that the force exerted by the items can be sensed, but are below the normal rotation speed used during the spin cycle of a washing machine, which may typically be in the region of 1200 rpm.

[0039] The controller 254 then, whilst the drum 206 is rotating, obtains information from the sensors 238, 240, 242, 244, 246, 248, 250, 252. In particular, in this example, the controller 254 obtains a measure of a force detected by each sensor. As mentioned above, if an item of clothing is stuck to the inside surface 232 of the drum 206, the sensor or sensors adjacent the location to which it is stuck will sense a higher force than the other sensors.

[0040] In some examples, the controller 254 is configured to adjust the rotation speed of the drum 206 until the sensors 238, 240, 242, 244, 246, 248, 250, 252 report stable readings.

[0041] In response, if the measure of force obtained from a first sensor is greater than a measure of force obtained from a second sensor by a predetermined threshold difference or more than a predetermined threshold difference, the controller 254 causes the one or more movable elements associated with the first sensor to extend to their second position to dislodge any items of clothing that may be stuck to the inside surface 232 of the drum 206.

[0042] In the examples of Figures 3 to 5, an item of clothing 256 is stuck to a portion of the inside surface 232 of the drum 206 adjacent the sensor 246 and the movable element 224 (see Figure 3). The sensor 246 and the movable element 224 are associated with one another. In the situation of Figure 3, ta measure of force obtained by the controller 254 from the sensor 246 is higher or much higher than a measure of force obtained from the other sensors, due to centrifugal force acting on the weight of the item of clothing 256 and consequently on sensor 246.

[0043] Therefore, in this example, the controller 254 causes the movable element 224 to move to its second position in which it extends into the drum 206. The movable element 224 in its extended position contacts with the item of clothing 256 and dislodges it from the inside surface 232 of the drum 206 (see for example Figure 4). This rebalances the drum 206, or at least makes the drum 206 less unbalanced, which results in less vibration during the spin cycle and thus less noise output.

[0044] The controller 254 then, whilst the drum 206 is still rotating, obtains new information from the sensors 238, 240, 242, 244, 246, 248, 250, 252. If the measure of force obtained from a sensor is greater than a measure of force obtained from another sensor by a predetermined threshold difference then the controller 254 again causes the one or more movable elements associated with that sensor to extend to their second position to dislodge any items of clothing that may be stuck to the inside surface 232 of the drum 206, and so on.

[0045] If or once all items of clothing have been released from the inside surface 232 of the drum 206, and/or the clothing is distributed evenly around the inside surface of the drum 206, the controller 254 will obtain equal or substantially equal measurements from each sensor and so no measure of force is larger than another measure by the predetermined threshold difference. The controller 254 then ends the measurement phase and may begin a typical spin or drying cycle.

[0046] In another example, which is shown in Figure 5, two items of clothing 256, 258 are stuck to the inside surface 232 of the drum 206. The first item of clothing 256 is relatively large and heavy compared to the second item of clothing 258. Therefore in this example the first item of clothing 256 exerts a higher force against its adjacent and associated sensor 246 whilst the drum 206 is spinning than the second item of clothing 258 does against its adjacent and associated sensor 238.

[0047] During the measurement phase, the controller 254 obtains a measure of force from each sensor. In the example of Figure 5 the measure obtained from the sensor 246 is larger than the measure obtained from the

sensor 238 by a difference that is greater than the predetermined threshold. In response, the controller 254 causes the movable element associated with the sensor 246, which is the movable element 224, to move to its extended position and to dislodge the first item of clothing 256 from being stuck on the inside surface 232 of the drum 206, as described above. However, the measure obtained from the sensor 238 is not larger than the measure obtained from another sensor by a difference that is greater than the predetermined threshold. In response, the controller 254 therefore does not causes any other movable element to move to its extended position. The controller 254 then obtains new information from the sensors as described above, and so on.

[0048] An advantage of this arrangement is that prior to beginning a spin cycle, imbalance of a washing load within a drum of a washing and/or drying machine can be reduced or overcome. This reduces vibrations during the spin cycle, which decrease the noise of the spin cycle. It will be noted however that although the disclosed invention may have particular utility during a spin cycle, it is not limited as such. For example the invention may operate during other stages of a washing and/or drying cycle (e.g. rinse, wash, dry etc.).

[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. 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 washing and/or drying machine comprising:

   a drum arranged for rotation within a main body portion of the machine;
   at least one movable element movable between a first position and a second position, when in the second position the movable element extending into the drum;
   at least one sensor; and
   a controller configured to, in response to obtaining information from the at least one sensor indicating that one or more items of a washing load are stuck to an inside surface of the drum, cause the movable element to move from the first position to the second position for separating the one or more items from the inside surface of the drum.

2. A washing and/or drying machine according to claim 1, wherein when in the first position the movable element extends into the drum, and when in the second position the movable element extends further into the drum than when in the first position.

3. A washing and/or drying machine according to claim 1, wherein when in the first position the movable element is outside of the drum.

4. A washing and/or drying machine according to any of claim 1 to 3, comprising at least one actuator for causing movement of the at least one movable element.

5. A washing and/or drying machine according to claim

4, wherein the actuator comprises a rack and pinion assembly.

6. A washing and/or drying machine according to claim 4 or claim 5, wherein the actuator comprises one or more magnets.

7. A washing and/or drying machine according to any of claims 4 to 6, wherein the at least one actuator is constructed and arranged to move with the drum as the drum rotates.

8. A washing and/or drying machine according to any of claims 1 to 7, the at least one sensor comprising a plurality of sensors and the at least one movable element comprising a plurality of movable elements, each sensor associated with one or more of the plurality of movable elements.

9. A washing and/or drying machine according to claim 8, wherein the controller is configured to, in response to obtaining information from a sensor of the plurality of sensors that one or more items of the washing load are stuck to the inside surface of the drum, cause each movable element associated with that sensor to move from the first position to the second position.

10. A washing and/or drying machine according to claim 8 or claim 9, wherein the plurality of movable elements are arranged such that they are evenly spaced around the drum.

11. A washing and/or drying machine according to any of claims 8 to 10, wherein the controller is configured to compare information obtained from a first sensor of the plurality of sensors and a second sensor of the plurality of sensors, and when a value obtained from the first sensor is greater than a value obtained from the second sensor by at least a predetermined threshold, cause each movable element associated with the first sensor to move from the first position to the second position.

12. A washing and/or drying machine according to any of claims 1 to 11, wherein the at least one sensor is selected from a group comprising: a pressure sensor, a weight sensor, and a force sensor.

13. A washing and/or drying machine according to any of claims 1 to 12, wherein the controller is configured to initiate a measurement cycle prior to causing a movable element to move from the first position to the second position.

14. A washing and/or drying machine according to claim 14, wherein the controller is configured to obtain the information from the at least one sensor only during the measurement cycle.

15. A method of controlling a washing and/or drying machine, the method comprising:

in response to obtaining information from at least one sensor indicating that one or more items of a washing load are stuck to an inside surface of a drum of the machine, causing a movable element to move from a first position to a second position, wherein, when in the second position the movable element extends into the drum of the machine for separating one or more items of a washing load from the inside surface of the drum.

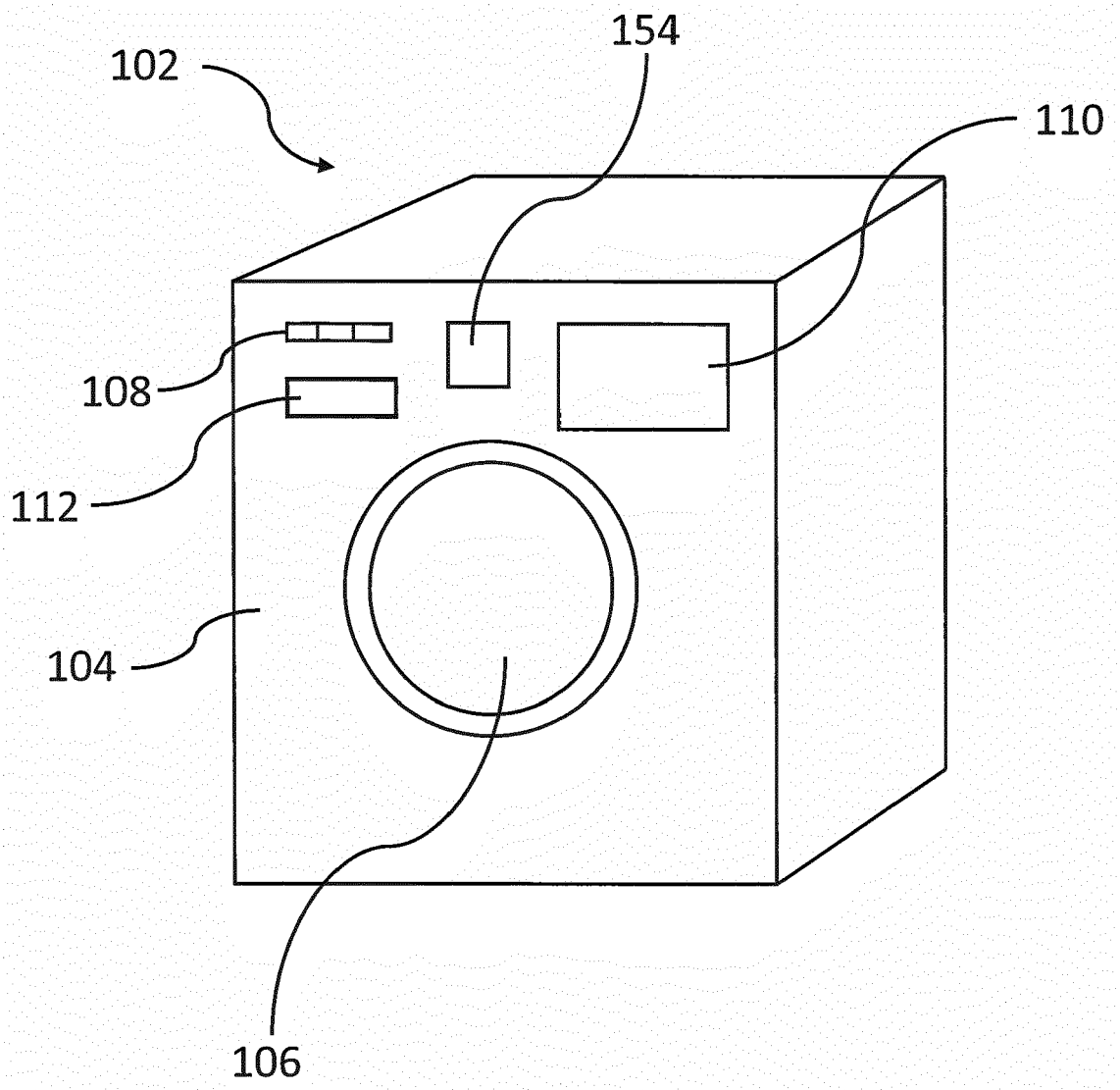

Figure 1

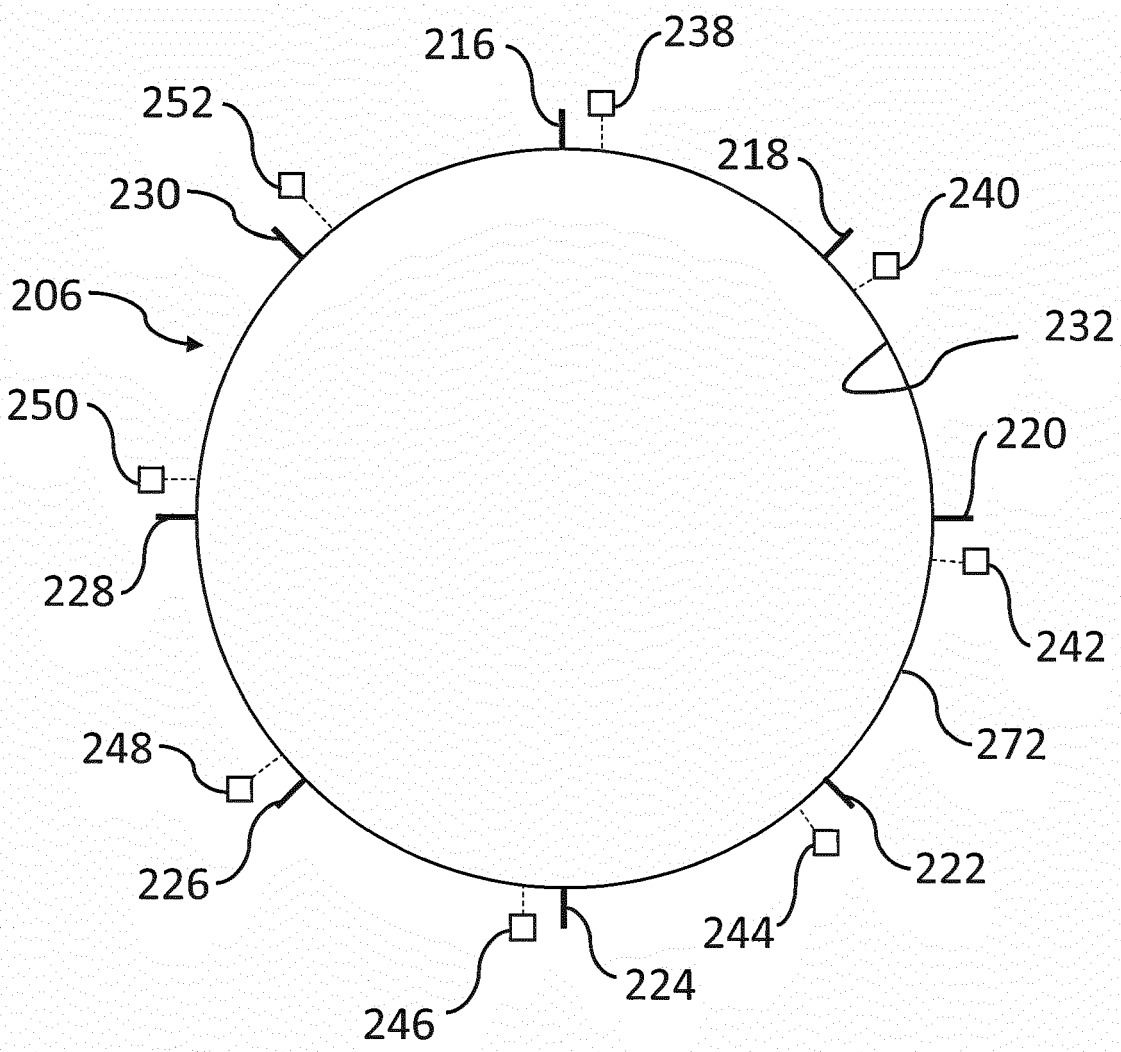
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Figure 2

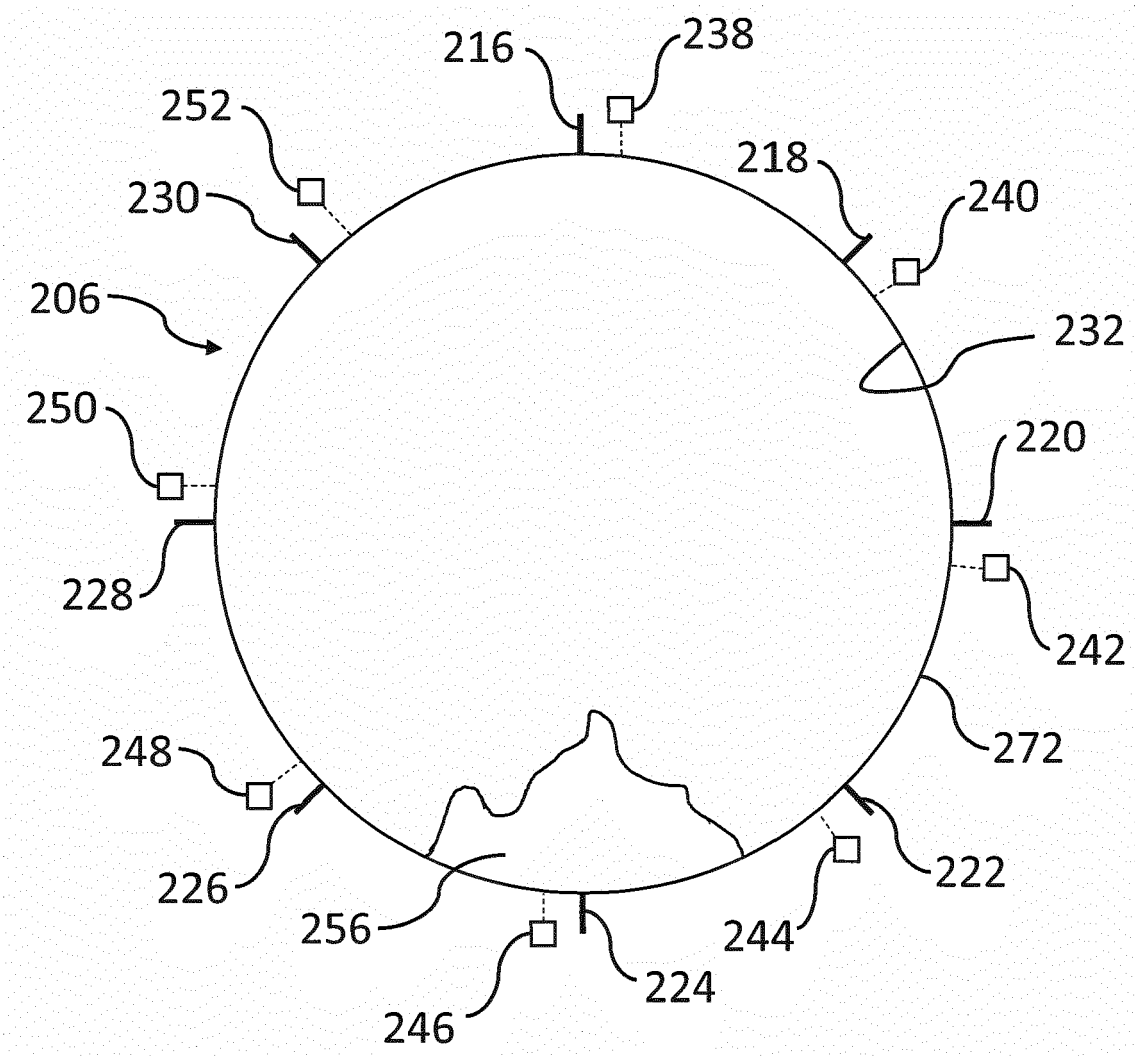
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Figure 3

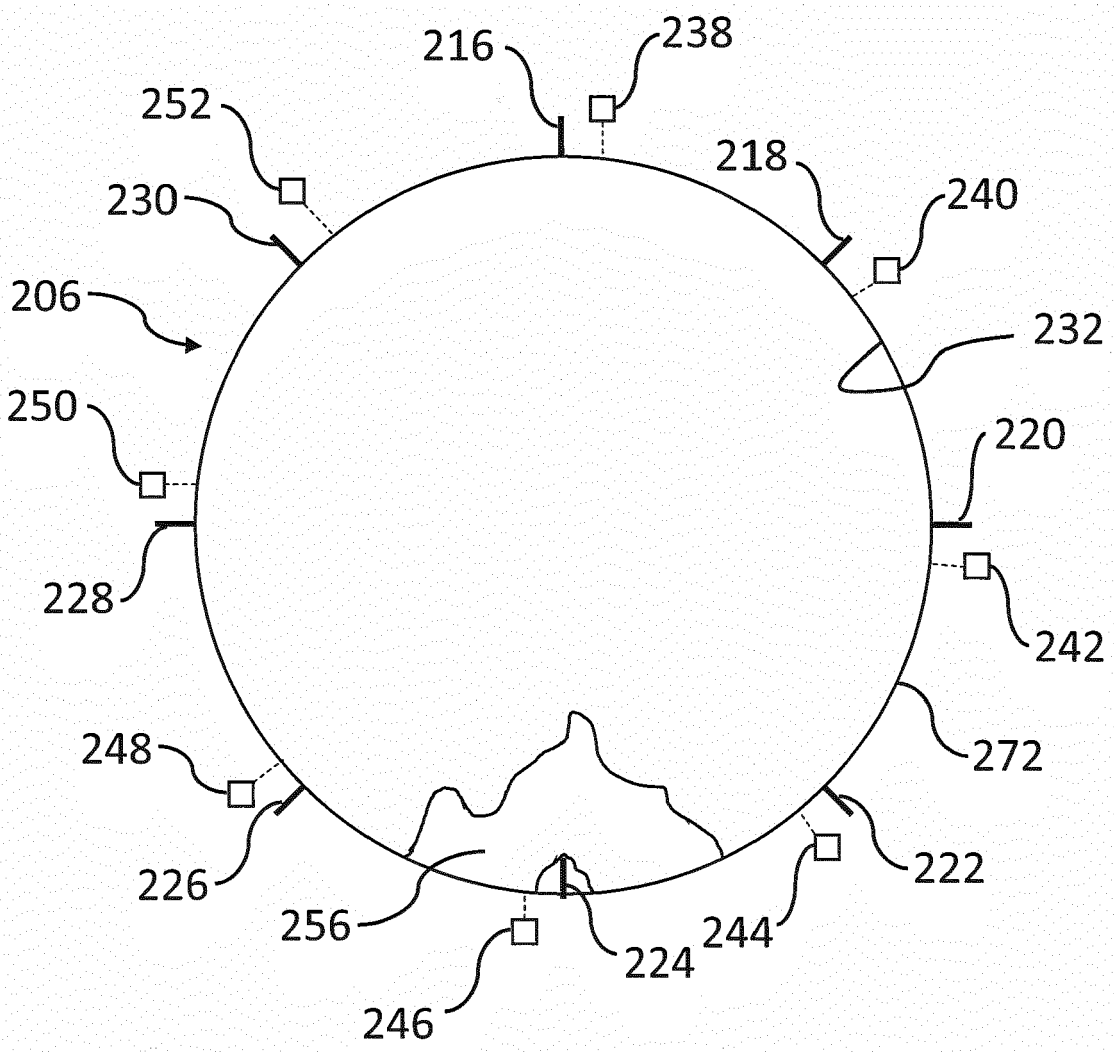
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Figure 4

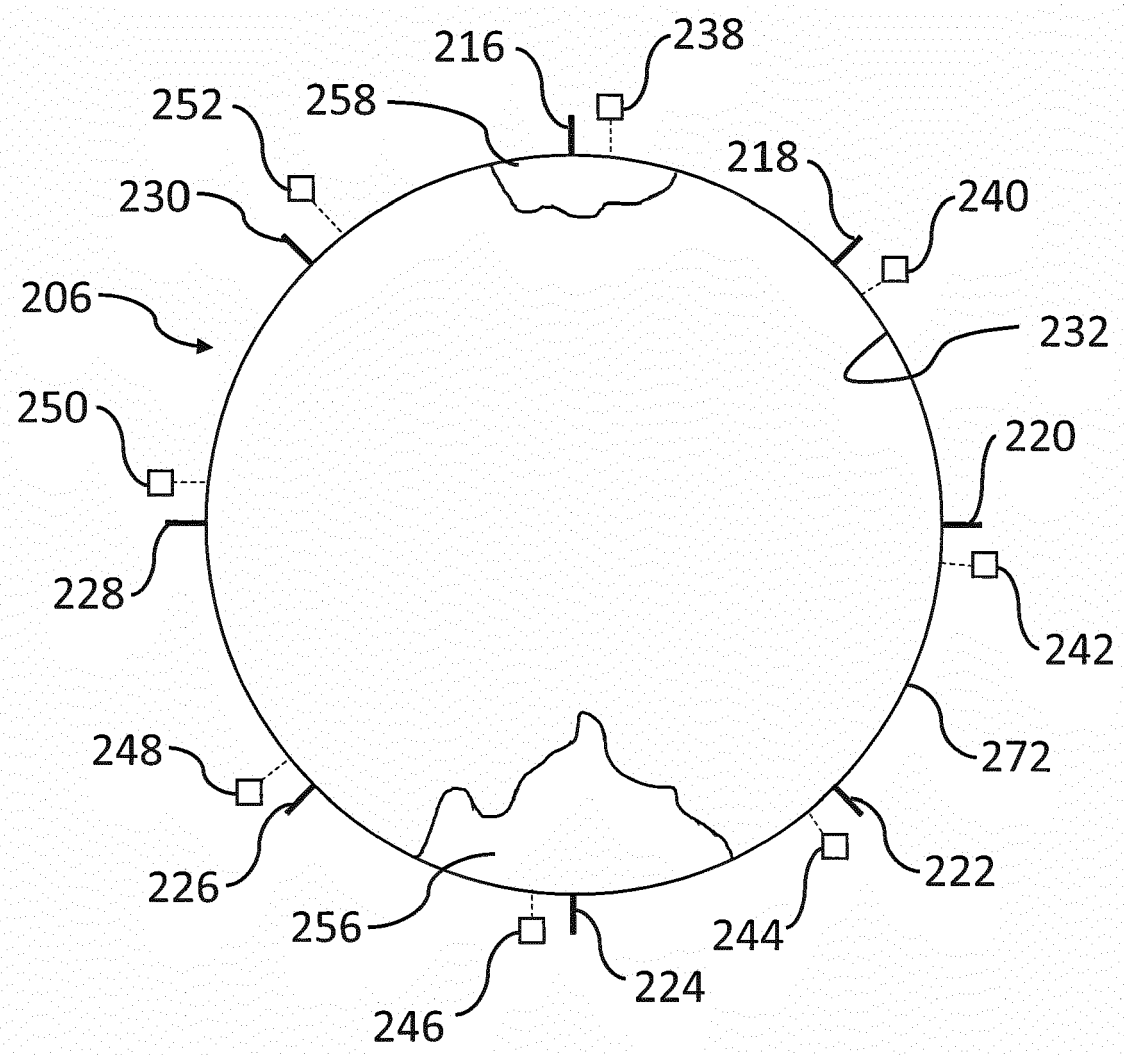
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Figure 5

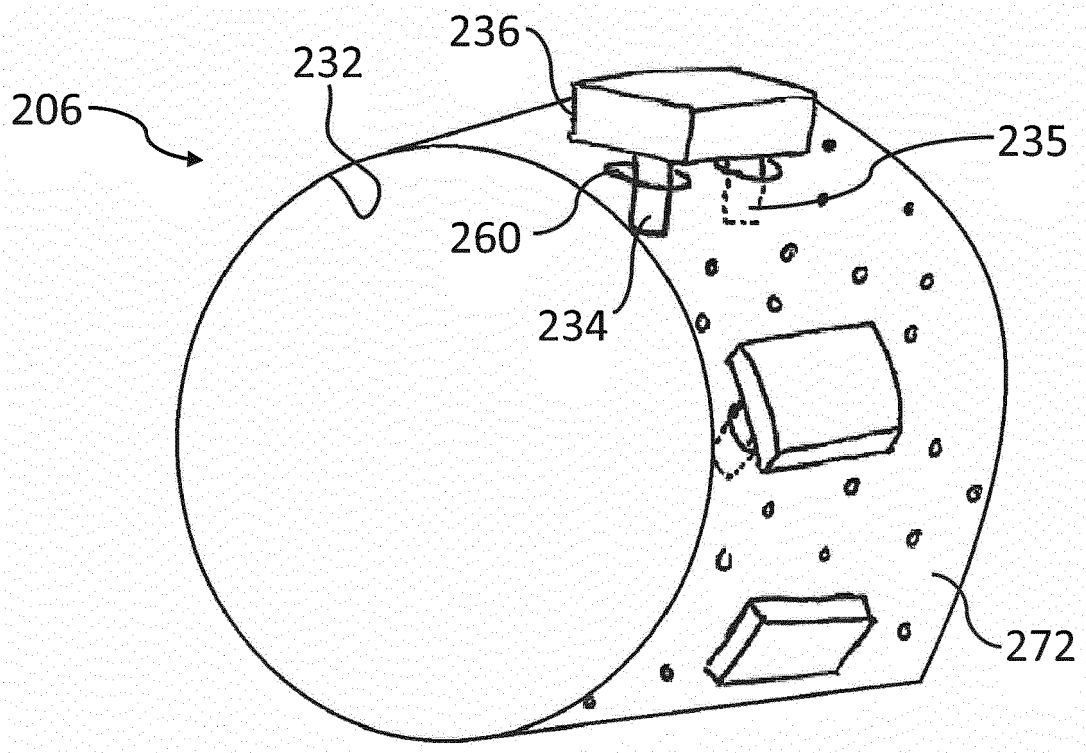

Figure 6

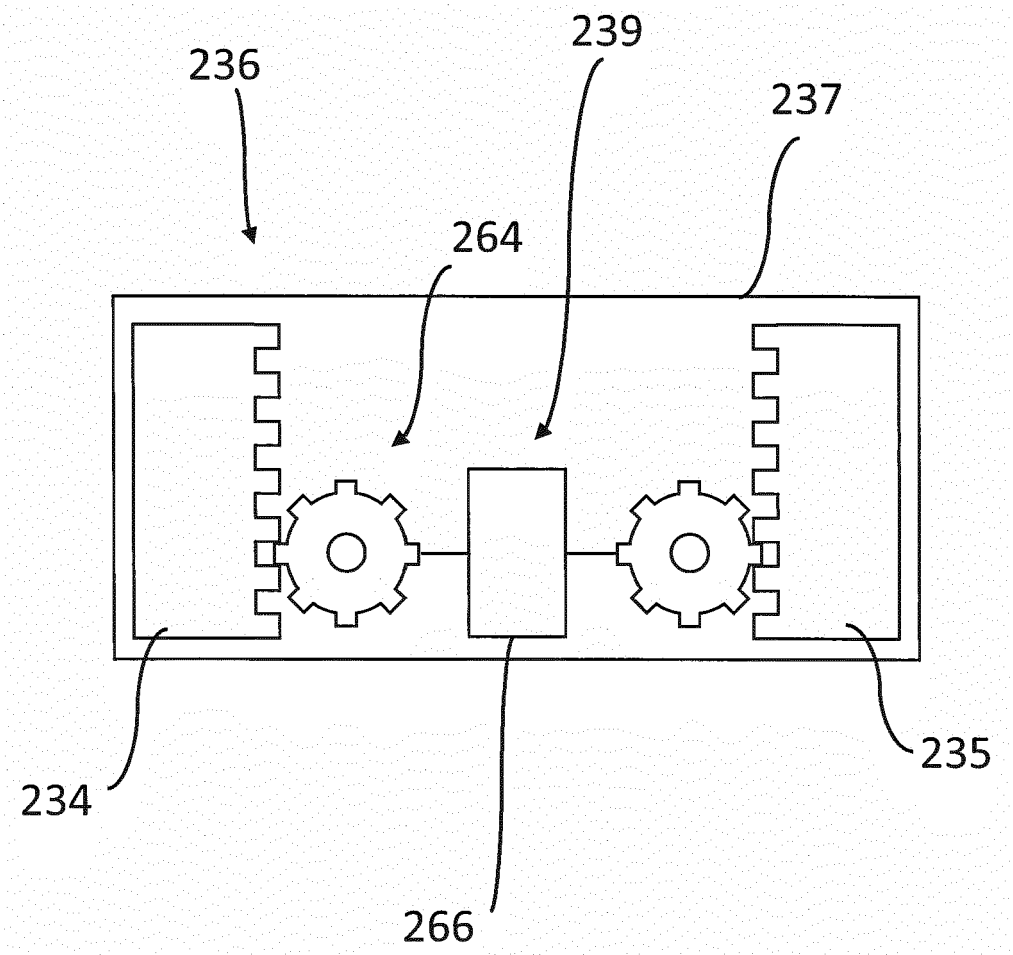

Figure 7

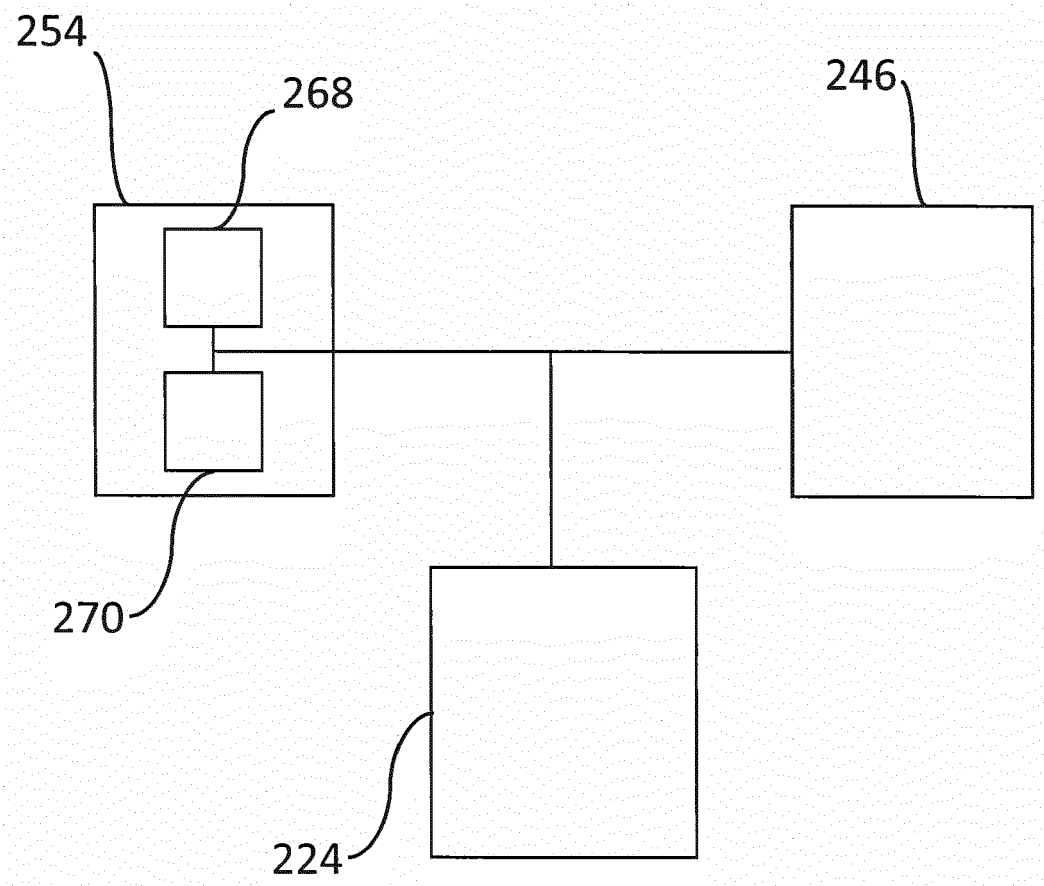

Figure 8

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EUROPEAN SEARCH REPORT

Application Number
EP 18 15 3761

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	JP 2007 135812 A (SAMSUNG ELECTRONICS CO LTD) 7 June 2007 (2007-06-07) * paragraph [0005] - paragraph [0016] * * figures 1-6 * -----	1-10, 12-15 11	INV. D06F37/04 D06F33/02 ADD. D06F58/04 D06F25/00 D06F37/20

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 July 2018	Bermejo, Marco

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