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(54) **WASHING MACHINE AND METHOD FOR OPERATING SUCH WASHING MACHINE**

(57) A washing machine (100) comprising an outer drum (110) arranged in the washing machine comprising outer drum opening(s) (115). The washing machine further comprises an inner drum (120) rotatably arranged in the outer drum comprising an inner drum opening (125). The outer drum opening(s) is (are) arranged in the outer drum for accessing the inner drum. The washing machine further comprises a cover element (130) rotatably arranged in the inner drum, wherein the cover element comprises an intermediate partition portion

(132) arranged to divide the inner drum, and two mutually opposing peripheral sealing portions (134) configured to alternately seal the inner drum opening. The cover element is configured to be repeatedly rotatable between a sealed and an opened coupling position in regard to the inner drum opening. The washing machine further comprises coupling means (140) configured to repeatedly couple the rotation of the inner drum and the cover element.

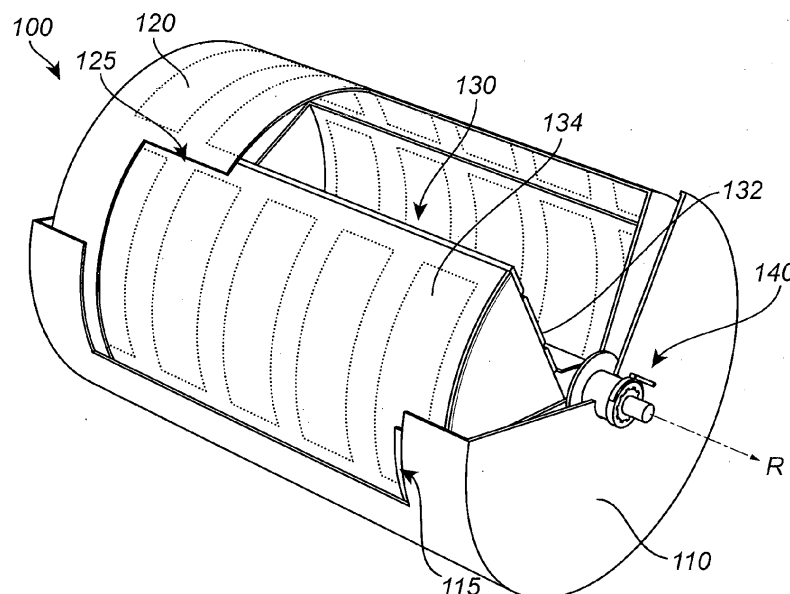


Fig. 1

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Description

Technical field

[0001] The present invention relates to the technical field of washing machines. In particular, the present invention relates to the technical field of the opening and closing mechanism for machines such as washing or drying machines.

Background

[0002] Washing machines are valuable household, business, and industry appliances designed to automate the process of washing clothing and various fabric items. The machine has been the object of various improvements throughout its lifetime, such as automation, energy and water usage efficiency, varying loading capacity, innovative and more efficient drum design etc.

[0003] Washing machines generally comprise a housing, outer casing, drum, or the like combined with an opening for accessing an inner drum, washing compartment, tub, or the like. This opening generally comprises a door, lid, or cover attached to the housing of the machine using a hinge mechanism. Some washing machine may also have a locking mechanism to keep the door securely closed during a washing cycle. This is a common solution for all type of washing machines, e.g., front-loading washers, top-loading washers, and side-loading washers.

[0004] The available washing machines may experience difficulty when accessing the inner drum of washing machine due to e.g., misalignment, obstruction, or deterioration to the hinge mechanism of the door. Furthermore, a door of a washing machine which is not properly closed during a washing cycle may lead to water leakage and/or a hazard to a user or operator.

[0005] Hence, it is of interest to provide alternative solutions within the field of washing machine to mitigate at least some of the above-stated problems seen in the prior art.

Summary

[0006] It is an object of the present invention to provide a washing machine having a rotatable opening and closing mechanism which can enable a safer and less error-prone operation of the washing machine, wherein the operation of the washing machine itself is self-sufficient to a greater extent.

[0007] This and other objects are achieved by a washing machine having the features in the dependent claims. Preferred embodiments are defined in the dependent claims.

[0008] Hence, according to a first aspect of the present invention, there is provided a washing machine comprising an outer drum arranged in the washing machine, the outer drum comprising at least one outer drum opening.

The washing machine further comprises an inner drum configured to hold items to be washed, the inner drum being rotatably arranged in the outer drum around a rotational axis, R, of the inner drum, and comprising an inner drum opening. The at least one outer drum opening is arranged in the outer drum for accessing the inner drum via the inner drum opening. The outer drum further comprises a cover element rotatably arranged in the inner drum around the rotational axis, R, wherein the cover element comprises an intermediate partition portion arranged to divide the inner drum in at least two sections, and at least two mutually opposing peripheral sealing portions configured to alternately seal the inner drum opening. The cover element is configured to be repeatedly rotatable between at least two predetermined coupling positions comprising a sealed coupling position and an opened coupling position in regard to the inner drum opening. The washing machine further comprises coupling means configured to repeatedly couple the rotation of the inner drum and the cover element to enable a joined rotation of the inner drum and the cover element.

[0009] According to a second aspect of the present invention, there is provided a method for operating a washing machine, wherein the method is implemented in a control unit and comprises the steps of receiving a signal for operating the washing machine, rotating the cover element around the rotational axis, R, to a predetermined coupling position of the at least two predetermined coupling positions based on the signal, and coupling the inner drum and the cover element in the predetermined coupling position. Furthermore, rotating the cover element to the predetermined coupling position comprises rotating the cover element to the coupling sealed position, sealing the inner drum opening by a sealing portion of the at least two sealing portions, in case the signal is a closing signal. Furthermore, rotating the cover element to the predetermined coupling position comprises rotating the cover element to the opened coupling position in case the signal is an opening signal.

[0010] Thus, the first and second aspects of the present invention are based on the common concept or idea of providing a washing machine or method for operating such washing machine, wherein the washing machine can be operated in a safer manner for a user or operator, as well as reducing the risk of malfunction during operation of the washing machine, e.g., during opening and closing of the door, lid, cover, or the like. This is achieved by the washing machine comprising a cover element rotatably arranged in the inner drum, comprising an intermediate partition portion dividing the inner drum in at least two sections, and at least two mutually opposing peripheral sealing portions configured to alternately seal the inner drum opening. Hence, the first and second aspects of the present invention share a common general inventive concept of providing a washing machine or method for operating a washing machine, wherein the opening and closing mechanism of the washing machine comprises a rotatable cover element configured to be

repeatedly rotatable between at least a sealed and opened coupling position, thus allowing or denying access to the inner drum of the washing machine.

[0011] It will be appreciated that the cover element comprises an intermediate partition portion arranged to divide the inner drum in at least two sections. This is advantageous in that dividing the inner drum, i.e., the loading compartment of items to be washed, allows for a more ergonomic loading and unloading of the washing machine for a user or operator. For example, the intermediate partition portion may be arranged in regard to the inner drum opening in such a way that the washed items may more easily be slid, shoved, glided, or the like from the inner drum through the inner drum opening. Furthermore, the intermediate partition portion may reduce the wear on the items to be washed. For example, the items to be washed may be subjected to less friction, stretching, and/or tangling.

[0012] It will be further appreciated that the cover element is configured to be repeatedly rotatable between at least a sealed coupling position, wherein at least one of the sealing portions seal the inner drum opening, and an opened coupling position. This is advantageous as it enables a safer operation of the washing machine for a user and/or the washing machine itself. The cover element ensures that the inner drum opening is properly sealed when starting a washing cycle, i.e., being in a sealed coupling position. The cover element also allows access to the inner drum via the inner drum opening when a washing cycle has finished, i.e., being in an opened coupling position.

[0013] It will be further appreciated that the cover element is rotatably arranged in the inner drum. Thus, the opening and sealing mechanism of the inner drum occurs within the inner drum. This may be desirable as the cover element enables a more compact washing machine compared to prior art. This allows for a more versatile washing machine in regard to e.g., requiring less space to operate in. Furthermore, the cover element being arranged in the inner drum may decrease the risk of spilling water in the area where the washing machine resides, when during for example opening and sealing of the inner drum. This may decrease the risk of injury of a user, as e.g., a wet floor may cause a user to slip.

[0014] It should be noted that the coupling means are configured to repeatedly couple the rotations of the inner drum and the cover element to enable a joined rotation of the inner drum and the cover element. In other words, the coupling means may repeatedly couple and decouple the rotation of the inner drum and the cover element. Hence, the cover element can rotate with or without the inner drum. This is advantageous in that it enables the cover element to be fastened, fixed, locked, retained, or the like in regard to the inner drum in the various at least two predetermined coupling positions. Thus, the coupling means provides for a safer operation of the washing machine for a user and/or the washing machine itself. Furthermore, the coupling means provides a more ver-

satile and adaptable washing machine in regard to washing needs, requirements, and/or desires. For example, a predetermined coupling position of the at least two predetermined coupling positions may involve the intermediate partition portion to be arranged in an inclined manner in regard to the inner drum opening. This predetermined coupling position may enable unloading the washing machine by a user or operator requiring less effort. The washed items may for example be slid, shoved, glided, or the like, from the inner drum. Thus, the present embodiment may facilitate the unloading of the washing machine in terms of e.g., required effort and/or time.

[0015] It should also be noted that in the present application the expression "washing machine" may indicate for example a "simple" washing machine (i.e., a washing machine which can only wash and rinse the laundry) as well as a washing-drying machine (i.e., a washing machine which can also dry the laundry). It may also indicate a washer-extractor or a washer without extractor.

[0016] The washing machine comprises coupling means. By the term "coupling means" it is here meant any component, element, mechanism, or the like that is suitable for pairing, connecting, joining, clutching, linking, or the like of components, elements, objects, or the like.

Thus, the phrase "coupling means configured to repeatedly couple the rotation of the inner drum and the cover element" infer coupling means configured to pair, connect, join, clutch, link, or the like the rotation of the inner drum and the cover element, therefore enabling a joined rotation of the inner drum and the cover element.

[0017] According to an embodiment of the present invention, the coupling means may be configured to couple the rotation of the inner drum and the cover element in the at least two predetermined coupling positions according to a first control scheme. For example, the first control scheme may comprise an opened coupling position, a sealed coupling position, a loading coupling position, and/or an unloading coupling position.

[0018] The present embodiment is advantageous in that the coupling of the rotation of the inner drum and the cover element is following a first control scheme. Hence, the at least two predetermined coupling positions may be coupled according to a pattern, order, sequence, or the like suitable for the washing machine. For example, the first control scheme may entail that a loading coupling position is always followed by a sealed coupling position. Thus, the present embodiment may reduce the amount of intervention from a user or operator.

[0019] According to an embodiment of the present invention, the washing machine may comprise locking means configured to lock the rotation of the inner drum in regard to the outer drum in at least one predetermined drum position comprising an opened drum position, according to a second control scheme. The opened drum position may comprise the outer drum opening and the inner drum opening to be arranged to align, allowing access to at least one section of the at least two sections of the inner drum from the outer drum opening via the

inner drum opening. Hence, locking the rotation of the inner drum in the opened drum position in regard to the outer drum enables entry to at least one of the sections of the inner drum from the outer drum opening.

[0020] The present embodiment is advantageous in that the rotation of the inner drum may be locked by locking means in regard to the outer drum in (a) predetermined drum position(s). The locking means facilitates the operation of the washing machine for a user or operator in e.g., loading and unloading the washing machine. For example, when a washing cycle is finished and the washing machine is ready for unloading, the user or operator is not required to exert unnecessary force to keep the inner drum in a suitable position for unloading. Furthermore, the present embodiment is advantageous in that the locking means are configured to lock the rotation of the inner drum in regard to the outer drum according to a second control scheme. For example, the opened drum position of the second control scheme may comprise a first and a second opened drum position. The first opened drum position may allow access to a first section of the at least two sections of the inner drum. The second opened drum position may allow access to a second section of the at least two sections of the inner drum. Hence, the present embodiment further reduces the amount of intervention from a user or operator.

[0021] According to an embodiment of the present invention, the coupling means may be configured to automatically couple the cover element and the inner drum in the opened coupling position in regard to the inner drum opening, and the locking means may be configured to automatically lock the inner drum in regard to the outer drum in the opened drum position, when a washing cycle has finished. Hence, when a washing cycle has finished, the coupling means may automatically couple the cover element and the inner drum in the opened coupling position, and the locking means may automatically lock the inner drum in the opened drum position.

[0022] The present embodiment is advantageous in that a user or operator may be allowed access to the inner drum opening via the outer drum opening automatically when a washing cycle has finished. Thus, the requirement of user or operator intervention is further reduced. The present embodiment further enables fresh air to flow into the inner drum along with the washed items directly after a finished cycle. This may reduce the risk of unpleasant odours from the inner drum and/or the risk of mildew if the washed items are left unattended for a longer period of time. In addition, the risk of the washed items being damaged due to prolonged exposure to moisture is reduced. Furthermore, the present embodiment enables a distinct visual sign for a user or operator of that a washing cycle has finished and the washing machine is ready for unloading.

[0023] According to an embodiment of the present invention, the washing machine may comprise a control unit configured to operate the washing machine. The

present embodiment is advantageous in that the control unit enables the washing machine to operate with a greater degree of automation. Furthermore, the control unit provides safer operation of the washing machine for a user or operator by at least reducing the required amount of user interaction for operating the washing machine.

[0024] According to an embodiment of the present invention, the coupling means may be configured to couple the cover element and the inner drum in one of a loading coupling position and an unloading coupling position of the at least two predetermined coupling positions, and the locking means may be configured to lock the inner drum in regard to the outer drum in the opened drum position, when the control unit has received one of a loading signal and an unloading signal, respectively. The loading coupling position and the unloading coupling position may comprise the intermediate partition portion to be arranged at an angle, α , in regard to a horizontal plane, P, of the outer drum, allowing access to at least one section of the at least two sections of the inner drum from the outer drum opening via the inner drum opening, wherein the horizontal plane, P, may contain the rotational axis, R. Hence, when the cover element is coupled in the loading or the unloading coupling position, the intermediate partition portion of the cover element may be arranged at an angle, α , in regard to the horizontal plane, P, of the outer drum. For example, when the cover element is in the unloading position, the angle α may be of such a value that the washed items to be unloaded slides, glides, flows, or the like from the at least one section of the inner drum through the outer drum opening without a user or operator having to intervene. The present embodiment is advantageous in that the ergonomics of operating the washing machine may be improved for a user or operator.

[0025] According to an embodiment of the present invention, the control unit may be configured to automatically start a washing cycle, when the cover element is in the sealed coupling position. Thus, when the cover element is in the sealed coupling position, comprising at least one of the sealing portions sealing the inner drum opening, a washing cycle is automatically started. The present embodiment is advantageous in that the cover element is in the sealed coupling position when a washing cycle is (automatically) started. This reduces the risk of the content of the inner drum exiting during a washing cycle, such as water, detergent, items to be washed, etc. Thus, the present embodiment enables a safer operation of the washing machine for a user, the items to be washed, the surroundings of the washing machine and/or the washing machine itself. The present embodiment is also favourable as it provides for a more efficient washing machine, at least in regard to time. For example, a user does not have to remain in the immediate area of the washing machine during the steps of opening, closing, locking, etc., of the washing machine. This is instead performed by the washing machine, via for example the control unit.

[0026] According to an embodiment of the present invention, the shape of the at least two sealing portions of the cover element may conform to the interior of the inner drum. Hence, the shape of the sealing portions of the cover element enables the sealing portions to be rotated alongside the interior of the inner drum. The present embodiment is advantageous in that it allows for a tighter and more secure seal of the inner drum.

[0027] According to an embodiment of the present invention, at least one of the coupling means and the locking means may be arranged external of the outer drum. The present embodiment is advantageous in that the coupling means and/or locking means may be shielded from the content of the inner drum, such as water, detergent, items to be washed, etc. Thus, the wear of the coupling means and/or locking means may be reduced. Furthermore, an external arrangement to the outer drum of the coupling means and/or locking means enables the couplings means and/or locking means to be easier reached and accessed. Therefore, the present embodiment facilitates maintenance of the washing machine for a user or operator e.g., if the coupling means are malfunctioning and in need of reparation. According to an embodiment of the present invention, the washing machine may comprise a housing, wherein the housing at least partially encloses the outer drum. The present embodiment is advantageous in that the housing at least partially encloses the outer drum, wherein the inner drum is arranged in the outer drum. The outer drum may therefore be protected to some extent. Consequently, the inner drum, the cover element, etc., may also be protected to some extent. This is favourable as a washing machine may comprise sensitive components or elements such as electronics. Furthermore, the housing further reduces the risk of content of the inner drum, such as water, exiting the washing machine. This is beneficial in that it provides safer operation of the washing machine for a user, the items to be washed, the surroundings of the washing machine, and/or the washing machine itself.

[0028] According to an embodiment of the present invention, the method for operating the washing machine may comprise the step of rotating the inner drum to an opened drum position, and locking the rotation of the inner drum in regard to the outer drum, in the opened drum position, in case the signal is an opening signal. The inner drum opening, and the outer drum opening may be aligned in the opened drum position, allowing access from the outer drum opening to at least one section of the at least two sections of the inner drum via the inner drum opening. Hence, upon receiving an opening signal, the inner drum rotates and is locked in regard to the outer drum to an opened position, allowing access to at least one section of the at least two sections of the inner drum. The present embodiment is advantageous in that it increases the automation of the washing machine. Thus, operating the washing machine requires less intervention by a user or operator. Furthermore, the present embodiment is favourable as the rotation of the inner

drum may be locked in the opened drum position when receiving an opening signal. Thus, the present embodiment requires less force exerted by a user or operator when operating the washing machine, e.g., during unloading the washed items.

[0029] According to an embodiment of the present invention, rotating the cover element around the rotational axis, R, to the predetermined coupling position may comprise rotating the cover element an angle, α , in regard to a horizontal plane, P, of the outer drum to a loading coupling position or an unloading coupling position of the at least two predetermined coupling positions, allowing access to at least one section of the at least two sections of the inner drum from the outer drum opening via the inner drum opening, in case the signal is a loading signal or an unloading signal, respectively. The horizontal plane, P, may contain the rotational axis, R. Thus, when the cover element is coupled in the loading or unloading coupling position, the intermediate partition portion may be arranged at an angle, α , in regard to the outer drum.

[0030] The present embodiment is advantageous in that the ergonomics of operating the washing machine may be improved for a user or operator. For example, less force exerted by the user or operator may be required during e.g., unloading washed items from the washing machine.

[0031] According to an embodiment of the present invention, a washing cycle may be automatically started when the cover element is in the sealed coupling position. It should be noted that rotating the cover element to the sealed coupling position entails the sealing portion of the at least two sealing portions of the cover element to seal the inner drum opening.

[0032] The present embodiment is advantageous in that the washing cycle may be started automatically upon the inner drum being properly sealed. This provides for a more efficient washing machine, at least in terms of time. Furthermore, the present embodiment reduces required intervention by a user or operator. Consequently, the present embodiment provides a washing machine operating automatic to a greater extent.

[0033] According to an embodiment of the present invention, the signal may be triggered from a control panel by a user or be an automatic signal sent when a washing cycle has finished. Hence, the signal may be automatic generated or generated by a user via a control panel. For example, a user may signify to the washing machine via the control panel that the task of loading the washing machine is completed and the washing cycle may therefore commence.

[0034] The present embodiment is advantageous in that it presents different possibilities to generate the signal for operating the washing machine. Thus, the present embodiment provides a more versatile and adaptable washing machine in regard to washing needs, requirements, and/or desires.

Brief description of the drawings

[0035] This and other aspects of the present invention will now be described in more detail, with reference to the appended drawings showing embodiment(s) of the invention.

Fig. 1 is a side view of a washing machine according to an exemplifying embodiment of the present invention.

Fig. 2 is a cross-sectional view of a selected portion of a washing machine according to an exemplifying embodiment of the present invention.

Figs. 3a-3b are side views of a washing machine according to exemplifying embodiments of the present invention.

Figs. 4a-4b are side views of a washing machine according to exemplifying embodiments of the present invention.

Fig. 5 is a schematic view of coupling means of a washing machine according to an exemplifying embodiment of the present invention.

Fig. 6 is a schematic view of a method for operating a washing machine according to an exemplifying embodiment of the present invention.

Fig. 7 is a schematic view of a method for operating a washing machine according to an exemplifying embodiment of the present invention.

Detailed description

[0036] The present invention will now be described more fully hereinafter with reference to the accompanying figures, in which currently preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided for thoroughness and completeness, and fully convey the scope of the invention to the skilled person.

[0037] Fig. 1 is a side view of a washing machine 100 according to an exemplifying embodiment of the present invention.

[0038] The washing machine 100 comprises an outer drum 110 arranged in the washing machine 100. It should be noted that only a portion of the outer drum 110 is visible in Fig. 1 due to simplicity and clarity. Hence, the outer drum 110 may enclose the inner drum 120 to a greater extent than indicated in Fig. 1. The outer drum 110 may constitute a shield, protection, cover, or the like to prevent water used during a washing cycle to exit the inner drum 120. According to an example, the washing machine 100 may comprise a suspension system. The outer drum 110 may be arranged in the washing machine 100 via the suspension system. The suspension system may be configured to for example absorb vibrations during various cycles, such as washing, rinsing, and spinning.

[0039] The outer drum 110 comprises at least one

outer drum opening 115. Thus, the outer drum 110 may comprise a plurality of outer drum openings 115. For example, this may be favourable in a scenario where the washing machine 100 is installed in a partition wall dividing two rooms. One side of the partition wall has access to a first outer drum opening 115 of the at least one drum opening 115, the other side of the partition wall has access to a second outer drum opening 115 of the at least one drum opening 115. This may be particular useful in certain environments where unwashed laundry and washed laundry may not be kept in the same room, such as in certain hospital or industrial environments.

[0040] The washing machine 100 further comprises an inner drum 120 configured to hold items to be washed, also referred to as laundry. The inner drum 120 is rotatably arranged in the outer drum 110 around a rotational axis, R, of the inner drum 120. As shown in Fig. 1, the inner drum 120 extends along the rotational axis, R. Fig. 1 also depicts how the outer drum 110 extends along the rotational axis, R. The inner drum 120 comprises an inner drum opening 125, wherein the at least one outer drum opening 115 is arranged in the outer drum 110 for accessing the inner drum 120 via the inner drum opening 125. In other words, the outer drum opening 115 is arranged in the outer drum 110 in such way which allows access to the inner drum 120 through the inner drum opening 125 from the outer drum opening 115. The size of the outer drum opening 115 and the size of the inner drum opening 125 may be the same or different. The outer drum 110 may be fixed in the washing machine 100 in regard to the rotational movement of the inner drum 120. Hence, if the outer drum 110 is arranged in the washing machine 100 via the suspension system described herein, the outer drum 110 would be able to move in different controlled movement to minimize vibrations and maintaining stability. Nonetheless, the outer drum 110 would be fixed, locked, secured, stationary, or the like, in regard to the rotational movement of the inner drum 120.

[0041] The washing machine 100 further comprises a cover element 130 rotatably arranged in the inner drum 120 around the rotational axis, R. Hence, the cover element 130 and the inner drum 120 is rotatable around the same axis, R. The cover element 120 extends along the rotational axis, R. The cover element 130 comprises an intermediate partition portion 132 arranged to divide the inner drum 120 in at least two sections. The partition portion 132 has according to Fig. 1 a flat shape, but different shapes are possible, such as a curved shape. The size of the at least two sections formed by the partition portion 132 may be the same or different.

[0042] The cover element 130 further comprises at least two mutually opposing peripheral sealing portions 134. Hence, at least a first sealing portion of the at least two sealing portions 134 are arranged at a first end of the cover element 130, and at least a second sealing portion of the at least two sealing portions 134 are arranged at a second end of the cover element 130. The sealing portions 134 are configured to alternately seal the inner drum

opening 125. For example, in a first mode of the washing machine 100, the first sealing portion seals the inner drum opening 125. In a second mode, the cover element 130 has rotated around the rotational axis, R, so that the second sealing portion instead seals the inner drum opening 125.

[0043] The cover element 130 is configured to be repeatably rotatable between at least two predetermined coupling positions. The predetermined coupling positions comprises at least a sealed coupling position and an opened coupling position in regard to the inner drum opening 125. Hence, in the sealed coupling position, the cover element 130 is arranged in the inner drum 120 in a position where a sealing portion 134 seals the inner drum opening 125. In contrast, in the opened coupling position, the cover element 130 is arranged in the inner drum 120 in a position where no sealing portions 134 seals the inner drum opening 125. Hence, in the opened coupling position, the sealing portions 134 are instead facing the interior of the inner drum 120.

[0044] According to an example, the cover element 130 comprises an intermediate partition portion 132 having a Y-shape. The Y-shaped partition portion 132 may be arranged to divide the inner drum 120 in three sections. The size of the three sections formed by the Y-shaped partition portion 132 may be the same or different. The cover element 130 according to the example further comprises three peripheral sealing portions 134. Each of the peripheral sealing portions 134 are arranged at an end of the Y-shaped partition portion 132, respectively. In other words, a first sealing portion 134 is arranged at a first end of the partition portion 132, a second sealing portion 134 is arranged at a second end of the partition portion 132, and a third sealing portion 134 is arranged at a third end of the partition portion 132. The sealing portions 134 are configured to alternately seal the inner drum opening 125. For example, in a first mode of the washing machine 100, the first sealing portion seals the inner drum opening 125. In a second mode, the cover element 130 has rotated around the rotational axis, R, so that the second sealing portion instead seals the inner drum opening 125. In a third mode, the cover element 130 has rotated further around the rotational axis, R, so that the third sealing portion instead seals the inner drum opening 125.

[0045] The washing machine 100 further comprises coupling means 140 configured to repeatably couple the rotation of the inner drum 120 and the cover element 130 to enable a joined rotation of the inner drum 120 and the cover element 130. Hence, the coupling means 140 may repeatedly couple and decouple the rotation of the inner drum 120 and the cover element 130. For example, when the couplings means 140 have coupled the rotation of the inner drum 120 and the cover element 130, the inner drum 120 and the cover element 130 rotates around the rotational axis, R, in a joined rotation. In contrast, when the coupling means 140 have decoupled the rotation of the inner drum 120 and the cover element 130, the

inner drum 120 rotates around the rotational axis, R, independent of the rotation of the cover element 130 around the rotational axis, R. The coupling means 140 may be any component, element, mechanism, or the like that is suitable for pairing, connecting, joining, clutching, linking, or the like the rotation of the inner drum 120 and the cover element 130. The coupling means may for example be mechanical, electrical and/or magnetic coupling means.

[0046] Fig. 2 is a cross-sectional view of a selected portion of a washing machine 100 according to an exemplifying embodiment of the present invention. It should be noted that the portion of the washing machine 100 shown in Fig. 2 has several features in common with the washing machine 100 shown in Fig. 1, and it is hereby referred to Fig. 1 and the associated text for an increased understanding of some of the features and/or functions of the washing machine 100 in Fig. 2.

[0047] For simplicity, only the inner drum 120 and the cover element 130 are visible. The cover element 130 is rotatably arranged in the inner drum 120 around the rotational axis, R. Furthermore, the cover element 130 is arranged at an angle, α , in regard to a horizontal plane, P, of the outer drum 110. The horizontal plane, P, contains the rotational axis, R.

[0048] Fig. 2 shows an exemplifying design of the cover element 120. In Fig. 2, the sealing portions 134 are curved, conforming to the interior of the inner drum 120. Furthermore, according to Fig. 2, the cover element 130 is central symmetric around the rotational axis, R. It should be noted that the shape of the cover element 130 may be different than depicted herein. For example, the cover element 130 may be mirror symmetric around the rotational axis, R.

[0049] Figs. 3a-3b are side views of a washing machine 100 according to an exemplifying embodiment of the present invention. It should be noted that the washing machine 100 shown in Figs. 3a-3b has several features in common with the washing machine 100 shown in Figs. 1 and 2, and it is hereby referred to Figs. 1 and 2 and the associated text for an increased understanding of some of the features and/or functions of the washing machine 100 in Figs. 3a-3b.

[0050] According to Figs. 3a-3b, the coupling means 140 are configured to couple the rotation of the inner drum 120 and the cover element 130 in the at least two predetermined coupling positions according to a first control scheme. Hence, the first control scheme may couple and decouple the rotation of the inner drum 120 and the cover element 130 according to a pattern, order, sequence, etc. According to Figs. 3a and 3b, the partition portion 132 divides the inner drum 120 in exactly two sections. For example, the first control scheme may entail a loading scenario where the coupling means 140 decouple the rotation of the inner drum 120 and the cover element 130, and couple said rotation when the cover element is arranged in a first predetermined coupling position, e.g., where a first section of the inner drum

120 is accessible via the inner drum opening 125. The first control scheme may further entail the coupling means 140 to decouple the rotation of the inner drum 120 and the cover element 130, and couple said rotation when the cover element is arranged in a second predetermined coupling position, e.g., where a second section of the inner drum 120 is accessible via the inner drum opening 125. Furthermore, when the washing machine 100 is considered full, the first control scheme may entail the coupling means 140 to couple said rotation in the sealed coupling position, thus enabling a washing cycle to commence.

[0051] The washing machine 100 further comprises locking means 150 configured to lock the rotation of the inner drum 120 in regard to the outer drum 110 in at least one predetermined drum position comprising an opened drum position, according to a second control scheme. The locking means may be any component, element, mechanism, or the like that is suitable for locking, detaining, fasten, clasp, or the like the rotation of the inner drum 120 in regard to the outer drum 110. It should be noted that the locking means 150 is configured to repeatedly lock and unlock said rotation. For example, the second control scheme may entail locking the rotation of the inner drum 120 in regard to the outer drum 110 when the coupling means 140 are engaged in specific coupling positions, e.g., have coupled the rotation of the inner drum 120 and the cover element 130, in a loading coupling position and/or an unloading coupling position. Thus, the locking means 150 prevents the inner drum 120 to rotate around the rotational axis, R. According to the example, the second control scheme thus prevents the rotation of the inner drum 120 when the washing machine 100 is ready to load and/or unload. This facilitates the task of loading and/or unloading the washing machine 100. The second control scheme may be the same control scheme as the first control scheme.

[0052] The opened drum position comprises the outer drum opening 115 and the inner drum opening 125 to be arranged to align. Thus, allowing access to at least one section of the at least two sections of the inner drum 120 from the outer drum opening 115 via the inner drum opening 125.

[0053] Furthermore, the coupling means 140 are configured to automatically couple the cover element 130 and the inner drum 120 in the opened coupling position in regard to the inner drum opening 125, and the locking means 150 are configured to automatically lock the inner drum 120 in regard to the outer drum 110 in the opened drum position, when a washing cycle has finished. Hence, when a washing cycle has finished, the coupling means 140 and the locking means 150 enables a user to automatically have access to the laundry within the inner drum 120. According to Figs. 3a-3b, the coupling means 140 and the locking means 150 are arranged external of the outer drum 110.

[0054] The washing machine 100 of Figs. 3a-3b comprises a control unit 160 configured to operate the wash-

ing machine 100. The control unit 160 may be a remote control unit or be physically arranged on the washing machine 100. The control unit 160 may be connected to a control panel. The control panel may allow a user to operate the washing machine 100 via the control unit 160. The control unit 160 may be configured to operate according to at least one of the first control scheme and the second control scheme. The control unit 160 of Fig. 3a is arranged on the washing machine 100. The control unit 160 of Fig. 3b is a remote control unit 160.

[0055] The coupling means 140 are configured to couple the cover element 130 and the inner drum 120 in one of a loading coupling position and an unloading coupling position of the at least two predetermined coupling positions, and the locking means 150 are configured to lock the inner drum 120 in regard to the outer drum 110 in the opened drum position, when the control unit 160 has received one of a loading signal and an unloading signal, respectively. Fig. 3a depicts an example of when the coupling means 140 have rotated to an unloading coupling position but have not yet coupled the cover element 130 and the inner drum 120. Fig. 3b depicts an example of when the coupling means 140 have coupled the cover element 130 and the inner drum 120 in an unloading coupling position, and the locking means 150 have locked the inner drum 120 in the opened drum position. Thus, a first section of the at least two sections of the inner drum 120 is ready to be unloaded. The unloading coupling position may comprise a first unloading coupling position and a second unloading coupling position. For example, the first unloading coupling position may entail access to the first section of the inner drum 120, whilst the second unloading coupling position may entail access to a second section of the inner drum 120, when the inner drum is in the opened drum position. Similarly, the loading coupling position may comprise a first loading coupling position and a second loading coupling position.

[0056] The loading coupling position and the unloading coupling position comprises the intermediate partition portion 132 to be arranged at an angle, α , in regard to a horizontal plane, P, of the outer drum 110, allowing access to at least a section of the at least two sections of the inner drum 120 from the outer drum opening 115 via the inner drum opening 125. Thus, the partition portion 132 may be inclined in regard to the plane, P. The horizontal plane, P, contains the rotational axis, R. According to Fig. 3a, the angle, α , between the partition portion 132 and the plane, P, may be between $0^\circ < \alpha < 90^\circ$. This may be suitable when unloading a first section of the inner drum 120. According to another example, the angle, α , between the partition portion 132 and the plane, P, may be between $90^\circ < \alpha < 180^\circ$. This may be suitable when loading the first section of the inner drum 120.

[0057] in Figs. 3a and 3b, the cover element 130 is arranged in the opened coupling position. Furthermore, in Fig. 3a, the coupling means 140 have decoupled the rotation of the inner drum 120 and the cover element 130. Hence, the cover element 130 may rotate independent of

the inner drum 120. The exemplifying embodiment of Fig. 3a may represent a scenario where the cover element 130 have rotated into an unloading coupling position to enable coupling of the rotation of the inner drum 120 and the cover element 140 in said coupling position. In Fig. 3b, the coupling means 140 have coupled the rotation of the inner drum 120 and the cover element 130. Thus, a joined rotation of the inner drum 120 and the cover element 130 is enabled. The exemplifying embodiment of Fig. 3b is especially favourable during unloading of the washing machine 100.

[0058] Figs. 4a-4b are side views of a washing machine 100 according to an exemplifying embodiment of the present invention. It should be noted that the washing machine 100 shown in Figs. 4a-4b has several features in common with the washing machine 100 shown in Figs. 1 to 3 and it is hereby referred to Figs. 1 to 3 and the associated text for an increased understanding of some of the features and/or functions of the washing machine 100 in Figs. 1 to 3.

[0059] The washing machine 100 shown in Fig. 4a comprises a housing 105, wherein the housing 105 at least partially encloses the outer drum 110. The housing 105 may be an exterior casing made from any suitable material. The housing 105 may be adapted for allowing an inflow and outflow of water. Furthermore, the housing 105 may be adapted to facilitate any other type of standard operations for a washing machine.

[0060] The control unit 160 of the washing machine 100 according to Figs. 4a-4b is configured to automatically start a washing cycle, when the cover element 130 is in the sealed coupling position. Thus, when the cover element 130 is in the sealed coupling position, i.e., a sealing portion of the at least two sealing portions 134 seals the inner drum opening 125, the control unit 160 is configured to automatically start a washing cycle of the washing machine 100. The control unit 160 of Fig. 4a is arranged on the washing machine 100. The control unit 160 of Fig. 4b is a remote control unit 160.

[0061] Furthermore, the shape of the at least two sealing portions 134 of the cover element 130 conforms to the interior of the inner drum 120. Hence, the sealing portions 134 will provide a tight seal when positioned to seal the inner drum opening 125. Additionally, the shape of the sealing portions 134 allows that the amount of space that the cover element 130 occupies within the inner drum 120 is as small as possible. Consequently, the available space to be loaded with laundry in the inner drum 120 is as large as possible, whilst enabling the opening and closing mechanism of the present invention.

[0062] At least one of the coupling means 140 and the locking means 150 are arranged external of the outer drum 110. According to Figs. 4a and 4b, both the coupling means 140 and the locking means 150 are arranged external of the outer drum 110.

[0063] In Figs. 4a and 4b, the cover element 130 is arranged in the sealed coupling position. Furthermore, in Fig. 4a, the coupling means 140 have coupled the rota-

tion of the inner drum 120 and the cover element 130. Thus, a joined rotation of the inner drum 120 and the cover element 130 is enabled. The exemplifying embodiment of Fig. 4a may represent a scenario where a washing cycle of the washing machine 100 is just about to start or has just finished. In Fig. 4b, the coupling means 140 have decoupled the rotation of the inner drum 120 and the cover element 130. Hence, the cover element 130 may rotate independent of the inner drum 120.

[0064] Fig. 5 is a schematical view of coupling means 140 of a washing machine 100 according to an exemplifying embodiment of the present invention. It should be noted that the coupling means 140 of the washing machine 100 shown in Fig. 5 has several features in common with the coupling means 140 shown in Figs. 1 to 4, and it is hereby referred to Figs. 1 to 4 and the associated text for an increased understanding of some of the features and/or functions of the coupling means 140.

[0065] In Fig. 5, exemplifying embodiments of i) the couplings means 140 and ii) an indexing system are shown. Furthermore, the coupling means 140 and the indexing system are depicted in an i_o), ii_o) opened mode and an i_c), ii_c) closed mode, respectively. Hence, the blown-up view $i_{o,c}$) depicts the coupling means 140 i_c) coupling and i_o) decoupling the rotation of the inner drum 120 and the cover element 130 to enable and disable a joined rotation of the inner drum 120 and the cover element 130, respectively. The blown-up view of $ii_{o,c}$) depicts an indexing system of the washing machine 100. The indexing system is configured to arrange at least one of the cover element 130 and the inner drum 120 in a desired position. The desired position may include a position which enables loading and unloading of the washing machine 100. The indexing system may comprise an indexing wheel to enable the arrangement of the cover element 130 and/or the inner drum 120 in the desired position. A position for enabling loading and unloading of the washing machine 100 would entail the inner drum 120 to be in the opened drum position and the cover element 130 to be arranged in the opened coupling position. The opened drum position comprises the outer drum opening 115 and the inner drum opening 125 to be arranged to align. Thus, allowing access to at least one section of the at least two sections of the inner drum 120 from the outer drum opening 115 via the inner drum opening 125. The indexing system may comprise the locking means 150, or vice versa. The locking means 150 are configured to lock the rotation of the inner drum 120 in regard to the outer drum 110 in a desired position. Hence, the blown-up view $ii_{o,c}$) depicts the locking means 150 ii_c) locking the rotation of the inner drum 120 in regard to the outer drum 110, and ii_o) unlocking the rotation of the inner drum 120 in regard to the outer drum 110.

[0066] in other words, the indexing system is configured to arrange the cover element 130 and/or the inner drum 120 in a desired position. In addition, the coupling means 140 are configured to couple the rotation of the inner drum 120 and the cover element 130 to enable a

joined rotation of the inner drum 120 and the cover element 130. Finally, the locking means 150 may lock the rotation of the inner drum 120 in regard to the outer drum in the desired position. The mechanism of the indexing system, the coupling means 140, and/or the locking means 150 may be electric, mechanic, pneumatic, and/or electromagnetic.

[0067] Fig. 6 is a schematical view of a method for operating a washing machine 100 according to an exemplifying embodiment of the present invention. It should be noted that the washing machine 100 of the method 300 shown in Fig. 6 has several features in common with the washing machine shown in Figs. 1 to 5, and it is hereby referred to Figs. 1 to 5 and the associated text for an increased understanding of some of the features and/or functions of the washing machine 100.

[0068] The method 300 for operating a washing machine is implemented in a control unit and comprises the steps of receiving M1 a signal for operating the washing machine and rotating M2 the cover element around the rotational axis, R, to a predetermined coupling position of the at least two predetermined coupling positions based on the signal. Hence, the predetermined coupling position may comprise additional coupling position, such as an unloading coupling position and a loading coupling position. The method 300 further comprises coupling M3 the inner drum and the cover element in the predetermined coupling position. It should be noted that the coupling M3 is reversible, i.e., the inner drum and the cover element may be repeatably coupled and decoupled. Furthermore, any feature of the washing machine discussed throughout this text may be controlled by the control unit.

[0069] Rotating the cover element to the predetermined coupling position comprises rotating the cover element to the sealed coupling position, sealing the inner drum opening by a sealing portion of the at least two sealing portions, in case the signal is a closing signal. Thus, the sealing portion provides a seal between the interior and exterior of the inner drum.

[0070] Rotating the cover element to the predetermined coupling position comprises rotating the cover element to the opened coupling position in case the signal is an opening signal. If the cover element is already in a coupling position, the signal may comprise decoupling the cover element before rotating the cover element into a different coupling position.

[0071] Fig. 7 is a schematical view of a method for operating a washing machine 100 according to an exemplifying embodiment of the present invention. It should be noted that the washing machine 100 of the method 300 shown in Fig. 7 has several features in common with the washing machine shown in Figs. 1 to 5, and it is hereby referred to Figs. 1 to 5 and the associated text for an increased understanding of some of the features and/or functions of the washing machine 100.

[0072] The method 300 according to Fig. 7 further comprises rotating M4 the inner drum to an opened drum

position and locking M5 the rotation of the inner drum in regard to the outer drum, in the opened drum position, in case the signal is an opening signal. The inner drum opening, and the outer drum opening are aligned in the opened drum position, allowing access from the outer drum opening to at least one section of the at least two sections of the inner drum via the inner drum opening.

[0073] It should be noted that the schematical view of the method 100 according to Fig. 7 is not limiting to the order in which the different steps of the method 100 are carried out. For example, after the step of receiving M1 a signal, the step of rotating M2 the cover element to a predetermined coupling position may occur simultaneously as the step of rotating M4 the inner drum to an opened drum position, if the signal is an opening signal.

[0074] Rotating the cover element around the rotational axis, R, to the predetermined coupling position comprises rotating the cover element an angle, α , in regard to a horizontal plane, P, of the outer drum to a loading coupling position or an unloading coupling position of the at least two predetermined coupling positions, allowing access to at least one section of the at least two sections of the inner drum from the outer drum opening via the inner drum opening, in case the signal is a loading signal or an unloading signal, respectively. The horizontal plane, P, contains the rotational axis, R.

[0075] According to the embodiment depicted in Fig. 7, a washing cycle is automatically started when the cover element is in the sealed coupling position. It should be noted that the washing machine and the method 300 for operating the washing machine may be partially or fully automatic.

[0076] The signal may be triggered from a control panel by a user or be an automatic signal sent when a washing cycle has finished. The control panel enables a user to interact with the washing machine. The control panel may be in the shape of a simple button or comprise additional elements such as a touch display.

[0077] The person skilled in the art realizes that the present invention by no means is limited to the preferred embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims. For example, the outer drum 110, the cover element 130, the peripheral sealing portions 134, etc., may have different shapes, dimensions and/or sizes than those depicted/described.

Claims

1. A washing machine (100) comprising:

an outer drum (110) arranged in the washing machine, the outer drum comprising at least one outer drum opening (115);
an inner drum (120) configured to hold items to be washed, the inner drum being rotatably arranged in the outer drum around a rotational

- axis, R, of the inner drum, and comprising an inner drum opening (125), wherein the at least one outer drum opening is arranged in the outer drum for accessing the inner drum via the inner drum opening;
- a cover element (130) rotatably arranged in the inner drum around the rotational axis, R, wherein the cover element comprises an intermediate partition portion (132) arranged to divide the inner drum in at least two sections, and at least two mutually opposing peripheral sealing portions (134) configured to alternately seal the inner drum opening, wherein the cover element is configured to be repeatably rotatable between at least two predetermined coupling positions comprising a sealed coupling position and an opened coupling position in regard to the inner drum opening; and
- coupling means (140) configured to repeatably couple the rotation of the inner drum and the cover element to enable a joined rotation of the inner drum and the cover element.
2. The washing machine according to claim 1, wherein the coupling means are configured to couple the rotation of the inner drum and the cover element in the at least two predetermined coupling positions according to a first control scheme.
 3. The washing machine according to claim 1 or 2, comprising locking means (150) configured to lock the rotation of the inner drum in regard to the outer drum in at least one predetermined drum position comprising an opened drum position, according to a second control scheme, wherein the opened drum position comprises the outer drum opening and the inner drum opening to be arranged to align, allowing access to at least one section of the at least two sections of the inner drum from the outer drum opening via the inner drum opening.
 4. The washing machine according to claim 3, wherein the coupling means are configured to automatically couple the cover element and the inner drum in the opened coupling position in regard to the inner drum opening, and the locking means are configured to automatically lock the inner drum in regard to the outer drum in the opened drum position, when a washing cycle has finished.
 5. The washing machine according to any one of the preceding claims, comprising a control unit (160) configured to operate the washing machine.
 6. The washing machine according to claim 3 and 5, wherein the coupling means are configured to couple the cover element and the inner drum in one of a loading coupling position and an unloading coupling position of the at least two predetermined coupling positions, and the locking means are configured to lock the inner drum in regard to the outer drum in the opened drum position, when the control unit has received one of a loading signal and an unloading signal, respectively,

wherein the loading coupling position and the unloading coupling position comprises the intermediate partition portion to be arranged at an angle, α , in regard to a horizontal plane, P, of the outer drum, allowing access to at least a section of the at least two sections of the inner drum from the outer drum opening via the inner drum opening, wherein the horizontal plane, P, contains the rotational axis, R.

 7. The washing machine according to claim 5 or 6, wherein the control unit is configured to automatically start a washing cycle, when the cover element is in the sealed coupling position.
 8. The washing machine according to any one of the preceding claims, wherein the shape of the at least two sealing portions of the cover element conforms to the interior of the inner drum.
 9. The washing machine according to any one of the preceding claims, wherein at least one of the coupling means and the locking means are arranged external of the outer drum.
 10. The washing machine according to any one of the preceding claims, comprising a housing (105), wherein the housing at least partially encloses the outer drum.
 11. A method (300) for operating a washing machine according to any one of the preceding claims, wherein the method is implemented in a control unit and comprises the steps of:
 - receiving (M1) a signal for operating the washing machine;
 - rotating (M2) the cover element around the rotational axis, R, to a predetermined coupling position of the at least two predetermined coupling positions based on the signal; and
 - coupling (M3) the inner drum and the cover element in the predetermined coupling position; wherein rotating the cover element to the predetermined coupling position comprises rotating the cover element to the sealed coupling position, sealing the inner drum opening by a sealing portion of the at least two sealing portions, in case the signal is a closing signal; and

wherein rotating the cover element to the predetermined coupling position comprises rotating the cover element to the opened coupling position in case the signal is an opening signal.

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12. The method according to claim 11, comprising:

rotating (M4) the inner drum to an opened drum position; and

locking (M5) the rotation of the inner drum in regard to the outer drum, in the opened drum position;

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in case the signal is an opening signal, wherein the inner drum opening and the outer drum opening are aligned in the opened drum position, allowing access from the outer drum opening to at least one section of the at least two sections of the inner drum via the inner drum opening.

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13. The method according to claim 12, wherein rotating the cover element around the rotational axis, R, to the predetermined coupling position comprises rotating the cover element an angle, α , in regard to a horizontal plane, P, of the outer drum to a loading coupling position or an unloading coupling position of the at least two predetermined coupling positions, allowing access to at least one section of the at least two sections of the inner drum from the outer drum opening via the inner drum opening, in case the signal is a loading signal or an unloading signal, respectively, wherein the horizontal plane, P, contains the rotational axis, R.

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14. The method according to any one of claims 11 to 13, wherein a washing cycle is automatically started when the cover element is in the sealed coupling position.

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15. The method according to any one of claims 11 to 14, wherein the signal may be triggered from a control panel by a user or be an automatic signal sent when a washing cycle has finished.

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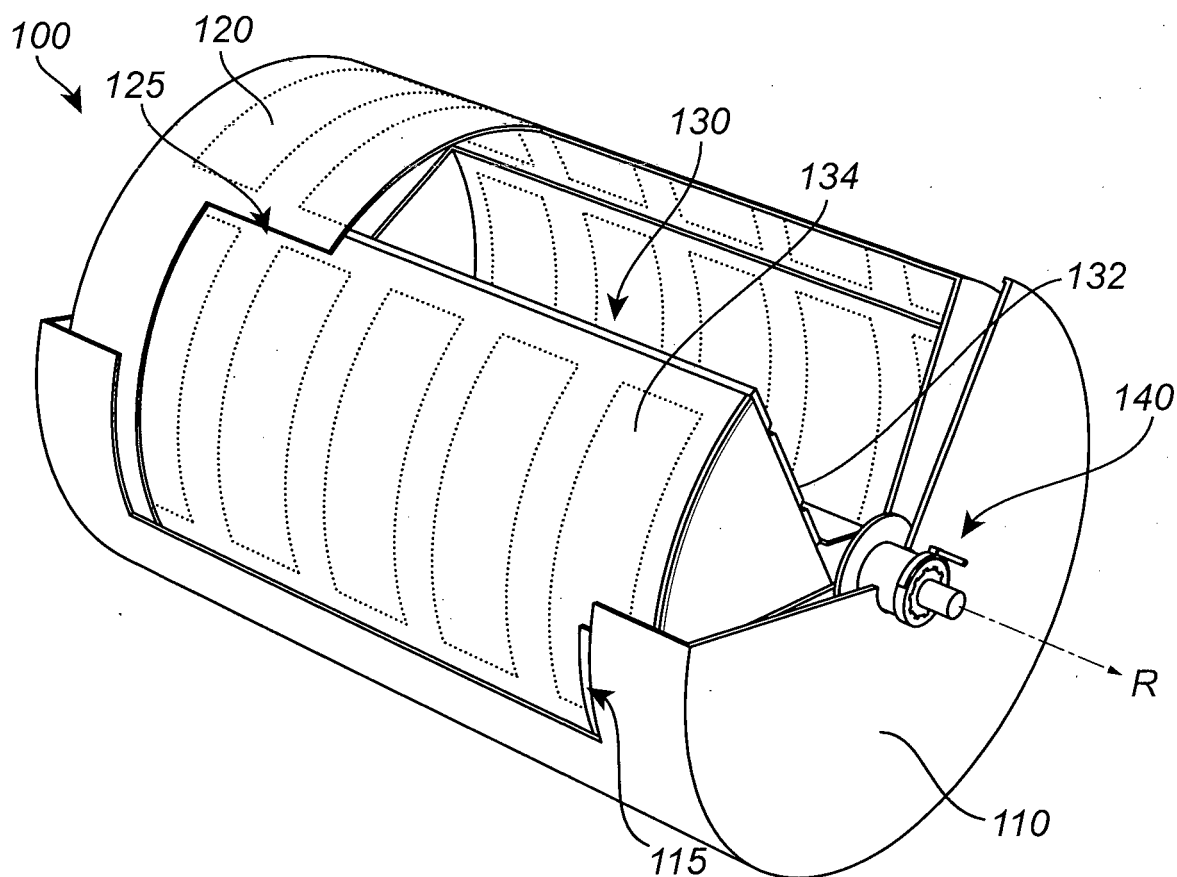


Fig. 1

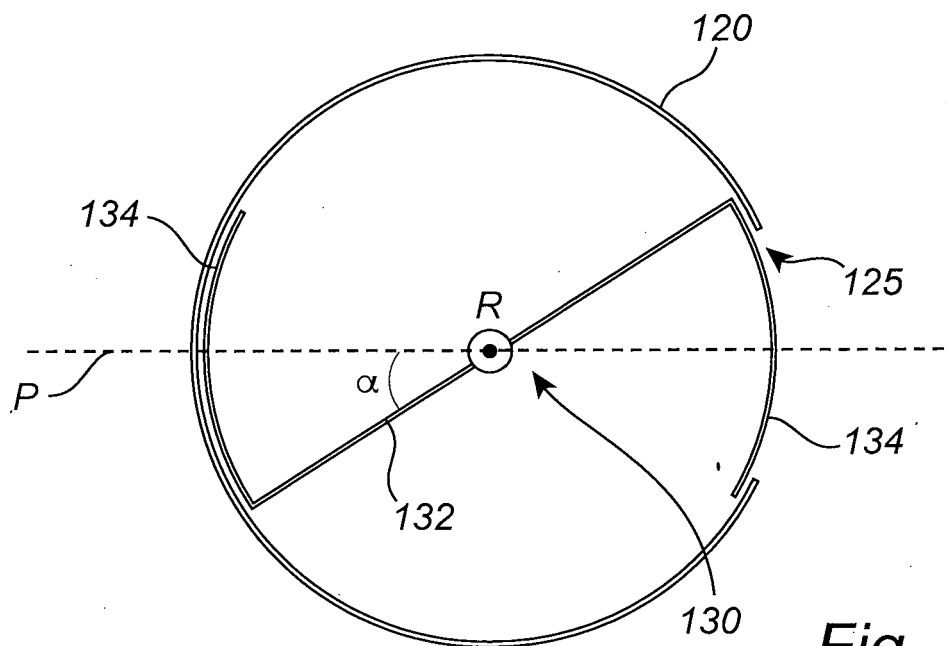
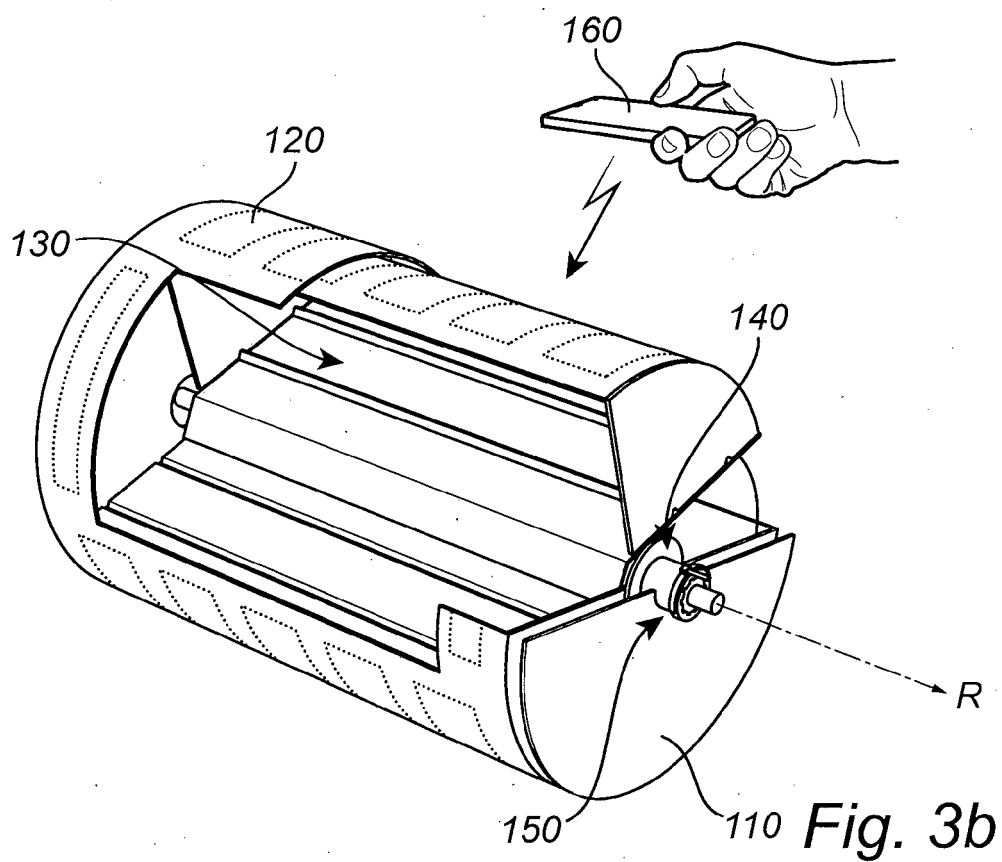
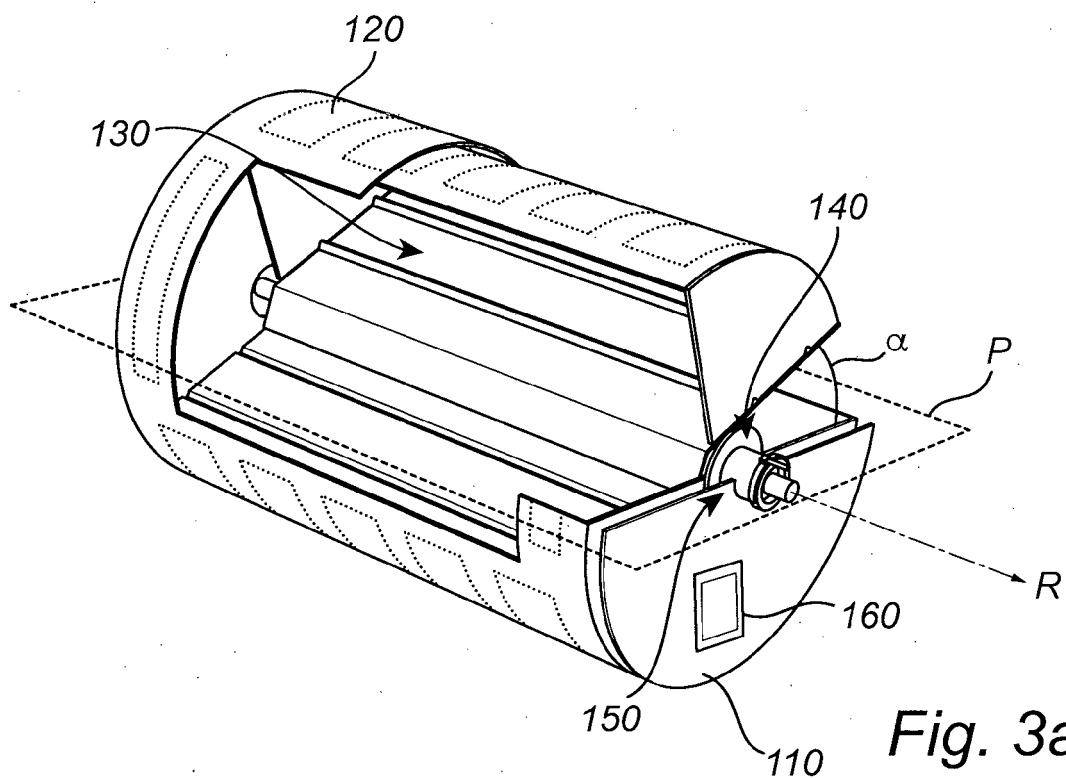


Fig. 2



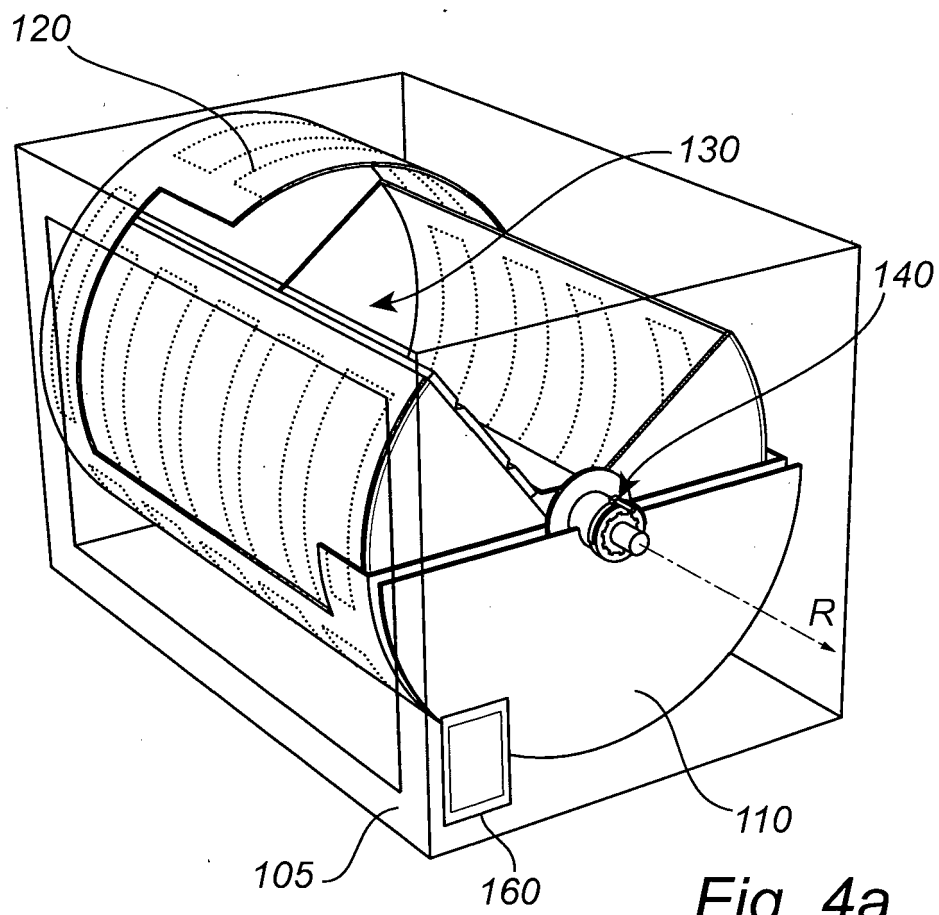


Fig. 4a

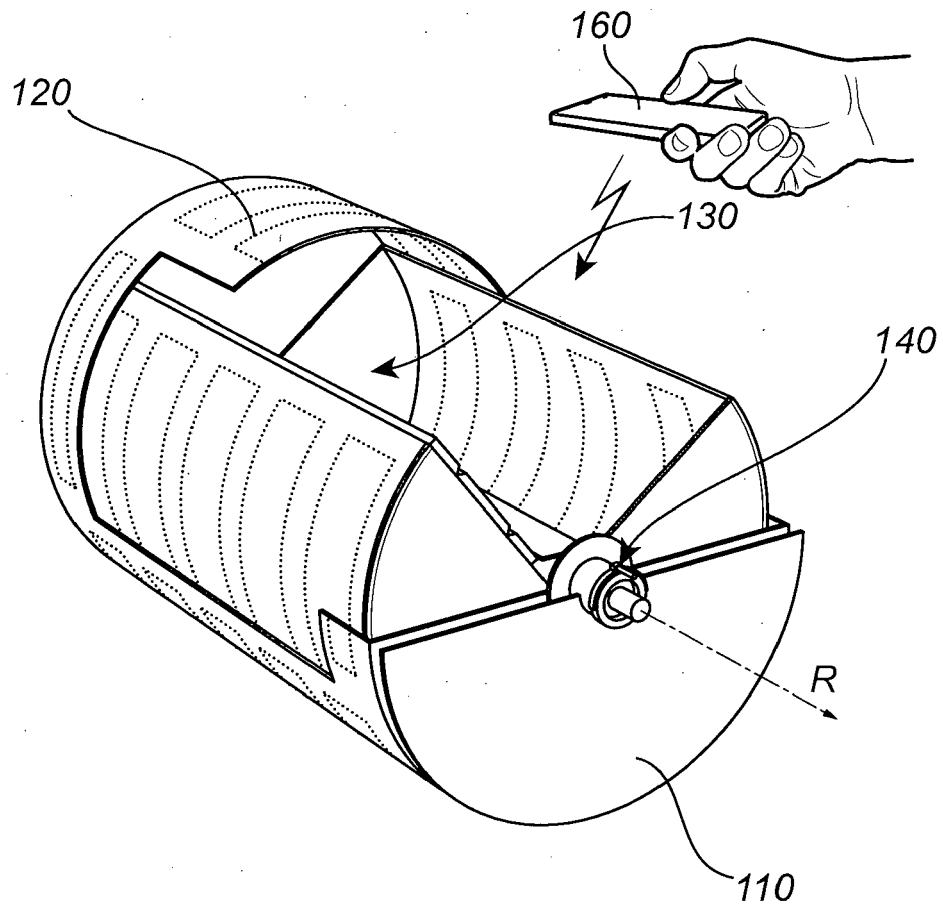


Fig. 4b

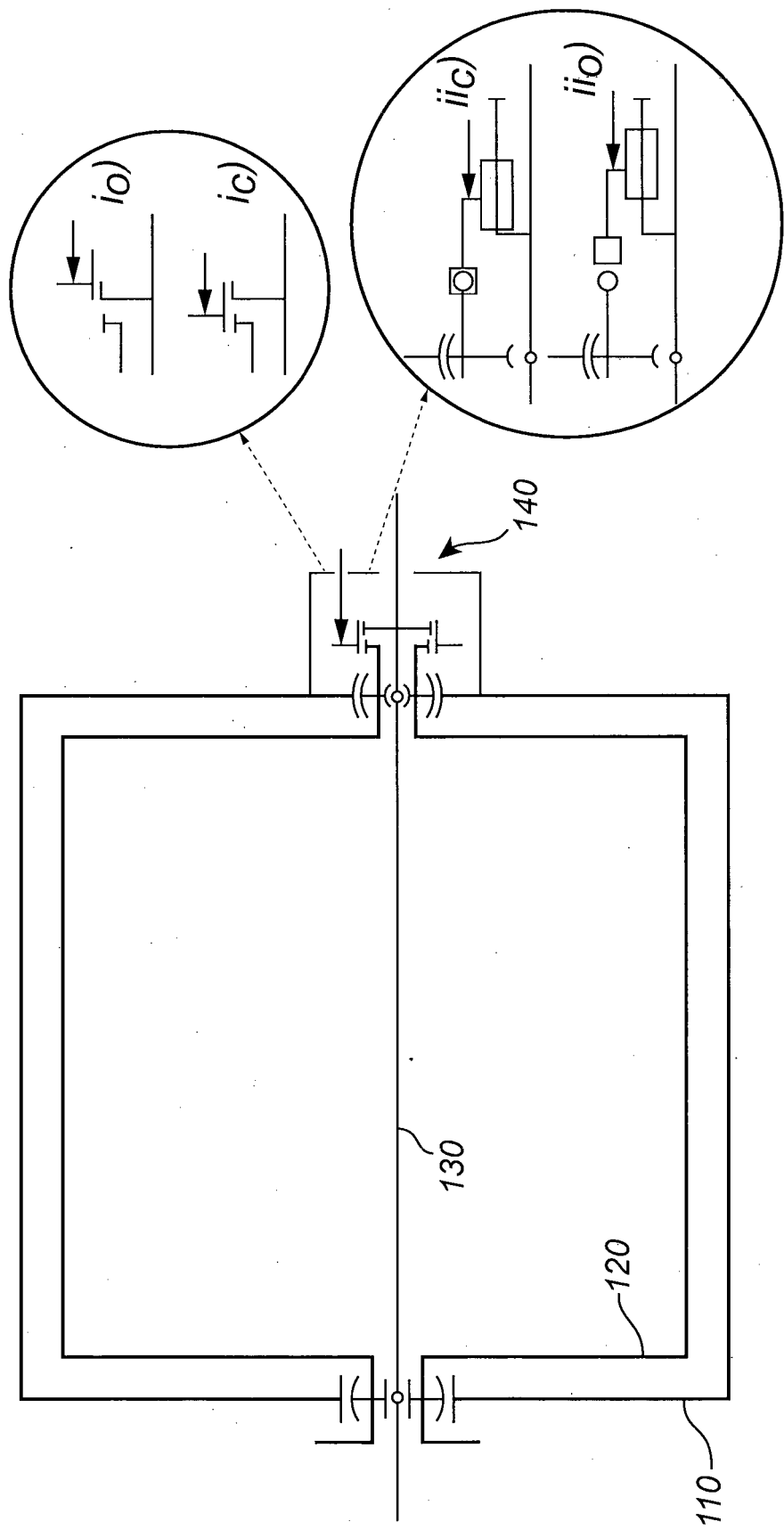


Fig. 5

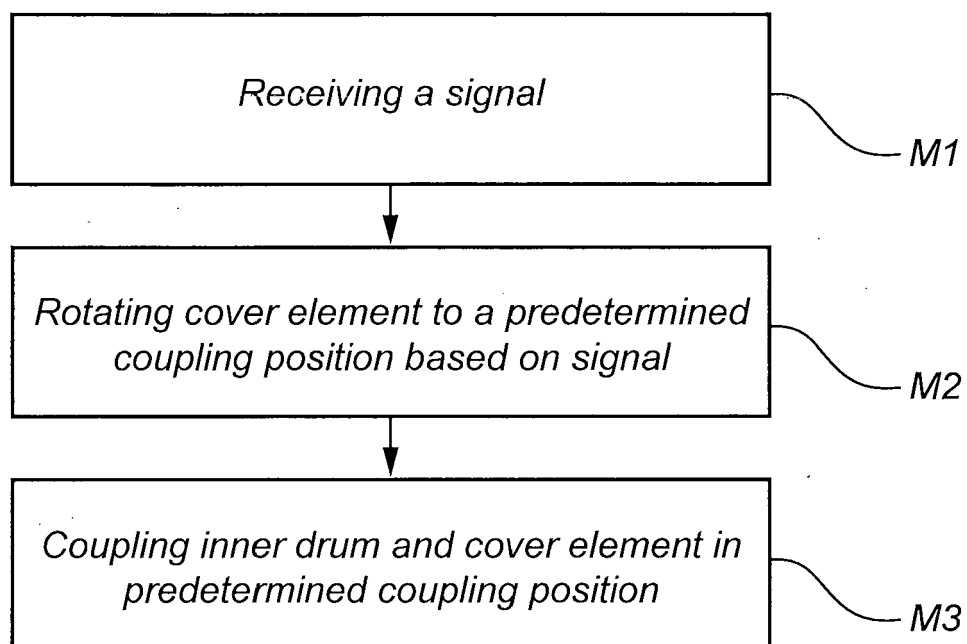


Fig. 6

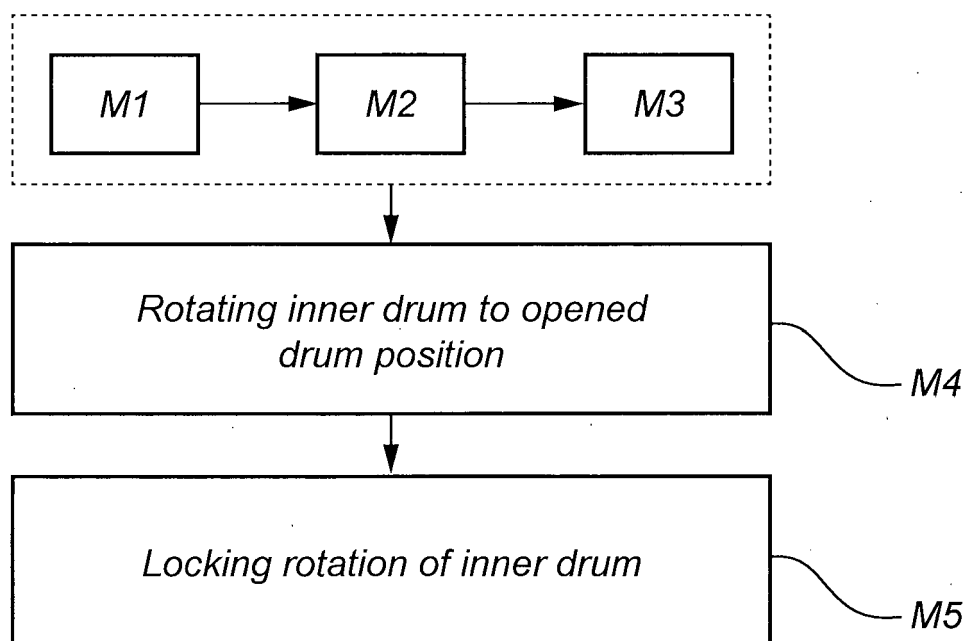


Fig. 7



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