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Inventor(s)	SEO; Dongpil et al.

WASHING MACHINE

Abstract

This washing machine comprises a housing, a drum rotatable while inside the housing, and a lifter extending from the inner circumference surface of the drum toward the rotation axis of the drum. The lifter comprises a lifter body mountable on the drum, a lifter case coupleable to and decoupleable from the lifter body, the lifter case having an inlet and an outlet, a filter to be provided on the lifter case, and a lifter valve that is deformable to be away from the inlet of the lifter case to open the inlet and return toward the inlet of the lifter case to close the inlet.

Inventors: **SEO; Dongpil (Suwon-si, KR), LEE; Kanghyun (Suwon-si, KR), LEE; Jaebok (Suwon-si, KR), CHO; Youngjin (Suwon-si, KR), HONG; Jaewan (Suwon-si, KR)**

Applicant: **SAMSUNG ELECTRONICS CO., LTD.** (Suwon-si, KR)

Family ID: **1000008614485**

Assignee: **SAMSUNG ELECTRONICS CO., LTD. (Suwon-si, KR)**

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application is a continuation application is a continuation application, under 35 U.S.C. § 111(a), of international application No. PCT/KR2023/016845, filed Oct. 27, 2023, which claims priority under 35 U. S. C. § 119 to Korean Patent Application No. 10-2022-0157694, filed Nov. 22, 2022, and Korean Patent Application No. 10-2023-0009653, filed Jan. 25, 2023, the disclosures of which are incorporated herein by reference in their entireties.

TECHNICAL FIELD

[0002] The present disclosure relates to a washing machine having a filter.

BACKGROUND ART

[0003] A washing machine is an apparatus for washing laundry put to the inside of the tub through friction by stirring the laundry, water, and a detergent together by using a driving force of a driving motor.

[0004] Operations that are performed by the washing machine include, regardless of the type of the washing machine, a washing operation for washing laundry put into the tub by supplying a detergent and water to the tub and rotating the drum, a rinsing operation for rinsing the laundry by supplying water to the tub and rotating the drum, and a dehydrating operation for dehydrating water of the laundry by discharging water from the tub and rotating the drum.

[0005] The washing machine includes a drain device configured to discharge water stored in the tub to the outside of the washing machine while performing the washing operation, the rinsing operation, and/or the dehydrating operation. The drain device is configured to again discharge water discharged from the tub to the tub while performing the washing operation and/or the rinsing operation.

[0006] The washing machine may include a filter configured to filter out foreign substances from wash water used to wash the laundry.

DISCLOSURE

Technical Problem

[0007] One aspect of the present disclosure provides a washing machine capable of facilitating management of a filter.

[0008] One aspect of the present disclosure provides a washing machine capable of increasing a filter replacement cycle.

[0009] One aspect of the present disclosure provides a washing machine capable of increasing the efficiency of a filter.

[0010] Technical objects of the disclosure are not limited to those described above, and other technical objects not described herein will also be clearly understood by a person who has a common knowledge in the technical field to which the disclosure pertains from the following detailed description.

Technical Solution

[0011] A washing machine according to a concept of the disclosure includes: a housing; a drum rotatable while inside the housing; and a lifter extending from an inner circumferential surface of the drum toward a rotation axis of the drum. The lifter includes a lifter body mountable on the drum; a lifter case coupleable to and decoupleable from the lifter body, the lifter case having an inlet and an outlet; a filter to be provided on the lifter case; and a lifter valve that is deformable to be away from the inlet of the lifter case to open the inlet and return toward the inlet of the lifter case to close the inlet. According to this configuration, the washing machine according to an embodiment may collect foreign substances in the lifter, thereby reducing the amount of foreign substances discharged from the washing machine.

[0012] A washing machine according to a concept of the disclosure includes a housing, a tub provided inside the housing, a drum rotatable while inside the tub, and a lifter extending from an inner circumferential surface of the drum toward a rotation axis of the drum. The lifter includes a lifter body mountable on the drum, a lifter case coupleable to and decoupleable from the lifter body, the lifter case having an inlet and an outlet, a filter to be provided in a portion of the lifter case in which the outlet is located, and a lifter valve that is deformable to be away from the inlet of the lifter case to open the inlet and return toward the inlet of the lifter case to close the inlet, the lifter valve being capable of opening and closing the inlet portion to allow foreign substances to be introduced into the lifter case while preventing foreign substances from being discharged from the lifter case.

Description

DESCRIPTION OF DRAWINGS

[0013] FIG. **1** illustrates a washing machine according to an embodiment.

[0014] FIG. **2** illustrates a cross-section of the washing machine shown in FIG. **1** according to an embodiment.

[0015] FIG. **3** illustrates a lifter shown in FIG. **2** according to an embodiment.

[0016] FIG. **4** illustrates an exploded view of part of the lifter shown in FIG. **3** according to an embodiment.

[0017] FIG. **5** illustrates a cross-section taken along line A-A′ of FIG. **3** according to an embodiment.

[0018] FIG. **6** illustrates an enlarged view of a lifter valve shown in FIG. **5** according to an embodiment.

[0019] FIG. **7** illustrates a state in which one end of a lifter case shown in FIG. **4** is coupled to a lifter body according to an embodiment.

[0020] FIG. **8** illustrates a state in which the other end of the lifter case shown in FIG. **7** is fixed to the lifter body according to an embodiment.

[0021] FIG. **9** illustrates a cross-section of the inside of a drum shown in FIG. **2** during rotation of the drum according to an embodiment.

[0022] FIG. **10** illustrates an enlarged view of portion C shown in FIG. **9**, which shows the flow of wash water introduced into the lifter according to an embodiment.

[0023] FIG. **11** illustrates an enlarged view of portion C shown in FIG. **9**, which shows a state of foreign substances inside the lifter according to the rotation of the drum according to an embodiment.

[0024] FIG. **12** illustrates an exploded view of part of a lifter according to an embodiment.

[0025] FIG. **13** illustrates a cross-section of the liter shown in FIG. **12** according to an embodiment.

[0026] FIG. **14** illustrates a cross-section of a lifter according to an embodiment.

[0027] FIG. **15** illustrates a cross-section of a lifter according to an embodiment.

[0028] FIG. **16** illustrates a lifter according to an embodiment according to an embodiment.
[0029] FIG. **17** illustrates a cross-section of a drum of a washing machine according to an embodiment.
[0030] FIG. **18** schematically illustrates components of a washing machine according to an embodiment and a signal flow between the components according to an embodiment.
[0031] FIG. **19** illustrates a flowchart of a method of controlling a washing machine according to an embodiment.
[0032] FIG. **20** illustrates an example in which filter status information is output on a washing machine according to an embodiment.
[0033] FIG. **21** illustrates a washing machine according to an embodiment.
[0034] FIG. **22** illustrates a cross-section of the washing machine shown in FIG. **21** according to an embodiment.
[0035] FIG. **23** illustrates a cross-section of a drum shown in FIG. **22** according to an embodiment.

MODES OF THE INVENTION

[0036] It should be appreciated that various embodiments of the disclosure and the terms used therein are not intended to limit the technological features set forth herein to particular embodiments and include various changes, equivalents, or replacements for a corresponding embodiment.
[0037] With regard to the description of the drawings, similar reference numerals may be used to refer to similar or related elements.
[0038] It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise.
[0039] As used herein, each of such phrases as “A or B,” “at least one of A and B,” “at least one of A or B,” “A, B, or C,” “at least one of A, B, and C,” and “at least one of A, B, or C,” may include any one of, or all possible combinations of the items enumerated together in a corresponding one of the phrases.
[0040] The term “and/or” includes any and all combinations of one or more of associated listed items.
[0041] As used herein, such terms as “1st” and “2nd,” or “first” and “second” may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (for example., importance or order).
[0042] It is to be understood that if a certain component (for example, a first component) is referred to, with or without the term “operatively” or “communicatively”, as “coupled with,” “coupled to,” “connected with,” or “connected to” another component (for example, a second component), it means that the component may be coupled with the other component directly (for example, wiredly), wirelessly, or via a third element.
[0043] It is to be understood that the terms such as “including” or “having,” etc., are intended to indicate the existence of the features, numbers, steps, operations, components, parts, or combinations thereof disclosed in the specification, and are not intended to preclude the possibility that one or more other features, numbers, steps, operations, components, parts, or combinations thereof may exist or may be added.
[0044] It is to be understood that if a certain component is referred to as being “coupled with,” “coupled to,” “supported on” or “in contact with” another component, it means that the component may be coupled with the other component directly or indirectly via a third component.
[0045] It will also be understood that when a certain component is referred to as being “on” or “over” another component, it may be directly on the other component or intervening components may also be present.
[0046] A washing machine, according to various embodiments, may perform washing, rinsing, draining, and dehydrating operations. A washing machine may also be a drying combination washing machine capable of performing a drying operation on the dehydrated laundry. A washing

machine may be an example of a washing machine. The washing machine is a concept that includes a device for washing clothes (objects to be washed or dried), a device for drying clothes, and a device capable of washing and drying clothes.

[0047] The washing machine according to various embodiments of the disclosure may include a top-loading washing machine, wherein an inlet through which laundry is put into the top-loading washing machine is provided upward, or a front-loading washing machine, wherein an inlet through which laundry is put into the front-loading washing machine is provided forward. The washing machine according to various embodiments of the disclosure may include another loading type of washing machine, except for the top-loading washing machine and the front-loading washing machine.

[0048] The top-loading washing machine may wash laundry by using water streams generated by a rotating body such as a pulsator. The front-loading washing machine may wash laundry by rotating a drum to repeatedly raise and drop the laundry. The front-loading washing machine may include a lift for raising laundry. The front-loading washing machine may include a drying combination washing machine capable of drying laundry stored in a drum. The drying combination washing machine may include a heating device for high-temperature air. The drying combination washing machine may further include a condensing device for dry air. For example, the drying combination washing machine may include a heat pump. The washing machine according to various embodiments of the disclosure may include a washing machine using another washing method, except for a washing machine using the above-described washing method.

[0049] Hereinafter, a washing machine according to various embodiments of the disclosure will be described in detail with reference to the accompanying drawings.

[0050] FIG. **1** shows a washing machine according to an embodiment of the disclosure. FIG. **2** shows a cross section of a washing machine shown in FIG. **1**.

[0051] Referring to FIGS. **1** and **2**, a washing machine **1** may include a washing machine housing **11** accommodating various components therein. The washing machine housing **11** may form an exterior of the washing machine **1**. The washing machine housing **11** may have the shape of a box that is at least partially open.

[0052] The washing machine housing **11** may include a housing opening **12** for allowing an access to inside of a drum **30**. The housing opening **12** may open approximately forward.

[0053] The washing machine **1** may include a door **13** for opening or closing the housing opening **12** provided in the washing machine housing **11**. The door **13** may be rotatably mounted on the washing machine housing **11** by a hinge **14**. At least one portion of the door **13** may be transparent or translucent to show the inside of the washing machine housing **11**.

[0054] The washing machine **1** may include a tub **20** provided inside the washing machine housing **11** to store water. The tub **20** may be disposed inside the washing machine housing **11**. The tub **20** may include a tub opening **22** provided to correspond to the housing opening **12**. The tub opening **22** may open substantially forward. The tub **20** may be supported on an inner surface of the washing machine housing **11**. The tub **20** may have a substantially cylindrical shape of which one side opens.

[0055] The tub **20** may be elastically supported from the washing machine housing **11** by a damper **80**. The damper **80** may connect the tub **20** to the washing machine housing **11**. While vibrations generated according to a rotation of the drum **30** are transferred to the tub **20** and/or the washing machine housing **11**, the damper **80** may absorb vibration energy between the tub **20** and the washing machine housing **11** to attenuate the vibrations.

[0056] The washing machine **1** may include the drum **30** accommodating laundry. The drum **30** may be rotatably provided inside the tub **20**. The drum **30** may perform washing, rinsing, and/or dehydrating while rotating inside the tub **20**. The drum **30** may include a through hole **34** that connects an inside space of the drum **30** to an inside space of the tub **20**. The drum **30** may have a substantially cylindrical shape of which one side opens. On an inner circumferential surface of the

drum **30**, at least one lifter **100** may be provided to raise and drop laundry according to a rotation of the drum **30**.

[0057] The drum **30** may include a drum opening **32** corresponding to the housing opening **12** and the tub opening **22**. Laundry may be put into or withdrawn from the drum **30** through the housing opening **12**, the tub opening **22**, and the drum opening **32**.

[0058] The washing machine **1** may include a driving device **40** configured to rotate the drum **30**. The driving device **40** may include a driving motor **41**, and a rotating shaft **42** for transferring a driving force generated in the driving motor **41** to the drum **30**. The rotating shaft **42** may penetrate the tub **20** and be connected to the drum **30**.

[0059] The washing machine **1** may be divided into a direct drive type in which the rotating shaft **42** is directly connected to the driving motor **41** to rotate the drum **30**, and an indirect drive type in which a pulley **43** is connected between the driving motor **41** and the rotating shaft **42** to drive the drum **30**.

[0060] The washing machine **1** according to an embodiment may be arranged as an indirect drive type, but may also be arranged as a direct drive type, without being limited thereto.

[0061] One end of the rotating shaft **42** may be connected to the drum **30**, and another end of the rotating shaft **42** may be connected to the pulley **43** to obtain a driving force from the driving motor **41**. A motor pulley **41***a* may be formed on the rotating axis of the driving motor **41**. A driving belt **44** is provided between the motor pulley **41***a* and the pulley **43** such that the rotating shaft **42** may be driven by the driving belt **44**.

[0062] In the rear portion of the tub **20**, a bearing housing **45** may be installed to rotatably support the rotating shaft **42**. The bearing housing **45** may be made of an aluminum alloy and may be inserted into the rear portion of the tub **20** upon injection-molding of the tub **20**.

[0063] The driving device **40** may be provided to perform washing, rinsing, and/or dehydration or drying operations by rotating the drum **30** regularly or reversely.

[0064] The washing machine **1** may include a water supply device **50**. The water supply device **50** may supply water to the tub **20**. The water supply device **50** may be located above the tub **20**. The water supply device **50** may include a water supply pipe **51**, and a water supply valve **56** provided in the water supply pipe **51**. The water supply pipe **51** may be connected to an external water supply source. The water supply pipe **51** may extend to a detergent supply device **60** and/or the tub **20** from the external water supply source. Water may be supplied to the tub **20** via the detergent supply device **60**. Water may be supplied to the tub **20** not via the detergent supply device **60**.

[0065] The water supply valve **56** may open or close the water supply pipe **51** in response to an electrical signal from a controller **90** in FIG. **19**. The water supply valve **56** may allow or block supply of water from the external water supply source to the tub **20**. The water supply valve **56** may include, for example, a solenoid valve that is opened or closed in response to an electrical signal.

[0066] The washing machine **1** may include the detergent supply device **60** configured to supply a detergent to the tub **20**. The detergent supply device **60** may supply a detergent to the inside of the tub **20** during a water supply process. Water supplied through the water supply pipe **51** may be mixed with a detergent via the detergent supply device **60**. The water mixed with the detergent may be supplied to the inside of the tub **20**. The detergent may include a conditioner for dryer, a deodorant, a sterilizer, or an air freshener, as well as a washing detergent. The detergent supply device **60** may be connected to the tub **20** through a connection pipe **61**.

[0067] The washing machine **1** may include a drain device **70**. The drain device **70** may be configured to discharge water accommodated in the tub **20** to outside. The drain device **70** may include a drain pump **73** for discharging water from the tub **20** to the outside of the washing machine housing **11**, a connection hose **71** connecting the tub **20** and the drain pump **73** such that water inside the tub **20** flows into the drain pump **73**, and a drain hose **74** for guiding water pumped by the drain pump **73** to the outside of the washing machine housing **11**. The drain device **70** may

include a drain valve **72** provided on the connection hose **71** to open and close the connection hose **71**.

[0068] The washing machine **1** may provide a user interface device **15** for interaction between the user and the washing machine **1**.

[0069] The washing machine **1** may include at least one user interface device **15**. The user interface device **15** may include at least one input interface **16** and at least one output interface **17**.

[0070] At least one input interface **16** may convert sensory information received from a user into an electrical signal.

[0071] At least one input interface **16** may include a power button, an operation button, a course selection dial (or a course selection button), and a washing/rinsing/dehydrating setting button. At least one input interface **16** may include, for example, a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or microphone, etc.

[0072] At least one output interface **17** may transmit various data related to the operation of the washing machine **1** to the user by generating sensory information.

[0073] For example, at least one output interface **17** may transmit information related to a washing course, an operating time of the washing machine **1**, and washing setting/rinsing setting/spinning setting to the user. Information on the operation of the washing machine **1** may be output through a screen, indicator, or voice. At least one output interface **17** may include, for example, a Liquid Crystal Display (LCD) panel, a Light Emitting Diode (LED) panel, a speaker, etc.

[0074] FIG. **3** illustrates a lifter shown in FIG. **2**. FIG. **4** illustrates an exploded view of part of the lifter shown in FIG. **3**. FIG. **5** illustrates a cross-section taken along line A-A′ of FIG. **3**. FIG. **6** illustrates an enlarged view of a lifter valve shown in FIG. **5**.

[0075] Referring to FIGS. **2** to **4**, a lifter **100** may extend from an inner circumferential surface of the drum **30** toward a rotation axis of the drum **30**. The lifter **100** may protrude from the inner circumferential surface of the drum **30**. The lifter **100** may extend in a direction substantially parallel to the rotation axis of the drum **30**. The lifter **100** may extend in the longitudinal direction of the drum **30**.

[0076] Referring to FIGS. **3** to **5**, the lifter **100** may include a lifter body **111** mounted on the drum **30**. The lifter body **111** may be mounted on the inner circumferential surface of the drum **30**. The lifter body **111** may extend in a direction approximately parallel to the rotation axis direction of the drum **30**. For example, the lifter body **111** may be fixed to the drum **30** in a hook manner. For example, the lifter body **111** may be fixed to the drum **30** by a screw. The lifter body **111** may support the lifter case **131**.

[0077] The lifter **100** may include a lifter case **131** mounted on the lifter body **111**. The lifter case **131** may be detachably mounted on the lifter body **111**. The lifter case **131** is provided to be easily separated from the lifter body **111**.

[0078] The lifter case **131** may include a first lifter case **131***a* and a second lifter case **131***b* mounted on the first lifter case **131***b*. An inlet **132** and an outlet **133** may be formed in the first lifter case **131***a*. The second lifter case **131***b* may be arranged to face the lifter body **111**. The second lifter case **131***b* may be provided with a supporter **136** configured to support a lifter valve **140**.

[0079] For example, the first lifter case **131***a* and the second lifter case **131***b* may be formed as one body.

[0080] The lifter case **131** may include an inlet **132** and an outlet **133**. The lifter case **131** may be connected to the internal space of the drum **30** through the inlet **132** and the outlet **133**.

[0081] Through the inlet **132**, wash water and/or foreign substances inside the drum **30** may be introduced to the inside of the lifter case **131**. The inlet **132** may be formed such that foreign substances smaller than or equal to a preset size and wash water may be introduced to the inside of the lifter case **131**. The inlet **132** may be formed such that microplastics having a size of

approximately 5 mm or smaller may pass through the inlet **132**. The inlet **132** may have at least one hole.

[0082] The inlet **132** may be provided such that foreign substances larger than a preset size may not pass through the inlet **132**. Foreign substances having a relatively large size may be provided to be separately collected from the drum **30**. By limiting the size of foreign substances flowing into the lifter **100**, the washing machine **1** according to an embodiment may improve the efficiency of the filter **120**.

[0083] The inlet **132** may be formed on at least one surface of the lifter case **131**. The inlet **132** may be formed on at least one surface of the lifter case **131** that faces a circumferential direction of the drum **30**. The inlet **132** may be provided to face a rotation direction of the drum **30**. The inlet **132** may be formed on a side surface of the lifter case **131**.

[0084] The inlet **132** may include a first inlet **132***a* facing a first rotation direction of the drum **30** and a second inlet **132***b* facing a second rotation direction opposite to the first direction of the drum **30**. While the drum **30** rotates in the first rotation direction, wash water and/or foreign substances may be introduced through the first inlet **132***a*. While the drum **30** rotates in the second rotation direction, wash water and/or foreign substances may be introduced through the second inlet **132***b*. The first inlet **132***a* and the second inlet **132***b* may be arranged to face opposite directions.

[0085] For example, one of the first inlet **132***a* and the second inlet **132***b* may be omitted.

[0086] The wash water and/or foreign substances inside the lifter case **131** may be discharged to the inside of the drum **30** through the outlet **133**. The outlet **133** may have at least one hole having a size larger than the inlet **132**.

[0087] The outlet **133** may be formed on at least one surface of the lifter case **131**. The outlet **133** may be formed on at least one surface of the lifter case **131** facing the rotation axis of the drum **30**. The outlet **133** may be provided facing the interior of the drum **30**.

[0088] The lifter **100** may include a filter **120** provided on the lifter case **131**. The filter **120** may be provided in a portion of the lifter case **131** in which the outlet **133** is located. The filter **120** may be provided to correspond to the outlet **133** of the lifter case **131**. The filter **120** may extend along the outlet **133**.

[0089] The filter **120** may be provided to filter out foreign substances discharged from the outlet **133**. The filter **120** may be provided to filter out microplastics having a size of approximately 5 mm or less.

[0090] The lifter case **131** may include a chamber **139** configured to collect foreign substances filtered out by the filter **120**. The chamber **139** may be formed inside the lifter case **131**. When the amount of foreign substances collected in the chamber **139** exceeds a preset amount, the user may separate the lifter case **131** from the lifter body **111** and discard the lifter case **131**, and mount a new lifter case **131** on the lifter body **111**.

[0091] Referring to FIGS. **5** and **6**, the lifter **100** may include a lifter valve **140** provided to open and close the inlet **132**. The lifter valve **140** may be provided as an elastic body. The lifter valve **140** may be provided to be deformable by a force exerted by the wash water and/or foreign substances while the wash water and/or foreign substances of the drum **30** are introduced through the inlet **132** as the drum **30** rotates. The lifter valve **140** may be deformed by the water flow inside the drum **30**, allowing the inlet **132** to be opened and closed.

[0092] The lifter valve **140** may open and close the inlet **132** to allow foreign substances to be introduced into the chamber **139** while preventing foreign substances from being discharged from the chamber **139**. The lifter valve **140** may allow the inlet **132** to be opened in a direction in which wash water and/or foreign substances are introduced through the inlet **132**. The lifter valve **140** may prevent the inlet **132** from being opened in a direction in which wash water and/or foreign substances are discharged through the inlet **132**. The lifter valve **140** may be provided as a check valve.

[0093] The lifter valve **140** may include a fixed portion **141** fixed to the lifter case **131** and a

moving portion **142** having a thickness that decreases in a direction away from the fixed portion **141**. The lifter valve **140** may open and close the inlet **132** as the moving portion **142** moves while the fixed portion **141** is fixed to the lifter case **131**.

[0094] For example, the fixed portion **141** may be fixed to the second lifter case **131***b*. The fixed portion **141** may be supported by the second lifter case **131***b*.

[0095] The moving portion **142** may be provided to correspond to the inlet **132**. The moving portion **142** may be provided to open and close the inlet **132**. The moving portion **142** may have a shape in which the thickness becomes thinner in a direction away from the fixed portion **141**. The moving portion **142** may be formed such that a thickness dl of one end adjacent to the fixed portion **141** is greater than a thickness d**2** of the other end farther from the fixed portion **141**. For example, the moving portion **142** may have a shape in which the thickness gradually decreases in a direction away from the fixed portion **141**. For example, the moving portion **142** may have a shape in which the thickness stepwise decreases in a direction away from the fixed portion **141**. The moving portion **142** may be provided with a thickness thinner than a thickness of the fixed portion **141**. With such a configuration, the lifter valve **140** may have an improved elastic mobility of the moving portion **142** with respect to the fixed portion **141**.

[0096] The lifter valve **140** may be provided to correspond to the inlet **132**. The lifter valve **140** may include a first lifter valve **140***a* provided to open and close the first inlet **132***a*, and a second lifter valve **140***b* provided to open and close the second inlet **132***b*. The first lifter valve **140***a* may be provided to be movable in a direction opposite to the second lifter valve **140***b*.

[0097] FIG. **7** illustrates a state in which one end of a lifter case shown in FIG. **4** is coupled to a lifter body. FIG. **8** illustrates a state in which the other end of the lifter case shown in FIG. **7** is fixed to the lifter body.

[0098] Referring to FIG. **4**, FIG. **7**, and FIG. **8**, a process of mounting the lifter case **131** to the lifter body **111** will be described.

[0099] Referring to FIG. **4**, the lifter body **111** may be mounted on the drum **30**. The lifter body **111** may include a lifter fixing portion **115**, and the drum **30** may include a lifter mounting portion **35** to which the lifter fixing portion **115** of the lifter body **111** is fixed. As the lifter fixing portion **115** of the lifter body **111** is mounted on the lifter mounting portion **35** of the drum **30**, the lifter body **111** may be fixed to the drum **30**. For example, the lifter body **111** may be fixed to the drum **30** via a screw.

[0100] Referring to FIG. **7**, the lifter case **131** may include a rotational coupling portion **137** provided at one end and a fixed coupling portion **138** provided at the opposite end. The lifter body **111** may include a body coupling portion **116** to which the rotational coupling portion **137** is coupled and a body fixing portion **117** to which the fixed coupling portion **138** is fixed.

[0101] In a state in which the lifter case **131** is arranged in an inclined direction with respect to the lifter body **111**, the rotational coupling portion **137** of the lifter case **131** may be rotatably coupled to the body coupling portion **116** of the lifter body **111**.

[0102] Referring to FIG. **8**, in a state in which the rotational coupling portion **137** of the lifter case **131** is rotatably coupled to the body coupling portion **116** of the lifter body **111**, as the lifter case **131** rotates with respect to the lifter body **111**, the fixed coupling portion **138** of the lifter case **131** may be fixed to the body fixing portion **117** of the lifter body **111**. The fixed coupling portion **138** of the lifter case **131** may be fixed to the body fixing portion **117** of the lifter body **111** in a hook manner.

[0103] According to an embodiment, the drum **30** of the washing machine **1** may be limited in a method of mounting the lifter **100** due to the length in a rotation axis direction.

[0104] According to an embodiment, the washing machine **1** is configured such that the lifter case **131** is coupled by moving in an inclined direction with respect to the lifter body **111**, and then fixed by rotating with respect to the lifter body **111**, thereby allowing the lifter case **131** to be easily mounted to and/or separated from the lifter body **111**.

[0105] FIG. **9** illustrates a cross-section of the inside of a drum shown in FIG. **2** during rotation of the drum. FIG. **10** illustrates an enlarged view of portion C shown in FIG. **9**, which shows the flow of wash water introduced into the lifter. FIG. **11** illustrates an enlarged view of portion C shown in FIG. **9**, which shows a state of foreign substances inside the lifter according to the rotation of the drum.

[0106] Referring to FIG. **9**, the washing machine **1** may include a plurality of lifters **100**. The plurality of lifters **100** may be arranged at approximately equal intervals along the inner circumferential surface of the drum **30**. For example, three lifters **100** may be arranged at approximately 120° intervals along the inner circumferential surface of the drum **30**. The lifters **100** may lift laundry L as the drum **30** rotates.

[0107] Referring to FIGS. **9** and **10**, while the drum **30** rotates in a first rotation direction R**1**, wash water and/or foreign substances in the drum **30** may be introduced to the inside of the lifter **100** through the first inlet **132***a*. As the drum **30** rotates in the first rotation direction R**1**, wash water and/or foreign substances in the drum **30** may apply force to the moving portion **142** of the first lifter valve **140***a* through the first inlet **132***a*. The first lifter valve **140***a*, which receives force from the wash water and/or foreign substances in the drum **30**, has the moving portion **142** elastically deformed while the fixed portion **141** is fixed to the lifter case **131**, allowing the first inlet **132***a* to be opened.

[0108] While the drum **30** rotates, foreign substances flowing to the inside of the lifter case **131** may be filtered out by the filter **120**. While the drum **30** rotates, the wash water flowing to the inside of the lifter case **131** may pass through the filter **120** and be discharged to the drum **30** through the outlet **133**.

[0109] While the drum **30** rotates in the first rotation direction R**1**, the second lifter valve **140***b* may close the second inlet **132***b*. While the drum **30** rotates in the first rotation direction R**1**, the direction of the force that the wash water and/or foreign substances in the drum **30** may exert on the second lifter valve **140***b* is opposite to the first rotation direction R**1**, so that the second lifter valve **140***b* may close the second inlet **132***b*. As the second lifter valve **140***b* closes the second inlet **132***b*, the wash water and/or foreign substances flowing to the inside of the lifter **100** may be prevented from being discharged to the drum **30** through the second inlet **132***b* without being filtered through the filter **120**.

[0110] While the drum **30** rotates in a direction opposite to the first rotation direction R**1**, the second lifter valve **140***b* may open the second inlet **132***b*. While the drum **30** rotates in the direction opposite to the first rotation direction R**1**, wash water and/or foreign substances in the drum **30** may be introduced through the second inlet **132***b* and exerts force in a direction that opens the second lifter valve **140***b*. While the drum **30** rotates in the opposite direction to the first rotation direction R**1**, the first lifter valve **140***a* may close the first inlet **132***a*.

[0111] Referring to FIG. **11**, foreign substances collected in the chamber **139** of the lifter **100** may move in a radially outward direction of the drum **30** due to centrifugal force caused by the rotation of the drum **30**. Foreign substances filtered out by the filter **120** may be separated from the filter **120** and moved toward the second lifter case **131***b* due to centrifugal force caused by the rotation of the drum **30**. With such a configuration, the washing machine **1** according to an embodiment may increase the replacement cycle of the filter **120**.

[0112] FIG. **12** illustrates an exploded view of part of a lifter according to an embodiment. FIG. **13** illustrates a cross-section of the liter shown in FIG. **12**.

[0113] Referring to FIGS. **12** and **13**, a lifter **200** according to an embodiment will be described. In describing the lifter **200** shown in FIGS. **12** and **13**, the same components as those of the lifter **100** shown in FIGS. **3** to **5** are assigned the same reference numerals, and detailed descriptions thereof may be omitted.

[0114] Referring to FIGS. **12** and **13**, the lifter **200** may include a lifter body **211**. The lifter body **211** may include a body coupling portion **116** and a body fixing portion **117**.

[0115] Unlike the lifter body **111** shown in FIGS. **3** to **5**, the lifter body **211** shown in FIGS. **12** and **13** may include a body opening **212**. The body opening **212** may be provided to face the lifter case **231**.
[0116] The lifter **200** may include a lifter case **231** detachably mounted to the lifter body **211**. The lifter case **231** may include a first lifter case **231***a* and a second lifter case **231***b*. The lifter case **231** may include an inlet **132**. The inlet **132** may include a first inlet **132***a* and a second inlet **132***b*. The lifter case **231** may include a chamber **139** for collecting foreign substances.
[0117] Unlike the lifter case **131** shown in FIGS. **3** to **5**, the lifter case **231** shown in FIGS. **12** and **13** may include an outlet **233** including a first outlet **233***a* and a second outlet **233***b*.
[0118] The first outlet **233***a* may be formed on one side of the lifter case **231** facing the rotation axis of the drum **30**. The second outlet **233***b* may be formed on a side opposite the one side of the lifter case **231** on which the first outlet **233***a* is formed. The second outlet **233***b* may be located radially outside of the drum **30** compared to the first outlet **233***a*. The second outlet **233***b* may be formed in the second lifter case **231***b*. The second outlet **233***b* may be provided to correspond to the body opening **212** of the lifter body **211**.
[0119] Unlike the lifter **100** shown in FIGS. **3** to **5**, the lifter **200** shown in FIGS. **12** and **13** may include a filter **220** including a first filter **220***a* and a second filter **220***b*.
[0120] The first filter **220***a* may be provided to correspond to the first outlet **233***a*. The second filter **220***b* may be provided to correspond to the second outlet **233***b*. The first filter **220***a* may filter out foreign substances from wash water discharged through the first outlet **233***a*. The second filter **200***b* may filter out foreign substances from wash water discharged through the second outlet **233***b*. At least one of the first filter **220***a* and the second filter **200***b* may be provided to filter out microplastics having a size of approximately 5 mm or less.
[0121] According to an embodiment, the drum **30** may include a drum outlet **38**. The drum outlet **38** may be provided to correspond to the body opening **212**.
[0122] According to an embodiment, a portion of the wash water inside the lifter **200** may be discharged from the lifter **200** to the inside of the drum **30** through the first outlet **233***a*. Another portion of the wash water inside the lifter **200** may be discharged from the lifter **200** through the second outlet **233***b*. The wash water discharged through the second outlet **233***b* may sequentially pass through the body opening **212** and the drum outlet **38** and be discharged to the tub **20**.
[0123] With such a configuration, the lifter **200** according to an embodiment may improve the fluidity of the wash water inside the tub **20**.
[0124] FIG. **14** illustrates a cross-section of a lifter according to an embodiment.
[0125] Referring to FIG. **14**, a lifter **300** according to an embodiment will be described. In describing the lifter **300** shown in FIG. **14**, the same reference numerals are assigned to the same components as those shown in FIGS. **3** to **5**, and detailed descriptions thereof may be omitted.
[0126] Referring to FIG. **14**, unlike the lifter **100** shown in FIG. **5**, the lifter **300** may include a valve support member **350**. One end of the valve support member **350** may be fixed to a first lifter valve **140***a*, and the opposite end of the valve support member **350** may be fixed to a second lifter valve **140***b*.
[0127] The valve support member **350** may apply elastic force to the first lifter valve **140***a* and/or the second lifter valve **140***b* in a direction in which the first lifter valve **140***a* moves away from the second lifter valve **140***b*. The valve support member **350** may be provided as an elastic body. The valve support member **350** may be provided as a spring. The valve support member **350** may apply force in a direction in which the first lifter valve **140***a* closes the first inlet **132***a*. The valve support member **350** may apply force in a direction in which the second lifter valve **140***b* closes the second inlet **132***b*.
[0128] The lifter **300** according to an embodiment includes a valve support member **350** that supports the lifter valve **140** in a direction in which the lifter valve **140** closes the inlet **132**, which allows the lifter valve **140** to open the inlet **132** only when a force greater than or equal to a preset

size is applied, thereby preventing foreign substances inside the lifter **300** from being discharged from the lifter **300** through the inlet **132**.

[0129] FIG. **15** illustrates a cross-section of a lifter according to an embodiment.

[0130] Referring to FIG. **15**, a lifter **400** according to an embodiment will be described. In describing the lifter **400** shown in FIG. **15**, the same component numbers may be assigned to the same components as those shown in FIGS. **3** to **5**, and a detailed description thereof may be omitted.

[0131] Referring to FIG. **15**, unlike the lifter **100** shown in FIG. **5**, the lifter **400** may include a valve support member **450**. One end of the valve support member **450** may be fixed to the first lifter valve **140***a*, and the opposite end of the valve support member **450** may be fixed to the second lifter valve **140***b*.

[0132] The valve support member **450** may apply an elastic force to the first lifter valve **140***a* and/or the second lifter valve **140***b* in a direction in which the first lifter valve **140***a* moves away from the second lifter valve **140***b*. The valve support member **450** may be provided as an elastic body. The valve support member **450** may be provided as a plate spring. The valve support member **450** may apply force in the direction in which the first lifter valve **140***a* closes the first inlet **132***a*. The valve support member **350** may apply force in the direction in which the second lifter valve **140***b* closes the second inlet **132***b*.

[0133] The lifter **400** according to an embodiment includes the valve support member **450** that supports the lifter valve **140** in the direction in which the lifter valve **140** closes the inlet **132**, which allows the lifter valve **140** to open the inlet **132** only when a force greater than or equal to a preset size is applied, thereby preventing foreign substances inside the lifter **400** from being discharged from the lifter **400** through the inlet **132**.

[0134] FIG. **16** illustrates a lifter according to an embodiment.

[0135] Referring to FIG. **16**, a lifter **500** according to an embodiment will be described. In describing the lifter **500** shown in FIG. **16**, the same reference numerals are assigned to the same components as the lifters **100** shown in FIGS. **3** to **5**, and detailed descriptions may be omitted.

[0136] Referring to FIG. **16**, the lifter **500** may include a lifter body **111** and a lifter case **531** detachably mounted to the lifter body **111**. Unlike the lifter **100** shown in FIGS. **3** to **5**, the lifter case **531** of the lifter **500** shown in FIG. **16** may include a window **534**, window) that is transparent or translucent and allows the inside of the lifter case **531** to be visible.

[0137] The window **534** of the lifter case **531** may be provided such that foreign substances collected in the chamber **139** inside the lifter case **531** may be checked from the outside of the lifter **500**. The window **534** of the lifter case **531** may be provided on one side facing the drum opening **32** of the drum **30**. Accordingly, the user may check the window **534** of the lifter case **531** through the drum opening **32**.

[0138] With such a configuration, the lifter **500** according to an embodiment may facilitate checking of the replacement time of the lifter case **531**.

[0139] FIG. **17** illustrates a cross-section of a drum of a washing machine according to an embodiment.

[0140] Referring to FIG. **17**, a washing machine **2** according to an embodiment will be described. In describing the washing machine **2** shown in FIG. **17**, the same reference numerals are assigned to the same components as the washing machine **1** shown in FIGS. **1** to **11**, and detailed descriptions thereof may be omitted.

[0141] Referring to FIG. **17**, the washing machine **2** according to an embodiment may include a lifter **100***a* having the same configuration as the lifter **100** of the washing machine **1** shown in FIGS. **1** to **11**. Unlike the washing machine **1** shown in FIGS. **1** to **11**, the washing machine **2** shown in FIG. **17** may include a lifter **100***a* that does not include a filter **120**. For example, the washing machine **2** according to an embodiment may include one lifter **100** including a filter **120** and two lifters **100***a* that do not include a filter **120**. For example, a washing machine according to

an embodiment may include two lifters **100** including a filter **120** and one lifter **100***a* not including a filter **120**.

[0142] The washing machine **1** shown in FIGS. **1** to **11** has three lifters **100** including a filter **120** arranged at equal angles with respect to the rotation axis of the drum **30**, so that even when foreign substances accumulate on the lifters **100** while the drum **30** rotates, the balance of the rotation of the drum **30** may be maintained. In contrast, the washing machine **2** shown in FIG. **17** has one lifter **100** including a filter **120** and two lifters **100***a* not including a filter **120** arranged at equal angles with respect to the rotation axis of the drum **30**, so that when foreign substances accumulate on the lifter **100** including the filter **120** while the drum **30** rotates, an unbalance may occur in the rotation of the drum **30**.

[0143] FIG. **18** schematically illustrates the configurations of a washing machine according to an embodiment and the signal flow between the configurations.

[0144] Referring to FIG. **18**, a control method for detecting clogging of a filter **120** of a lifter **100** of a washing machine **1** shown in FIG. **9** is described.

[0145] Referring to FIG. **18**, in an embodiment, a washing machine **1** may include a user interface device **15**, a driving device **40**, a sensor unit **95**, a communication module **96**, and a controller **90**.

[0146] The user interface device **15** may provide a user interface for interacting with the user and the washing machine **1**.

[0147] The user interface device **15** may include at least one input interface **16** and at least one output interface **17**.

[0148] The at least one input interface **16** may convert sensory information received from the user into electrical signals.

[0149] At least one input interface **16** may include a power button, an operation button, a course selection dial (or a course selection button), and a washing/rinsing/dehydrating setting button. At least one input interface **16** may include a filter check button. According to various embodiments, the filter check button may be a button for operating the drum **30** to determine whether the filter **120** requires cleaning and/or replacement. At least one input interface **16** may include, for example, a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or microphone, etc.

[0150] At least one output interface **17** may transmit various data related to the operation of the washing machine **1** to the user by generating sensory information.

[0151] For example, at least one output interface **17** may transmit information related to a washing course, an operating time of the washing machine **1**, and washing setting/rinsing setting/spinning setting to the user. Information on the operation of the washing machine **1** may be output through a screen, indicator, or voice. At least one output interface **17** may include, for example, a Liquid Crystal Display (LCD) panel, a Light Emitting Diode (LED) panel, a speaker, etc.

[0152] The driving device **40** may include the driving motor **41** that provides driving force to rotate the drum **30**. The driving device **40** may operate based on a control signal from the controller **90**.

[0153] The sensor unit **95** may include at least one sensor that obtains information related to the operating state of the washing machine **1**.

[0154] For example, the sensor unit **95** may include at least one of a water level sensor for detecting the water level of the tub, a sensor for detecting the operating state of the driving device **40**, or a vibration sensor for detecting vibration of drum **30**.

[0155] The sensor for detecting the operating state of the driving device **40** may include, for example, a current sensor for measuring the driving current applied to the driving motor **41**, but is not limited thereto.

[0156] The washing machine **1** may include a communication module **96** for wired and/or wireless communication with an external device.

[0157] The communication module **96** may include at least one of a short-range communication module or a long-range communication module.

[0158] The communication module **96** may transmit data to an external device (e.g. a server, user device and/or home appliance) or receive data from the external device. For example, the communication module **96** may establish communication with a server and/or user device and/or home appliance and transmit/receive various data.
[0159] For this, the communication module **96** may establish a direct (wired) communication channel or a wireless communication channel with an external electronic device (for example, a server, a user terminal, and/or a home appliance), and support communication through the established communication channel. According to an embodiment of the disclosure, the communication module **96** may include a wireless communication module (for example, a cellular communication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module), or a wired communication module (for example, a local area network (LAN) communication module or a power line communication module). A corresponding communication module among the communication modules may communicate with an external electronic device through a first network (for example, a short-range communication network, such as Bluetooth, wireless fidelity (WiFi) direct, or infrared data association (IrDA)) or a second network (for example, a telecommunication network, such as a legacy cellular network, a 5G network, a next-generation communication network, internet, or a computer network (for example, a local area network (LAN) or a wide area network (WAN)). Such various kinds of communication modules may be integrated into a component (for example, a single chip) or implemented as a plurality of independent components (for example, a plurality of chips).
[0160] A short range communication module may include a Bluetooth communication module, a Bluetooth Low Energy (BLE) communication module, a near field communication module (Near Field Communication module), a WLAN (Wi-Fi) communication module, a Zigbee communication module, an infrared data association (IrDA) communication module, a Wi-Fi Direct (WFD) communication module, an ultrawideband (UWB) communication module, an Ant+ communication module, a microwave (uWave) communication module or the like, but is not limited thereto.
[0161] A long range communication module may include a communication module that performs various types of long-distance communication, and may include a mobile communicator. The mobile communicator transmits and receives wireless signals with at least one of a base station, an external terminal, and a server on a mobile communication network.
[0162] In an embodiment, the communicator may communicate with an external device such as a server, user device, or other home appliance through a nearby access point (AP). The access relay (AP) may connect a local area network (LAN) to which the washing machine **1** or user device is connected to a wide area network (WAN) to which a server is connected. The washing machine **1** or user device may be connected to the server through a wide area network (WAN). The controller **90** may control various components (e.g. the driving device **40** of the washing machine **1**. The controller **90** may control various components of the washing machine **1** to perform at least one operation including water supply, washing, rinsing, and/or dehydrating according to a user input. For example, the controller **90** may control the driving motor **41** to adjust the rotational speed of the drum **30**.
[0163] The controller **90** may include hardware such as a CPU or memory, and software such as a control program. For example, the controller **90** may include an algorithm for controlling the operation of components in the washing machine **10**, at least one memory **92** that stores data in the form of a program, and at least one processor **91** that performs the above-described operation using data stored in at least one memory. The memory **92** and the processor **91** may be implemented as separate chips. The processor **91** may include one or more processor chips or may include one or more processing cores. The memory **92** may include one or more memory chips or may include one or more memory blocks. Also, the memory **92** and the processor **91** may be implemented as a single chip.

[0164] Referring to FIG. **18**, the controller **90** may operate the driving device **40** and the sensor unit **95** based on receiving a signal through the input interface **16**.
[0165] As the driving device **40** is operated by the controller **90**, the drum **30** may rotate. For example, the drum **30** may be rotated when there is no laundry inside to check a replacement timing of the filter **120** of the lifter **100**.
[0166] When the amount of foreign substances accumulated in the lifter **100** provided on the inner circumferential surface of the drum **30** is less than or equal to a preset amount, an unbalance in the rotation of the drum **30** may not occur.
[0167] When the amount of foreign substances accumulated in the lifter **100** provided on the inner circumferential surface of the drum **30** is greater than the preset amount, an unbalance in the rotation of the drum **30** may occur
[0168] As the sensor unit **95** is operated by the controller **90**, the sensor unit **95** may detect whether an unbalance occurs in the rotation of the drum **30**. For example, the sensor unit **95** may detect the vibration of the drum **30** to detect whether an unbalance occurs in the rotation of the drum **30**.
[0169] The controller **90** may determine whether to replace the filter **120** of the lifter **100** based on information obtained from the sensor unit **95**.
[0170] For example, the controller **90** may determine that the filter **120** of the lifter **100** needs to be replaced based on the fact that the size of the vibration caused by the rotation of the drum **30** is greater than a preset size, and may determine that the filter **120** of the lifter **100** does not need to be replaced based on the fact that the size of the vibration caused by the rotation of the drum **30** is smaller than the preset size.
[0171] The controller **90** may indicate to the user through the output interface **17** that the filter **120** of the lifter **100** needs to be replaced based on a determination that the filter **120** of the lifter **100** needs to be replaced.
[0172] FIG. **19** illustrates a flowchart of a method of controlling a washing machine according to an embodiment.
[0173] Referring to FIG. **19**, the input interface **16** may, upon receiving a user input for checking whether the filter **120** of the lifter **100** needs to be replaced, transmit a signal to the controller **90**, and the controller **90** may receive a signal for checking whether the filter **120** of the lifter **100** needs to be cleaned and/or replaced **1100**. For example, when the drum **30** is stopped and there is no laundry inside the drum **30**, the input interface **16** may receive a user input for checking whether the filter **120** of the lifter **100** needs to be cleaned and/or replaced.
[0174] The controller **90** may generate a control signal for rotating the drum **30** (**1200**). The drum **30** may rotate at a preset speed based on the signal of the controller **90** (**1300**).
[0175] The controller **90** may operate the sensor unit **95** to detect information about the rotation of the drum **30**. The sensor unit **95** may detect vibration caused by the rotation of the drum **30**. The controller **90** may receive information about vibration caused by the rotation of the drum **30** from the sensor unit **95** (**1400**).
[0176] The controller **90** may determine that cleaning and/or replacement of the filter **120** of the lifter **100** is needed based on occurrence of an unbalance in the vibration caused by the rotation of the drum **30**. The controller **90** may, based on a determination that cleaning and/or replacement of the filter **120** of the lifter **100** is needed, generate a signal to stop the driving device **40** and/or a signal to indicate to the output interface **17** that cleaning and/or replacement of the filter **120** of the lifter **100** is needed (**1500**).
[0177] Based on the signal generated from the controller **90**, the rotation of the drum **30** may be stopped, and/or a notification to clean and/or replace the filter **120** of the lifter **100** may be displayed on the output interface **17** (**1600**).
[0178] The flow chart shown in FIG. **19** is not intended to limit the order of each of the operations **1100**, **1200**, **1300**, **1400**, **1500**, and **1600**, and the order of each of the operations **1100**, **1200**, **1300**, **1400**, **1500**, and **1600** may be changed according to various embodiments.

[0179] For example, the operation **1100** in which the controller **90** receives a signal to check whether the filter **120** is cleaned may be omitted. The operation **1200** in which a control signal to rotate the drum **30** is generated may include generating, by the controller **90**, a control signal to rotate the drum **30** for a dehydration process. The operation **1300** in which the drum **30** rotates may include the drum **30** rotating during the dehydration process.
[0180] After the dehydration process starts and a preset time elapses, the sensor unit **95** may detect the vibration of the drum **30**, and the controller **90** may receive a signal from the sensor unit **95 1400**.
[0181] After the dehydration process starts and a preset time elapses, the controller **90** may, based on vibration caused by the rotation of the drum **30** not being stabilized, determine that the filter **120** of the lifter **100** needs to be cleaned and/or replaced.
[0182] The controller **90** may, based on a determination that the filter **120** of the lifter **100** needs to be cleaned and/or replaced, generate a signal to stop the driving device **40** and/or a signal indicating to the output interface **17** that the filter **120** needs to be cleaned and/or replaced **1500**.
[0183] Based on the signal generated from the controller **90**, the rotation of the drum **30** may be stopped, and/or a cleaning and/or replacement notification of the filter **120** of the lifter **100** may be displayed on the output interface **17 1600**.
[0184] FIG. **20** illustrates an example in which filter status information is output on a washing machine according to an embodiment.
[0185] Referring to FIG. **20**, the washing machine **1** may output status information of the filter **120** in response to the vibration by the rotation of the drum **30** being detected by the sensor unit **95**.
[0186] For example, the controller **90** may, in response to receiving a detection signal from the sensor unit **95**, control the output interface **17** to output information indicating that cleaning and/or replacement of the filter **120** is needed.
[0187] The output interface **17** may include a display, and outputting information indicating that cleaning and/or replacement of the filter **120** is needed may include displaying a visual indicator on the display indicating that cleaning and/or replacement of the filter **120** is needed.
[0188] In the present disclosure, the visual indicator may include any means capable of conveying visualized information, such as text, a shape, an icon, or an animation.
[0189] That is, the controller **90** may control the output interface **17** to display a visual indicator indicating that cleaning and/or replacement of the filter **120** is needed in response to receiving a detection signal from the sensor unit **95**.
[0190] As another example, the output interface **17** may include at least one indicator lamp, and outputting information indicating that cleaning and/or replacement of the filter **120** is needed may include lighting or blinking an indicator lamp corresponding to the filter **120** among the at least one indicator lamp.
[0191] That is, the controller **90** may control the output interface **17** to light or blink an indicator lamp corresponding to the filter **120** in response to receiving a detection signal from the sensor unit **95**.
[0192] At least one input interface **16** may include a filter check button. According to various embodiments, the filter check button may be a button for operating the drum **30** to check whether the filter **120** needs to be cleaned and/or replaced. In response to receiving a user input through the filter check button, the controller **90** may generate a control signal for rotating the drum **30** in a state in which no laundry is present inside the drum **30** to check whether the filter **120** of the lifter **100** needs to be replaced.
[0193] FIG. **21** illustrates a washing machine according to an embodiment. FIG. **22** illustrates a cross-section of the washing machine shown in FIG. **21**. FIG. **23** illustrates a cross-section of a drum shown in FIG. **22**.
[0194] As shown in FIGS. **21** and **22**, the washing machine **1***a* of the washing machine **1***a* may include a housing **11***a* accommodating various components therein. The housing **11***a* may form an

exterior of the washing machine **1***a*. The housing **11***a* may have a box shape with one part open.
[0195] The housing **11***a* may include a housing opening **12***a* formed to be accessible to the inside of the drum **30***a*. The housing opening **12***a* may open substantially upward.
[0196] The washing machine **1***a* may include a door **13***a* for opening and closing the housing opening **12***a* provided in the housing **11***a*. The door **13***a* may be rotatably mounted to the housing **11***a* by a hinge. At least a portion of the door **13***a* may be transparent or translucent such that an inside of the housing **11***a* may be seen.
[0197] The washing machine **1***a* may include a tub **20***a* provided inside the housing **11***a* to store water. The tub **20***a* may be disposed inside the housing **11***a*. The tub **20***a* may include a tub opening **22***a* provided to correspond to the housing opening **12***a*. The tub opening **22***a* may open substantially upward. The tub **20***a* may be supported inside the housing **11***a*. The tub **20***a* may have a substantially cylindrical shape with one side open.
[0198] The tub **20***a* may be elastically supported from the housing **11***a* by the damper **80***a*. The damper **80***a* may connect the housing **11***a* and the tub **20***a*. When the vibration generated by the rotation of the drum **30***a* is transmitted to the tub **20***a* and/or the housing **11***a*, the damper **80***a* may be provided to attenuate vibration by absorbing vibration energy between the tub **20***a* and the housing **11***a*.
[0199] The washing machine **1***a* may include a drum **30***a* provided to accommodate laundry. The drum **30***a* may be rotatably provided inside the tub **20***a*. The drum **30***a* may rotate within the tub **20***a* to perform washing, rinsing, and/or dehydration. The drum **30***a* may include a through hole **34***a* connecting the inner space of the drum **30***a* and the inner space of the tub **20***a*. The drum **30***a* may have a substantially cylindrical shape with one side open.
[0200] A balancing unit **36***a* may be installed on top of the drum **30***a* to solve load unbalance caused by laundry. The balancing unit **36***a* includes a housing having an annular channel and a ball or a fluid mass body movably provided inside the channel and may solve the load unbalance of the drum **30***a* while the ball or the fluid moves according to the rotation of the drum **30***a*.
[0201] The pulsator **37***a* is rotatably provided at the bottom of the drum **30***a* to generate a wash water flow. Laundry may be washed by the wash water flow generated by the pulsator **37***a*.
[0202] The drum **30***a* may include a drum opening **32***a* provided to correspond to the housing opening **12***a* and the tub opening **22***a*. Laundry may be put into the drum **30***a* or taken out of the drum **30***a* through the housing opening **12***a*, the tub opening **22***a*, and the drum opening **32***a*.
[0203] The washing machine **1***a* may include a driving device **40***a* configured to rotate the drum **30***a* and the pulsator **37***a*. The driving device **40***a* may include a driving motor **41***a* and a shaft system for transmitting the driving force generated by the driving motor **41***a* to the drum **30***a* and the pulsator **37***a*.
[0204] The driving motor **41***a* may include a fixed stator **48***a* and a rotor **49***a* that rotates by electromagnetically interacting with the stator **48***a*.
[0205] The shaft system may include a dehydration shaft **47***a* arranged to transmit the driving force of the driving motor **41***a* to the drum **30***a*, a washing shaft **46***a* provided to transmit the driving force of the driving motor **41***a* to the pulsator **37***a*, and a clutch device **45***a* that connects or disconnects the driving motor **41***a* and the dehydration shaft **47***a*.
[0206] The dehydration shaft **47***a* is formed to have a hollow, and the washing shaft **46***a* may be provided in the hollow of the dehydration shaft **47***a*. The washing shaft **46***a* remains connected to the rotor **49***a* of the driving motor **41***a* and the dehydration shaft **47***a* may be connected to or disconnected from the rotor **49***a* of the driving motor **41***a* by the clutch device **45***a*.
[0207] When the clutch device **45***a* disconnects the dehydration shaft **47***a* and the driving motor **41***a*, power is transmitted to the washing shaft **46***a* such that only the pulsator **37***a* rotates, and when the clutch device **45***a* connects the dehydration shaft **47***a* and the driving motor **41***a*, power is transmitted to both the dehydration shaft **47***a* and the washing shaft **46***a* such that the drum **30***a* and the pulsator **37***a* may rotate simultaneously.

[0208] When only the pulsator **37***a* rotates, wash water flow is generated by the rotation of the pulsator **37***a*, and laundry is rotated by the wash water flow and rubbed against the drum **30***a*, such that laundry may be washed. When the pulsator **37***a* and the drum **30***a* rotate at the same time, the laundry inside the drum **30***a* is rotated and the laundry is dehydrated by the centrifugal force, such that the laundry may be dehydrated.
[0209] The washing machine **1***a* may include a water supply device **50***a*. The water supply device **50***a* may supply water to the tub **20***a*. The water supply device **50***a* may be located above the tub **20***a*. The water supply device **50***a* may include a water supply pipe and a water supply valve provided in the water supply pipe. The water supply pipe may be connected to an external water supply source. The water supply pipe may extend from an external water supply source to the detergent supply device **60***a* and/or the tub **20***a*. Water may be supplied to the tub **20***a* via the detergent supply device **60***a*. Water may be supplied to the tub **20***a* without passing through the detergent supply device **60***a*.
[0210] The water supply valve may open or close the water supply pipe in response to an electrical signal from the controller **90***a*. The water supply valve may allow or block the supply of water from an external water supply source to the tub **20***a*. The water supply valve may include, for example, a solenoid valve that opens and closes in response to an electrical signal.
[0211] The washing machine **1***a* may include a detergent supply device **60***a* configured to supply detergent to the tub **20***a*. The detergent supply device **60***a* may be configured to supply detergent into the tub **20***a* during the water supply process. Water supplied through the water supply pipe may be mixed with detergent via the detergent supply device **60***a*. Water mixed with detergent may be supplied into the tub **20***a*. The detergent may include not only laundry detergent but also dryer rinse, deodorant, disinfectant or fragrance.
[0212] The washing machine **1***a* may include a drain device **70***a*. The drain device **70***a* may be configured to discharge water contained in the tub **20***a* to the outside. A drain port **21***a* may be formed at a lower portion of the tub **20***a* to drain water stored in the tub **20***a* to the outside of the tub **20***a*. A drain hose **74***a* may be connected to the drain hole **21***a*, and a drain valve **72***a* for opening and closing the drain hose **74***a* may be provided in the drain hose **74***a*.
[0213] The washing machine **1***a* may provide a user interface device **15***a* for interaction between the user and the washing machine **1***a*.
[0214] The washing machine **1***a* may include at least one user interface device **15***a*. The user interface device **15***a* may include at least one input interface **16***a* and at least one output interface **17***b*.
[0215] At least one input interface **16***a* may convert sensory information received from the user into an electrical signal.
[0216] At least one input interface **16***a* may include a power button, an operation button, a course selection dial (or a course selection button), and a washing/rinsing/dehydrating setting button. At least one input interface **16***a* may include, for example, a tact switch, a push switch, a slide switch, a toggle switch, a micro switch, a touch switch, a touch pad, a touch screen, a jog dial, and/or microphone, etc.
[0217] At least one output interface **17***b* may transmit various data related to the operation of the washing machine **1***a* to the user by generating sensory information.
[0218] For example, at least one output interface **17***b* may transmit information related to a washing course, an operating time of the washing machine **1***a*, and washing setting/rinsing setting/spinning setting to the user. Information on the operation of the washing machine **1***a* may be output through a screen, indicator, or voice. At least one output interface **17***b* may include, for example, a Liquid Crystal Display (LCD) panel, a Light Emitting Diode (LED) panel, a speaker, etc.
[0219] Referring to FIGS. **22** and **23**, a washing machine **1***a* may include the same lifter **100** as the lifter **100** shown in FIGS. **1** to **11**. For example, the lifter **100** according to an embodiment may be

provided on an inner circumferential surface of the drum of a front-loading washing machine, or may be provided on an inner circumference surface of the drum of a top-loading washing machine. The lifter **100** may be provided to filter out foreign substances from wash water inside the drum **30***a*. The lifter **100** may be provided to filter out microplastics having a size of approximately 5 mm or less.

[0220] Referring to FIGS. **22** and **23**, the washing machine **1***a* may include a lifter **100***a* that does not include a filter **120**, as the washing machine **2** shown in FIG. **17**. For example, the washing machine **1***a* according to an embodiment may include one lifter **100** including a filter **120** and two lifters **100***a* not including a filter **120**. For example, a washing machine according to an embodiment may include two lifters **100** including a filter **120** and one lifter **100***a* not including a filter **120**.

[0221] The washing machine **1***a* shown in FIGS. **21** to **23** includes one lifter **100** including a filter **120** and two lifters **100***a* not including a filter **120** arranged at equal angles with respect to the rotation axis of the drum **30***a*, so that when foreign substances accumulate on the lifter **10** including the filter **120** during rotation of the drum **30***a*, an unbalance may occur in the rotation of the drum **30***a*.

[0222] The washing machine **1***a* shown in FIGS. **21** to **23** may employ the same control configuration as the control configuration of the washing machine **2** shown in FIG. **19**. The washing machine **1***a* shown in FIGS. **21** to **23** may employ the same control method as the control method shown in FIG. **20** to check whether the filter **120** of the lifter **100** is replaced.

[0223] A washing machine according to an embodiment includes: a housing **11**; a drum **30** rotatably provided inside the housing; and a lifter **100** extending from an inner circumferential surface of the drum toward a rotation axis of the drum. The lifter includes a lifter body **111** mounted on the drum; a lifter case **131** detachably mountable to the lifter body, the lifter case having an inlet **132** and an outlet **133**; a filter **120** provided on the lifter case; and a lifter valve **140** provided as an elastic body to open and close the inlet. According to this configuration, the washing machine **1** according to an embodiment may collect foreign substances in the lifter **100**, thereby reducing the amount of foreign substances discharged from the washing machine **1**.

[0224] The filter may be provided on a portion of the lifter case in which the outlet is located. According to this configuration, the washing machine **1** according to an embodiment can filter foreign substances from wash water discharged from the lifter **100**.

[0225] The outlet may be configured to face the rotation axis of the drum. According to this configuration, the washing machine **1** according to an embodiment may easily discharge wash water introduced into the lifter **100** to the inside of the drum **30**.

[0226] The outlet may be a first outlet **233***a*, and the lifter case may include a second outlet **233***b* facing the first outlet. According to this configuration, the lifter **200** according to one embodiment may increase the fluidity of the washing water inside the drum **30**.

[0227] The second outlet may be located radially outside of the drum compared to the first outlet. According to this configuration, the lifter **200** according to one embodiment can effectively collect foreign substances by centrifugal force as the drum **30** rotates.

[0228] The inlet may be configured to face a rotation direction of the drum. According to this configuration, the washing machine **1** according to one embodiment can easily allow washing water and/or foreign substances in the drum **30** to flow into the lifter **100** while the drum **30** rotates.

[0229] The lifter valve may include a fixed portion **141** fixed to the lifter case, and a moving portion **142** having a thickness that decreases in a direction away from the fixed portion. According to this configuration, the lifter **100** according to one embodiment can open and close the inlet **132** with a relatively simple configuration.

[0230] The lifter case may include: a rotating coupling portion **137** configured to be rotatably coupled to the lifter body; and a fixed coupling portion **138** provided to be fixable to the lifter body while the rotating coupling portion is being rotatably coupled to the lifter body. According to this

configuration, the washing machine **1** according to one embodiment can facilitate attachment and detachment of the lifter **100** to and from the inner circumferential surface of the drum **30**.

[0231] The inlet may include a first inlet **132***a* facing a first rotation direction of the drum and a second inlet **132***b* facing a second rotation direction opposite to the first rotation direction of the drum. The lifter valve may include a first lifter valve **140***a* configured to open and close the first inlet and a second lifter valve **140***b* configured to open and close the second inlet. The lifter may include a valve support member **350** or **450** configured to apply elasticity to the first lifter valve in a direction away from the second lifter valve. According to this configuration, the washing machine **1** according to one embodiment can prevent washing water and/or foreign substances from flowing back into the drum **30** through the inlet **132** from the inside of the lifter **300** or **400**.

[0232] The lifter case may include a transparent or translucent window **534** provided on a portion facing a drum opening of the drum. According to this configuration, the lifter **500** according to one embodiment can facilitate checking of the amount of foreign matter accumulated inside.

[0233] The lifter may be a first lifter **100**, and a second lifter **100***a* having a different configuration from the first lifter may be provided on the inner circumferential surface of the drum.

[0234] The washing machine may further include: a driving device **40** configured to drive the drum; a vibration sensor **95** configured to detect vibration of the drum while the drum rotates; and a controller **90** configured to control the driving device based on information detected by the vibration sensor.

[0235] The controller may be configured to stop an operation of the driving device based on determining that the vibration of the drum is greater than a preset magnitude. According to this configuration, the washing machine **2** according to one embodiment can facilitate checking of a replacement timing of the filter **120** of the lifter **100**.

[0236] The lifter case may include a chamber **139** configured to collect foreign substances filtered out by the filter.

[0237] The lifter valve may be configured to open and close the inlet to allow the foreign substances to be introduced into the chamber and prevent the foreign substances from being discharged from the chamber. According to this configuration, the washing machine **1** according to one embodiment can prevent foreign substances from flowing back through the inlet **132** of the lifter **100**.

[0238] A washing machine **1** according to one embodiment includes a housing, a tub provided inside the housing, a drum rotatably provided inside the tub, and a lifter extending from an inner circumferential surface of the drum toward a rotation axis of the drum. The lifter includes a lifter body mounted on the drum, a lifter case detachably mountable to the lifter body, the lifter case having an inlet and an outlet, a filter provided in a portion of the lifter case in which the outlet is located, and a lifter valve provided as an elastic body, the lifter valve being capable of opening and closing the inlet portion to allow foreign substances to be introduced into the lifter case while preventing foreign substances from being discharged from the lifter case. According to this configuration, the washing machine **1** according to one embodiment can collect foreign substances in the lifter **100**, thereby reducing the amount of foreign substances discharged from the washing machine **1**, and preventing foreign substances from flowing back through the inlet **132** of the lifter **100**.

[0239] The lifter valve may include a fixed portion fixed to the lifter case, and a moving portion provided with a thickness thinner than the fixed portion. According to this configuration, the lifter **100** according to one embodiment can open and close the inlet portion **132** with a relatively simple configuration.

[0240] The inlet may be provided to face the rotation direction of the drum. The outlet may be provided to face the rotation axis of the drum. According to this configuration, the washing machine **1** according to one embodiment can improve the fluidity of the washing water inside the drum **30**.

[0241] The outlet may include a first outlet provided to discharge water from the lifter case to the drum, and a second outlet provided to discharge water from the lifter case to the tub. According to this configuration, the lifter **200** according to one embodiment can increase the fluidity of the washing water inside the drum **30**.
[0242] The washing machine may further include a driving device configured to drive the drum, a vibration sensor configured to detect vibration of the drum while the drum rotates, and a controller configured to control the driving device based on information detected by the vibration sensor. The controller may stop an operation of the driving device based on determining that the vibration of the drum is greater than a preset size. According to this configuration, the washing machine according to one embodiment **2** can facilitate checking a replacement timing of the filter **120** of the lifter **100**.
[0243] According to the concept of the present disclosure, the washing machine can easily separate the lifter case in which foreign substances are collected from the lifter body, thereby facilitating management of the filter.
[0244] According to the concept of the present disclosure, the washing machine can collect foreign substances, which are collected inside the lifter, to be separated from the filter through centrifugal force caused by rotation of the drum, thereby increasing the replacement cycle of the filter.
[0245] According to the concept of the present disclosure, the washing machine can filter out microplastics by the lifter, thereby increasing the efficiency of the filter.
[0246] The effects of the present invention are not limited to those described above, and other effects that are not described above will be clearly understood by those skilled in the art from the above detailed description.
[0247] While the specific embodiments of the preset invention have been illustrated and described above, the present invention is not limited to the above-described embodiments and may be variously modified and made by those skilled in the art without departing from the gist of the technological sprit of the present invention defined by the appended claims.

Claims

1. A washing machine comprising: a housing; a drum rotatable while inside the housing; and a lifter extending from an inner circumferential surface of the drum toward a rotation axis of the drum, wherein the lifter includes: a lifter body mountable on the drum; a lifter case coupleable to and decoupleable from the lifter body, the lifter case having an inlet and an outlet; a filter to be provided on the lifter case; and a lifter valve that is deformable to be away from the inlet of the lifter case to open the inlet and return toward the inlet of the lifter case to close the inlet.
2. The washing machine of claim 1, wherein the lifter valve is provided as an elastic body, and the filter is provided on a portion of the lifter case in which the outlet is located.
3. The washing machine of claim 1, wherein the outlet is configured to face the rotation axis of the drum.
4. The washing machine of claim 3, wherein the outlet is a first outlet, and the lifter case includes a second outlet facing the first outlet.
5. The washing machine of claim 4, wherein the second outlet is located radially outside of the drum compared to the first outlet.
6. The washing machine of claim 1, wherein the inlet is configured to face a rotation direction of the drum.
7. The washing machine of claim 1, wherein the lifter valve includes: a fixed portion fixed to the lifter case; and a moving portion having a thickness that decreases along a direction away from the fixed portion.
8. The washing machine of claim 1, wherein the lifter case includes: a rotating coupling portion configured to be rotatable while coupled to the lifter body; and a fixed coupling portion that is

provided to be fixable and coupleable to the lifter body while the rotating coupling portion is rotatable while coupled to the lifter body.

9. The washing machine of claim 1, wherein the inlet is a first inlet facing a first rotation direction of the drum and the lifter includes a second inlet facing a second rotation direction opposite to the first rotation direction of the drum, the lifter valve is a first lifter valve configured to open and close the first inlet and the lifter includes a second lifter valve configured to open and close the second inlet, and the lifter includes a valve support member configured to apply elasticity to the first lifter valve in a direction away from the second lifter valve.

10. The washing machine of claim 1, wherein the lifter case includes a transparent or translucent window provided on a portion facing a drum opening of the drum.

11. The washing machine of claim 1, wherein the lifter is a first lifter, and a second lifter having a different configuration from the first lifter is provided on the inner circumferential surface of the drum.

12. The washing machine of claim 11, further comprising: a driving device configured to drive the drum; a vibration sensor configured to detect vibration of the drum while the drum rotates; and a controller configured to control the driving device based on information detected by the vibration sensor.

13. The washing machine of claim 12, wherein the controller is configured to stop an operation of the driving device based on determining that the vibration of the drum is greater than a preset magnitude.

14. The washing machine of claim 1, wherein the lifter case includes a chamber configured to collect foreign substances filtered out by the filter.

15. The washing machine of claim 14, wherein the lifter valve is configured to open and close the inlet to allow the foreign substances to be introduced into the chamber and prevent the foreign substances from being discharged from the chamber.