DESCRIPTION

WASHING MACHINE

TECHNICAL FIELD

The present disclosure relates to a washing machine including a filter device that filters water.

BACKGROUND ART

PTL 1 discloses a washing machine including a filter device that filters washing water.

FIG. 7 is a cross-sectional view of a filter device of a conventional washing machine described in PTL 1. As illustrated in FIG. 7, filter device 100 includes tubular filter case 150 and filter body 151 housed inside filter case 150. Furthermore, filter body 151 is provided with dense filter portion 151a in which rectangular filter meshes each having a small area are arranged vertically and horizontally and coarse filter portion 151b. Filter device 100 collects foreign matter contained in passing washing water in dense filter portion 151a and coarse filter portion 151b.

Citation List

Patent Literature

PTL 1: Unexamined Japanese Patent Publication No. 2006-255317

SUMMARY OF THE INVENTION

However, the above-described conventional configuration has a problem that it is difficult to remove foreign matter such as lint or hair when the foreign matter such as lint or hair is entangled in a rectangular filter mesh

having a small area.

The present disclosure provides a washing machine that can easily remove foreign matter collected by a filter device that filters water.

A washing machine according to the present disclosure includes a housing, a water tub that is supported by the housing, a drum that is rotatably disposed in the water tub, a drain path that discharges water drained from the water tub to an outside, a filter case that is disposed in a middle of the drain path, and a filter body that is detachably housed inside the filter case and collects foreign matter contained in the water drained. The filter body includes a central portion extending in a longitudinal direction of the filter body, and a plurality of side portions extending in a U-shape with the central portion being as a center.

A washing machine according to the present disclosure can easily remove foreign matter collected by a filter device that filters water.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an external perspective view of a washing machine according to a first exemplary embodiment of the present invention.

FIG. 2 is a schematic longitudinal sectional view of the washing machine.

FIG. 3A is a perspective view of a case member of the washing machine.

FIG. 3B is a perspective view of a filter member of the washing machine.

FIG. 4A is a side view of the filter member of the washing machine.

FIG. 4B is a top view of the filter member of the washing machine.

FIG. 4C is a cross-sectional view taken along line B-B of FIG. 4B.

FIG. 4D is a cross-sectional view taken along line A-A of FIG. 4B.

FIG. 5 is a schematic view illustrating a flow of washing water in a state where the filter member is mounted on the case member of the washing machine.

FIG. 6A is a schematic view of a state where a filter portion of the washing machine has collected foreign matter.

FIG. 6B is a schematic view of removing the foreign matter from the filter portion of the washing machine.

FIG. 7 is a cross-sectional view of a filter device of a conventional washing machine.

DESCRIPTION OF EMBODIMENTS

Hereinafter, exemplary embodiments will be described in detail with reference to the drawings as appropriate.

(First exemplary embodiment)

In the present first exemplary embodiment, a drum type washing machine will be described as an example of a washing machine.

FIG. 1 is an external perspective view of the washing machine according to the first exemplary embodiment.

As illustrated in FIG. 1, the washing machine includes main body 1 having an approximately box shape, first door body 3 that is provided openably and closably with respect to main body 1, operation unit 4 disposed at a top of first door body 3, display 5 disposed adjacent to operation unit 4, and detergent accommodating container 6 that can be pulled out to be opened and closed by a user putting his hand in handle 40 that is recessed with respect to main body 1. Furthermore, a part of water feeder 25 described later is exposed on an upper surface of main body 1.

When the user operates operation unit 4, main body 1 is powered on,

and various washing courses such as washing, rinsing, and spin-drying are selected. Display 5 displays a selection result, information regarding time until completion of the selected washing course, progress status of various washing processes, washing completion information, and the like.

Next, an inside of the washing machine will be described.

FIG. 2 is a schematic longitudinal sectional view of the washing machine according to the first exemplary embodiment. Inside main body 1, water tub 11 formed in a bottomed cylindrical shape is disposed with its central axis inclined downward from a front side toward a back side. Water tub 11 is swingably supported on main body 1 in a vibration-damping manner by damper 15 disposed at a lower part of main body 1 and spring body 16 disposed at an upper part of main body 1.

Inside water tub 11, bottomed cylindrical rotary drum 10 is rotatably included. Rotary drum 10 is provided with a large number of water passage holes 14 on an outer peripheral portion of rotary drum 10 so that washing water in water tub 11 can pass into and out of rotary drum 10. A plurality of protrusions 13 is provided on an inner wall surface of rotary drum 10. When rotary drum 10 is rotated at a low speed, protrusions 13 give an agitating operation (tumbling operation) in which clothes are hooked and lifted upward by protrusions 13 and then dropped at an appropriate height. The washing machine according to the present exemplary embodiment performs the tumbling operation to perform agitating and beating washing and a drying operation of the clothes.

Throw-in opening 7 is formed on a front surface of main body 1 and faces openings of water tub 11 and rotary drum 10. First door body 3 is provided openably and closably so as to cover throw-in opening 7. The user can take in and out the clothes through throw-in opening 7 with first door body

3 opened. Annular packing 8 is disposed between throw-in opening 7 and water tub 11. Annular packing 8 prevents the clothes from entering a gap between throw-in opening 7 and water tub 11 and prevents the washing water from leaking.

Motor 12 is attached to the back side of water tub 11 and drives rotary drum 10 in water tub 11 to rotate in forward and reverse directions.

Controller 27 is disposed above water tub 11 and includes a control circuit including a printed circuit board. Controller 27 controls the motor and the like to control a series of washing operations such as washing, rinsing, and spin-drying.

Detergent accommodating portion 26 includes detergent accommodating container 6, water supply member 30, water delivery member 31, and connection pipe member 32.

Water supply member 30 is connected to water feeder 25 connected to a water service faucet. Water delivery member 31 is provided below water supply member 30, and holds detergent accommodating container 6 so that detergent accommodating container 6 can be pulled out.

Connection pipe member 32 has one end connected to water delivery member 31 and the other end connected to water tub 11. As described above, detergent accommodating container 6 can be pulled out from main body 1, and in FIG. 2, a state of being pulled out from main body 1 is illustrated by a two-dot chain line.

Drain port 17 is provided to a lower part on the back side of water tub 11, and one end of drain pipe 19 is connected to drain port 17. Furthermore, the other end of drain pipe 19 is connected to case member 60. Drain pipe 19 guides water discharged from drain port 17 to case member 60. Filter member 50 is provided inside case member 60. Drain hose 35 is connected to

case member 60. Drain hose 35 drains water that has passed through case member 60 and filter member 50 to an outside of main body 1. Note that case member 60 is also referred to as a filter case.

Furthermore, circulation pump 21 is attached to case member 60. Circulation path 22 is provided so as to connect jetting port 23 provided to water tub 11 with circulation pump 21.

Overflow port 36 is provided to a lower part of a front surface of water tub 11 at a position higher than jetting port 23. One end of overflow hose 37 is connected to overflow port 36. Furthermore, overflow hose 37 is connected to drain hose 35 via case member 60.

Case member 60 is disposed inside main body 1, but filter member mounting portion 65 (see FIG. 3A) described later is exposed to the outside. Filter member 50 is detachably housed inside filter member mounting portion 65. Grip 51 that is an end portion of filter member 50 is exposed to the outside (see FIG. 1). Second door body 45 is disposed so as to cover a lower part of main body 1, filter member mounting portion 65, and grip 51, and is provided openably and closably with respect to main body 1. The user can remove foreign matter 70 (see FIG. 6A) inside case member 60 by detaching filter member 50 from case member 60 with second door body 45 opened.

Next, case member 60 and filter portion 52 will be described with reference to FIGS. 3A and 3B.

FIG. 3A is a perspective view of case member 60 of the washing machine according to the first exemplary embodiment. FIG. 3B is a perspective view of filter member 50 of the washing machine.

Case inflow path 61 is formed on an upper surface side of case member 60 and is connected to drain pipe 19. Case inflow path 61 allows water that has flowed in from drain pipe 19 to drop into filter portion 52. Drain cock 18

is attached to cock attachment portion 64. When drain cock 18 is opened, water in case member 60 flows into case discharge path 62. Case discharge path 62 is connected to drain hose 35 and discharges, via drain hose 35, the water that has flowed in. Circulation pump 21 is attached to circulation pump connecting portion 63. Overflow hose 37 is connected to overflow path connecting portion 66. Overflow hose 37 communicates with overflow port 36 provided to water tub 11. A screw thread is provided inside filter member mounting portion 65.

Subsequently, filter member 50 will be described with reference to FIG. 3B.

Filter member 50 mainly includes grip 51 and filter portion 52. Grip 51 is rotatably provided with respect to filter portion 52. Filter portion 52 is provided on a back side of grip 51, and filter portion 52 is housed inside case member 60.

A screw thread is provided on a side surface of grip 51 so as to correspond to filter member mounting portion 65. Filter portion 52 constitutes a bayonet structure together with grip 51. When grip 51 is rotated clockwise with respect to case member 60, grip 51 and filter member mounting portion 65 are screwed together. Filter member 50 is locked to case member 60 by the screwing of grip 51 and filter member mounting portion 65 and cannot be pulled out. Furthermore, when grip 51 is rotated counterclockwise with respect to case member 60, the lock is released and filter member 50 can be pulled out.

Next, filter portion 52 will be described with reference to FIGS. 4A, 4B, 4C, and 4D.

FIG. 4A is a side view of the filter portion of the washing machine according to the first exemplary embodiment, FIG. 4B is a top view of the filter

portion of the washing machine, FIG. 4C is a cross-sectional view taken along line B-B of FIG. 4B, and FIG. 4D is a cross-sectional view taken along line A-A of FIG. 4B.

Base 57 is provided on a back surface of grip 51. Central portion 55 is provided so as to extend from base 57. In addition, central portion 55 is formed in a plate shape so that a tip in a longitudinal direction is inclined upward.

First cylinders 53 are formed so as to extend from central portion 55 to right and left with central portion 55 as a center. Each of first cylinders 53 is gently inclined upward from central portion 55 to the other end.

Second cylinders 54 are disposed at right and left end portions of first cylinders 53 so as to extend upward. Second cylinders 54 are integrated with first cylinders 53 to form a U-shape. Note that the "U-shape" includes not only a completely U-shape but also a substantially U-shape. A plurality of first cylinders 53 and a plurality of second cylinders 54, which form U-shapes, are disposed at a predetermined interval, and disposed over entire central portion 55 in the longitudinal direction. As a result, central portion 55, first cylinders 53, and second cylinders 54 form a rib-like structure as a whole. As described above, first cylinders 53 extend from central portion 55 in a horizontal direction (crosswise direction). Note that each of first cylinders 53 may be inclined upward (vertical direction) as each of first cylinders 53 goes away from central portion 55. Second cylinders 54 extend upward from tips of first cylinders 53.

Rib 56 is formed in the longitudinal direction of central portion 55 and is located on a center line of central portion 55. In addition, rib 56 extends upward. Rib 56 has a role of straightening flowing water and a role of ensuring strength of filter portion 52.

Next, an operation and an effect of the present invention will be described with reference to FIGS. 5, 6A, and 6B.

FIG. 5 is a schematic view illustrating a flow of the washing water in a state where the filter member is mounted on the case member of the washing machine. FIG. 6A is a schematic view of a state where the filter portion of the washing machine has collected foreign matter. FIG. 6B is a schematic view of removing the foreign matter from the filter portion of the washing machine.

When water in water tub 11 is drained, drain cock 18 is opened. The washing water in water tub 11 then flows into case inflow path 61 via drain pipe 19 and reaches filter portion 52 mounted inside case member 60. The washing water passes through filter portion 52 as indicated by arrow B in FIG. 5, and is discharged to the outside via case discharge path 62 and drain hose 35.

Meanwhile, when the circulation pump is used, drain cock 18 is closed. When circulation pump 21 is operated, water is sucked from circulation pump connecting portion 63 by an operation of circulation pump 21 and is sent into filter portion 52. The sent-in washing water passes through filter portion 52, then passes through circulation pump connecting portion 63, and is supplied to water tub 11 again, as indicated by arrow C in FIG. 5. As described above, circulating the washing water filtered by filter portion 52 can enhance a cleaning ability while reducing an amount of water used.

As described above, foreign matter 70 contained in the washing water is collected by filter portion 52 regardless of whether the washing water is drained or circulated by use of the circulation pump. Specifically, the washing water that has dropped from above the tip of central portion 55 is discharged to the outside through a gap between second cylinder 54 and adjacent second cylinder 54 or a gap between first cylinder 53 and adjacent first cylinder 53

while moving to the right. Foreign matter 70 such as lint or hair is entangled in second cylinder 54 or first cylinder 53 when passing through the gap between second cylinder 54 and adjacent second cylinder 54 or the gap between first cylinder 53 and adjacent first cylinder 53. If foreign matter 70 is left as it is, foreign matter 70 may cause mold or generation of an offensive odor. Therefore, when foreign matter 70 has been gathered in filter portion 52 to some extent, filter portion 52 needs to be cleaned.

Next, a method of cleaning filter member 50 and an effect of filter member 50 will be described with reference to FIG. 6.

First, the user opens second door body 45 and takes out filter member 50. As described above, filter member 50 can be detached from case member 60 by the user rotating grip 51 in a predetermined direction to release the lock and pulling grip 51 toward the user. Note that detached filter member 50 can be locked by the user inserting filter member 50 into filter member mounting portion 65 and rotating filter member 50 in a direction opposite to the above-described predetermined direction.

Subsequently, foreign matter 70 collected by second cylinder 54 or first cylinder 53 is traced upward with a nail, a fingertip, or a daily item such as a toothbrush. Since second cylinder 54 and first cylinder 53 are formed in a series, the user can easily collect foreign matter 70 only by tracing foreign matter 70 upward, and remove foreign matter 70 from an end of second cylinder 54.

If foreign matter 70 cannot be completely removed by being traced upward, a water flow may be applied from a back surface of first cylinder 53. When the water flow is applied from the back surface of first cylinder 53, foreign matter 70 moves along second cylinder 54, so that it is possible to remove even fine foreign matter 70 that could not be removed only by being

traced.

Furthermore, when foreign matter 70 winds around central portion 55, foreign matter 70 is difficult to remove only by being traced upward. However, since rib 56 is formed on central portion 55, it is possible to prevent foreign matter 70 from being wound around central portion 55 and being collected. Even if foreign matter 70 is wound around central portion 55, a gap is formed between central portion 55 and rib 56, and therefore foreign matter 70 can be cut and removed with scissors.

In the present exemplary embodiment, since first cylinder 53 is provided at a bottom of filter portion 52, foreign matter 70 can be collected also at the bottom. In addition, since the water flow passes through the bottom via the gap between first cylinder 53 and adjacent first cylinder 53, a drain flow rate can be secured.

Furthermore, the water flow that has flowed into an inside of filter portion 52 is divided into right and left so as to avoid rib 56, and discharged from the gap between second cylinder 54 and adjacent second cylinder 54 or the gap between first cylinder 53 and adjacent first cylinder 53. As a result, it is possible to prevent an eddy water flow to be generated in central portion 55, and furthermore, to reduce a resistance that water receives from the filter.

As described above, a drum type washing machine according to the present exemplary embodiment includes main body 1, water tub 11 that is supported by main body 1, rotary drum 10 that is disposed in water tub 11 and rotatably provided, drain pipe 19 and drain hose 35 that discharge water drained from water tub 11 to an outside, case member 60 that is provided between drain pipe 19 and drain hose 35, and filter member 50 that is detachably housed in case member 60 and collects foreign matter 70 contained in the drained water. Filter member 50 includes central portion 55 extending

in a longitudinal direction of filter member 50, and a plurality of side portions each extending in a U-shape with central portion 55 as a center.

As a result, foreign matter 70 collected by filter member 50 can be removed from the side portions only by being traced upward. Thus, the filter device that filters water can be easily cleaned, and therefore, maintainability of the filter device can be improved.

Furthermore, filter member 50 may include rib 56 disposed in a longitudinal direction of central portion 55, and rib 56 may extend upward.

As a result, it is possible to prevent an eddy water flow to be generated in central portion 55, and furthermore, to reduce a resistance that water receives from the filter. Therefore, it is possible to prevent a velocity of a water flow from decreasing in filter member 50.

Furthermore, each of the side portions includes first columnar member 53 and second columnar member 54. First columnar member 53 extends from central portion 55 in a horizontal direction. Second columnar member 54 extends upward from a tip of first columnar member 53. Furthermore, a plurality of first columnar members 53 and a plurality of second columnar members 54 are provided.

As a result, foreign matter 70 collected by filter member 50 can be removed from ends of second columnar members 54 only by being traced upward.

Furthermore, first cylinder 53 is inclined upward as first cylinder 53 goes away from central portion 55.

As a result, foreign matter 70 gathered on a side of the central portion is pulled in a crosswise direction along first columnar member 53, and foreign matter 70 is easily pulled along this inclination. As a result, the foreign matter is easily transferred from first columnar member 53 to second

columnar member 54 smoothly. Therefore, foreign matter 70 collected by filter member 50 can be more easily removed from the ends of second columnar members 54 only by being traced upward.

Note that, in the description of the present exemplary embodiment, the description has been made by use of the wording indicating directions such as "horizontal direction" and "vertical direction", but the wording is not limited to a case of completely "horizontal" and "vertical" directions, but also includes a case of "substantially horizontal" and "substantially vertical" directions.

(Other exemplary embodiments)

As described above, the first exemplary embodiment has been described as an example of a technology disclosed in the present application. However, the technology in the present disclosure is not limited to this, and can be applied to exemplary embodiments in which changes, replacements, additions, omissions, or the like have been made.

Therefore, other exemplary embodiments will be exemplified below.

The present exemplary embodiment has been described by use of the drum type washing machine. However, the washing machine of the present invention is not limited to the drum type washing machine, and may be a pulsator type washing machine or a two-layer type washing machine.

In the present exemplary embodiment, first cylinder 53 and second cylinder 54 have been described as the side portion. The side portion is not limited to a cylinder, and may be a prism or a plate, as long as the side portion extends in a U-shape with the central portion as the center. That is, each of first cylinder 53 and second cylinder 54 may be a columnar member.

In the present exemplary embodiment, it has been described that second cylinders 54 and first cylinders 53 form the U-shape. However, the shape formed by second cylinders 54 and first cylinders 53 is not limited to the

U-shape, and may be a rounded U-shape or a semicircular shape. Furthermore, right and left first cylinders 53 are not limited to those formed so that a right part and a left part are in a straight line, and may be disposed so as to be staggered. In addition, a length of each of second cylinders 54 may be constant or may vary.

As described above, a washing machine according to the present invention can easily remove foreign matter collected by a filter device that filters water, and thus can be applied to a drum type washing machine, a pulsator type washing machine, and a two-layer type washing machine.

REFERENCE MARKS IN THE DRAWINGS

1	main body
3	first door body
4	operation unit
5	display
7	throw-in opening
10	rotary drum
11	water tub
45	second door body
50	filter member
51	grip
52	filter portion
53	first cylinder (first columnar member)
54	second cylinder (second columnar member)
55	central portion
56	rib
57	base

60 case member (filter case)

61 case inflow path

62 case discharge path

63 circulation pump connecting portion

64 cock attachment portion

65 filter member mounting portion

66 overflow path connecting portion

70 foreign matter

CLAIMS

1. A washing machine comprising:

a housing;

a water tub that is supported by the housing;

a drum that is rotatably disposed in the water tub;

a drain path that discharges water drained from the water tub to an outside;

a filter case that is disposed in a middle of the drain path; and

a filter body that is detachably housed inside the filter case and collects foreign matter contained in the water drained,

wherein the filter body includes

a central portion extending in a longitudinal direction of the filter body, and a plurality of side portions each extending in a U-shape with the central portion being as a center.

2. The washing machine according to claim 1,

wherein the filter body includes a rib disposed in a longitudinal direction of the central portion, and the rib extends upward.

3. The washing machine according to claim 1 or 2,

wherein each of the side portions includes a first columnar member and a second columnar member,

the first columnar member extends from the central portion in a horizontal direction,

the second columnar member extends upward from a tip of the first columnar member, and

a plurality of the first columnar members and a plurality of the second columnar members are provided.

4. The washing machine according to claim 3,

wherein the first columnar member is inclined upward as the first columnar member goes away from the central portion.