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DRUM TYPE WASHING MACHINE

Field of the Invention

5 The present invention relates to a drum type washing machine which includes a rotary drum installed in a water tub such that a rotational axis thereof is declined toward a rear portion of the washing machine.

10 Background of the Invention

 A conventional drum type washing machine including a rotary drum having a substantially horizontal rotational axis in a water tub performs a washing process by rotating
15 the cylindrical rotary drum such that laundry articles accommodated in the rotary drum are lifted up by stirring protrusions prepared at an inner wall of the rotary drum and are then dropped when reaching a specific height to thereby undergo pounding motions (see Japanese Laid-open Publication
20 No. 9-215894, pp. 2 - 6, Fig. 1).

 As described above, since the washing process of the drum type washing machine is performed mainly by way of pounding the laundry articles, the laundry articles are subject to less damages than a washing machine having a
25 rotary drum vertically mounted therein. However, such drum type washing machine including a horizontally mounted rotary



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drum has certain disadvantages in that the user has to bend down to load and unload the laundry articles into and from the rotary drum through an opening prepared at a front wall of the washing machine, which is not only inconvenient but also unsuitable for a small house. To solve the problem, it has been suggested to have the rotational axis of the rotary drum slanted, while raising the opening of the rotary drum, to thereby facilitate the loading and unloading of the laundry articles and the installation of the drum type washing machine in a small space.

However, if the rotary drum is horizontally slanted, the laundry articles are gathered at a rear bottom portion of the rotary drum. Thus, a satisfactory effect of the pounding motions cannot be obtained by lifting up and dropping the laundry articles with conventional stirring protrusions. Further, the slanted rotary drum having the conventional stirring protrusions produces another problem in that washing fluid is collected at the rear bottom portion of the rotary drum, rendering it difficult to completely soak the laundry articles in the washing fluid if the amount of the washing fluid is small.

Summary of the Invention

It is, therefore, an object of the present invention to provide a drum type washing machine implemented with

stirring protrusions for sufficiently agitating laundry articles in a slanted rotary drum.

In accordance with the present invention, there is provided a drum type washing machine including a cylindrical rotary drum installed in a water tub such that a rotational axis thereof is declined toward a rear portion of the washing machine, wherein stirring protrusions having their respective pinnacles formed at an oblique angle with respect to the direction of the rotational axis are installed at a plurality of locations on an inner peripheral surface of the rotary drum.

Since the agitating direction is changed when the agitating operation is performed to reverse the rotational direction of the rotary drum, the laundry articles are sufficiently agitated by changing its positions in the rotary drum, to thereby improve the agitating efficiency.

Brief Description of the Drawings

The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments given in conjunction with the accompanying drawings, in which:

Fig. 1 shows a cross sectional view of a main part of a drum type washing machine in accordance with a preferred embodiment of the present invention;

Figs. 2A to 2C give a top view, front view and side view of a first example of a stirring protrusion in accordance with the present invention, respectively;

5 Figs. 3A to 3C present a top view, front view and side view of a second example of a stirring protrusion in accordance with the present invention, respectively; and

Figs. 4A and 4B offer cross sectional views of a rotary drum having stirring protrusions, for showing the movement of laundry articles therein

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Detailed Description of the Preferred Embodiments

Referring to Fig. 1, there is shown drum type washing machine 1 in accordance with a preferred embodiment of the present invention. As illustrated in Fig. 1, housing 6
15 accommodates therein water tub 3 suspended by a suspension structure (not shown), and cylindrical rotary drum 2 having a base is installed in water tub 3 such that a rotational axis thereof is declined toward a rear portion of housing 6.
20 Formed at a front portion of water tub 3 is laundry articles loading opening 11 extending to an open end of rotary drum 2. The laundry articles are loaded into and unloaded from rotary drum 2 through laundry articles loading opening 11 after door 9 for opening 11 is opened. Door 9, installed at
25 an inclining surface formed at a front surface of housing 6, enables the loading/unloading of the laundry articles to be

performed without a user having to bend down, which improves usability of the conventional front loading drum type washing machine.

5 A number of water passing holes 8 opened into water tub 3 are provided at a peripheral surface of rotary drum 2, and stirring protrusions 4 are prepared at a plurality of locations on an inner side wall of rotary drum 2. Rotary drum 2 is driven to rotate in clockwise and counterclockwise directions by motor 7 installed at a rear wall of water tub 10 3. Water tub 3 is connected to water supply piping 12 and water drain piping 13 and water is fed into and drained from water tub 3 by regulating a water supply valve and a water drain valve (both not shown).

15 After an opening of door 9, the laundry articles and detergent are loaded into rotary drum 2 and then the operation of drum type washing machine 1 is initiated. A predetermined amount of fresh water is fed into water tub 3 through water supply piping 12, after which rotary drum 2 is driven to rotate by motor 7 to start a washing process. By 20 such rotation of rotary drum 2, the laundry articles accommodated in rotary drum 2 are made to undergo repeated agitating motions by being lifted up in a rotational direction by stirring protrusions 4 formed at an inner side wall of rotary drum 2 and then dropped when reaching a 25 specific height, thereby creating pounding motions. The washing fluid is drained through water drain piping 13 after

a period of time required for the washing process and the laundry articles are dewatered by way of rotating rotary drum 2 at a high rotation speed. Thereafter, fresh water is fed into water tub 3 through water supply piping 12 and a rinsing process is initiated. In the rinsing process, the laundry articles in rotary drum 2 are subject to repeated agitating motions, i.e., being lifted up by stirring protrusions 4 and then dropped, by rotating rotary drum 2 as in the washing process to thereby perform the rinsing process.

In drum type washing machine 1 configured to have rotary drum 2 slanted with respect to a horizontal direction as in the present embodiment, water supplied into water tub 3 is collected in a rear bottom portion of water tub 3 and rotary drum 2 and the laundry articles are also gathered at the rear bottom portion, at which state the laundry articles are desirably soaked in the washing fluid when rotary drum 2 is in a stop mode. However, when the rotary drum 2 is rotated to agitate the laundry articles, the agitation of laundry articles may not be carried out sufficiently since the laundry articles may gather at a rear portion of rotary drum 2. Accordingly, it is required to agitate the laundry articles while moving the laundry articles from the rear portion to a front portion of rotary drum 2 by rotating the rotary drum 2. For such requirement, the shape of stirring protrusions 4 provided in rotary drum 2 is important.

Referring to Figs. 2A and 2C, there is shown a first example of stirring protrusion 4. Stirring protrusion 4 includes base 4b of a substantially rectangular shape abutted against an inner peripheral surface of rotary drum 2 and has a cross section of a mountain shape having pinnacle 4a of a predetermined height formed in a generally diagonal direction with respect to base 4b. Formed between pinnacle 4a and base 4b is inclined surface 4c of a substantially arc shape having different radii depending on the cross sectional position. Inclined surface formed between pinnacle 4a and base 4b has different inclinations on its right left sides respectively. Stirring protrusion 4 is placed on the inner peripheral surface of rotary drum 2 such that the longitudinal direction of base 4a coincides with the direction of the rotational axis of rotary drum 2, so that pinnacle 4a forms a slanted angle with respect to the direction of the rotational axis of rotary drum 2. A preferable slanted angle is 20 degrees. In this case, the inclination of inclined surface 4c becomes gentle in a direction from the rear portion to the front portion of rotary drum 2.

Referring back to Fig. 1, if rotary drum 2 having stirring protrusions 4 configured as above at three locations (shown at only two of them) on the inner peripheral surface is rotated in a clockwise direction in front view in the washing or the rinsing process, the

laundry articles, which are apt to gather at rear portion of slanted rotary drum 2, are moved from the rear portion to the front portion of rotary drum 2 while being lifted up along inclined surfaces 4c. Therefore, the laundry articles
5 are sufficiently agitated in such slanted rotary drum 2 without sliding toward the lower position of the rear portion of rotary drum 2. As a result, the laundry articles are agitated, while changing positions in rotary drum 2, to thereby prevent a reduction in the washing efficiency.

10 In case of washing a large amount of the laundry articles, the laundry articles may not be completely soaked in the washing fluid. In such case, the agitating motions for changing positions of the laundry articles in rotary drum 2 are required in order to make the laundry articles
15 fully soaked in the washing fluid. However, in rotary drum 2 having stirring protrusions 4, changing of the positions of the laundry articles are sufficiently performed, which in turn prevents poor cleaning and enhances the cleaning efficiency.

20 Figs. 3A to 3C show a second example of stirring protrusion 14, wherein the height of pinnacle 14a becomes greater toward the rear portion of rotary drum 2. The rest of the configuration is substantially the same as in the first example. By heightening stirring protrusion 14 toward
25 the rear portion of rotary drum 2, i.e., the lower position of rotary drum 2, the laundry articles are moved up to the

lower part of stirring protrusion 14, i.e., the front portion of rotary drum 2, with an increase in the motion of lifting up the laundry articles from the lower position to the higher position, as illustrated in Fig. 4B. Further, when stirring protrusion 14 is positioned in the lower portion of rotary drum 2, the laundry articles are rolled or slid over pinnacle 14a while moving toward the front portion of rotary drum 2. Accordingly, the laundry articles are agitated by changing the positions in rotary drum 2 to increase the agitating efficiency.

When rotary drum 2 is slantingly disposed, the agitating efficiency can be improved by installing stirring protrusions 4 and 14 near to the rear portion of rotary drum 2 as shown in Figs. 4A and 4B.

Furthermore, since the length of stirring protrusions 4 and 14 are configured to be approximately 1/2 of that of rotary drum 2, there occurs a motion such that the laundry articles lifted up by stirring protrusions 4, 14 are moved to the space without stirring protrusions, i.e., the front portion of rotary drum 2, thereby obtaining an effect of raising the laundry articles in the lower position of the rear portion of rotary drum 2 to the higher position of the front portion thereof.

In the stirring protrusions 4, 14 configured as described above, the inclined surfaces thereof for connecting bases 4b, 14b and pinnacles 4a, 14a, respectively,

are of an arc shape. However, the inclined surfaces may be formed to be flat.

The conventional drum type washing machine is advantageous in that the laundry articles are subject to less damage and that a small amount of water is used, but is problematic with respect to the usability and space. That is, the structure of carrying the laundry articles into and out of the rotary drum through the opening, provided at the front surface of the washing machine, is not only inconvenient but also unsuitable for the houses having a limited space. However, the loading/unloading processes of the laundry articles can be performed conveniently by slantingly disposing the rotary drum, so that the usability thereof is equal to that of the conventional washing machine having a vertical water tub. Further, the problem of the laundry articles gathering in the lower position of the rotary drum due to the slanted rotary drum can be solved by implementing the stirring protrusions configured as in the above examples. As a result, a drum type washing machine having an excellent cleaning efficiency can be fabricated.

While the invention has been shown and described with respect to the preferred embodiments, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the following claims.

Claims:

1. A drum type washing machine comprising a cylindrical rotary drum installed in a water tub such that a rotational axis thereof is declined toward a rear portion of the washing machine,

wherein stirring protrusions having their respective pinnacles formed at an oblique angle with respect to the direction of the rotational axis are installed at a plurality of locations on an inner peripheral surface of the rotary drum,

wherein the stirring protrusions are installed near the rear portion of the rotary drum.

2. The drum type washing machine of claim 1, wherein each of the stirring protrusions has a base abutted against the inner peripheral surface of the rotary drum and installed such that a longitudinal direction of the base is

in parallel with the direction of the rotational axis of the rotary drum; and inclined surfaces on both sides thereof extending from the base to the pinnacle and having different shapes from each other.

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3. The drum type washing machine of claim 1 or 2, wherein the height of the pinnacle of each of the stirring protrusions becomes greater toward the rear portion of the rotary drum.

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4. The drum type washing machine of claim 1 or 2, wherein the length of the stirring protrusions is about 1/2 of that of the rotary drum.