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(71) Applicant: **MATSUSHITA ELECTRIC INDUSTRIAL
CO., LTD.**
Kadoma-shi, Osaka 571-8501 (JP)

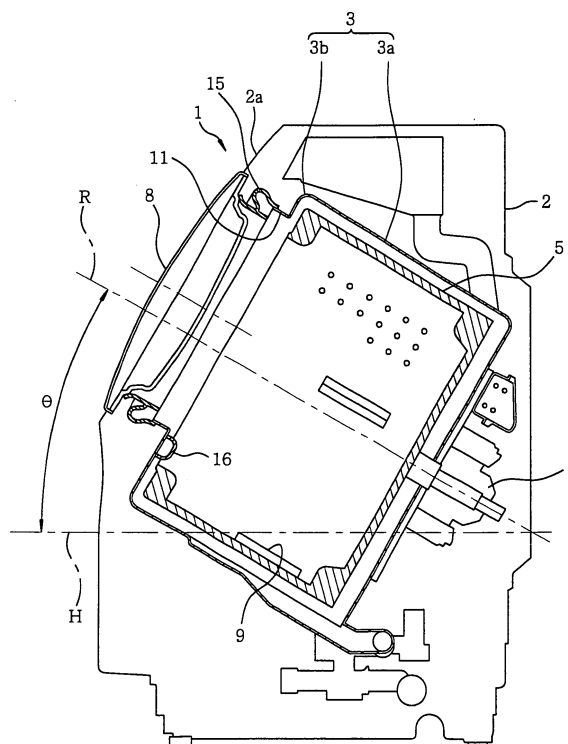
(72) Inventors:
• **Ida, Haruo**
Kishiwada-shi Osaka 596-0077 (JP)
• **Ishihara, Takayuki**
Ikeda-shi Osaka 563-0037 (JP)
• **Fukuda, Tsuyoshi**
Toyonaka-shi Osaka 561-0831 (JP)

(74) Representative: **Turi, Michael, Dipl.-Phys. et al**
Samson & Partner
Widenmayerstrasse 5
80538 München (DE)

(54) **Drum type washing machine**

(57) A drum type washing machine includes a housing (2), a water tub (3) disposed in a housing (2) and having a body (3a) with a base on one end and a lid (3b) for providing a laundry loading/unloading opening (11) on the other end, a rotary drum (5) disposed in the body (3a) of the water tub (3) and having a closed bottom and at its top a rotary drum opening, the rotary drum (5) opening being disposed on the same side as the lid (3b) of the water tub (3), and a door (8) installed in the housing. The central axis of the laundry loading/unloading opening (11) is positioned above a rotational axis of the rotary drum (5) and the diameter of the laundry loading/unloading opening (11) is smaller than that of the rotary drum opening. Further, the door (8) is disposed to be substantially concentric with the laundry loading/unloading opening (11).

FIG. 1



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Description

[0001] The present invention relates to a drum type washing machine for washing laundry accommodated in a rotary drum by rotating the rotary drum disposed in a water tub.

[0002] A conventional drum type washing machine is shown in Fig. 3. As shown in the drawing, housing 57 of the washing machine has water tub 53 installed via a suspension structure. Disposed in water tub 53 is rotary drum 51 which is provided with multiple drum perforations 52 on its cylindrical surface and is driven to rotate by drum driving motor 55. Further, by opening door 54, which is installed at the front portion of housing 57, laundry can be loaded into or unloaded from rotary drum 51 via laundry loading/unloading opening 58 formed at the front portion of water tub 53.

[0003] After opening door 54, laundry and detergent are added in rotary drum 51, and when the washing machine starts, water is supplied in water tub 53 and also in rotary drum 1 through drum perforations 52. Then, when rotary drum 51 is driven to rotate at a predetermined rotation speed by drum driving motor 55, the laundry in rotary drum 51 is lifted up in the rotational direction by agitation blades 56 disposed on the inner cylindrical surface of rotary drum 51 and drops down upon reaching a specific height, thereby undergoing pounding motions. After completion of the washing process, soiled wash water is drained, and a rinsing process is carried out in fresh water. Then, when the rinsing process is finished, a water-extracting process is carried out by spinning rotary drum 51 at a high rotational speed. The series of processes described are automatically performed according to a preset control sequence (see Japanese Patent Laid-Open Application No. 1997-215893, pp. 3 to 5, Fig. 1).

[0004] In the conventional drum type washing machine, the centers of the laundry loading/unloading opening and the door are arranged so that they lie on the substantially same line, namely, on the rotational axis of the rotary drum. Further, the diameter of the laundry loading/unloading opening, formed at the front portion of the water tub, is designed to be smaller than the cross section of the rotary drum. Although it is preferable to have as large diameter of the rotary drum as possible so long as permitted within a space for installation, the size of the laundry loading/unloading opening has an optimum size with respect to the diameter of the door. Accordingly, the loading/unloading opening is sized with respect to the diameter of the door while noting the fact that possible installation space for the drum type washing machine will be limited if the door is too big.

[0005] Since the laundry loading/unloading opening and the door are arranged concentrically on the rotational axis of the rotary drum and the diameter of the laundry loading/unloading opening is formed to be smaller than the diameter of the rotary drum, there is a blind spot in the front portion of the rotary drum, i.e., a

space that cannot be directly observed, when the door is opened. Therefore, user may fail to notice any laundry in the space and forget to take the laundry out while it is also difficult to reach the space to take out laundry therefrom.

[0006] Accordingly, it is a primary object of the present invention to provide a drum type washing machine having a structure for facilitating loading and unloading of laundry to compensate for the design limitation of the smaller loading/unloading opening compared to that of the rotary drum.

[0007] In accordance with a preferred embodiment of the present invention, there is provided a drum type washing machine including: a housing; a water tub disposed in the housing and includes a cylindrical body, the body having a base on one end and a lid for providing a laundry loading/unloading opening on the other end; a cylindrical rotary drum disposed in the body of the water tub and having a closed bottom and at its top a rotary drum opening, the rotary drum opening being disposed on the same side as the lid of the water tub; a motor installed at a center of the rotary drum; and a door installed in the housing, wherein the central axis of the laundry loading/unloading opening is positioned above a rotational axis of the rotary drum and the diameter of the laundry loading/unloading opening is smaller than that of the rotary drum opening; and the door is disposed to be substantially concentric with the laundry loading/unloading opening.

[0008] In such configuration, the rotary drum is disposed approximately concentric with and in the water tub, and the laundry loading/unloading opening formed at the water tub is placed such that its center is positioned above the center of the rotary drum. Further, the door installed at the housing is substantially concentric with the laundry loading/unloading opening. Therefore, when loading or unloading laundry into or out of the rotary drum by opening the door, user's line of vision can easily reach the inside of the rotary drum from above and the lower portion of the rotary drum can be observed easily because the centers of laundry loading/unloading opening and the door are positioned higher. Thus, user's line of vision is hardly obstructed from observing the area that used to be hidden from view so that user would not forget to take out any laundry in the area. Therefore, it is possible to fabricate a washing machine with such an enhanced feature to increase user convenience.

[0009] The above and other objects and features of the present invention will become apparent from the following description of a preferred embodiment given in conjunction with the accompanying drawings, in which:

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

Fig. 2 is a plan view showing a configuration of a lid of a water tub; and

Fig. 3 is a cross sectional view of a conventional

drum type washing machine.

[0010] With reference to Fig. 1, there is described a configuration of major components of drum type washing machine 1 in accordance with a preferred embodiment of the present invention. Housing 2 has therein water tub 3 supported on a suspension structure (not shown), and cylindrical rotary drum 5 having a bottom surface is disposed in water tub 3 such that the direction R of its rotational axis is slanted at a specific angle θ with respect to the horizontal direction H.

[0011] Specifically, rotary drum 5 is installed in water tub 3 such that its opening is positioned at the front portion of housing 2 while the bottom surface of rotary drum 5 is disposed at the rear portion of housing 2. Further, rotary drum 5 is slanted such that the direction R of the rotational axis thereof is declined toward the rear portion of housing 2 at the angle θ . Rotary drum 5 is driven to rotate by drum driving motor 4 installed at the rear portion of water tub 3. Water tub 3 includes cylindrical main body 3a having a base and lid 3b connected to main body 3a, wherein lid 3b of the water tub extends in the negative radial direction (i.e., toward the center) to provide laundry loading/unloading opening 11 through which laundry is loaded into or unloaded from rotary drum 5. Further, door 8 is installed at an inclined surface 2a formed at the front surface portion of housing 2 such that it faces laundry loading/unloading opening 11. Though lid 3b and main body 3a of water tub 3 are described as separate components herein, it is also possible to form lid 3b and main body 3a seamlessly as one component. For instance, when lid 3b and main body 3a are formed of, e.g., a plastic material, they are molded as one body, or, when they are made of, e.g., a metallic material, they are manufactured as one body. Laundry can be loaded into or unloaded from rotary drum 2 after door 8 is opened. Further, by forming door 8 partially or entirely with a transparent material, the inside of rotary drum 5 can be viewed from outside. Moreover, bellows 15, which is made of a flexible elastic body, is disposed around laundry loading/unloading opening 11. Accordingly, when door 8 is closed, the inner surface of door 8 makes a pressurized contact with an end of bellows 15, to thereby prevent splashed water by the rotation of rotary drum from running over water tub 3.

[0012] As described above, by having rotary drum 5 slanted and installing door 2 on housing 2 to face the opening of rotary drum 5, loading and unloading of laundry can be performed without a user having to bend down, and installation of drum type washing machine 1 in a small space, e.g., bathroom, where a conventional vertical washing machine is typically installed, becomes easier because having clearance space in front of washing machine 1 is no longer required. Therefore, drum type washing machine 1 can be configured to be suitable for even small houses with limited space.

[0013] With regard to laundry loading/unloading opening 11 location, it is formed such that its center lies

above the rotational axis of rotary drum 5. Further, door 8 is disposed to be substantially concentric with laundry loading/unloading opening 11. Since there is an optimum diameter of door 8 with respect to, e.g., an installation space of washing machine 1, the diameter of door 8 is smaller than that of rotary drum opening. Further, since laundry loading/unloading opening 11 is sized corresponding to the diameter of door 8, the diameter of laundry loading/unloading opening 11 is also formed to be smaller than that of rotary drum opening. If laundry loading/unloading opening 11 and door 8 are installed such that their centers are positioned above the rotational axis of rotary drum 5 as described, the blind spot area is made smaller when the inside of rotary drum 5 is looked into through laundry loading/unloading opening 11 after opening door 8. Thus, laundry accommodated in rotary drum 5 can be observed without being hidden from view. Therefore, it is highly unlikely that a user would fail to take out any laundry inside the rotary drum 5. Particularly, by slanting rotary drum 5 and installing door at inclined surface 2a formed to correspond to the angle of inclination of rotary drum 5 as in drum type washing machine 1 in accordance with the preferred embodiment of the present invention, the inside of rotary drum 5 can be viewed more extensively.

[0014] Inventors of the present invention conducted extensive research to find an optimum angle e of inclination of rotary drum 5, and it was found that the preferable angle to be about 30 ± 5 degrees. By slanting rotary drum 5 at the angle θ of about 30 ± 5 degrees, any users, whether they are children (not infants), adults or people using a wheelchair, can load and unload laundry conveniently regardless of their height. Further, by disposing laundry loading/unloading opening 11 and door 8 such that their centers are positioned above the rotational axis of rotary drum 5 while having rotary drum 5 slanted, loading/unloading of laundry becomes easier, and a user can easily inspect each washing operation step through transparent door 8.

[0015] However, since the diameter of laundry loading/unloading opening 11 is smaller than that of the opening of rotary drum 5 and laundry loading/unloading opening 11 is off-centered from the rotational axis of rotary drum 5, the lower portion of lid 3b of water tub 3 extends inward beyond the open end of rotary drum 5 to overlap with the rotary drum opening. Thus, in case some of laundry articles come out of the open end of rotary drum 5, they may get caught between rotary drum 5 and lid 3b as rotary drum 5 rotates.

[0016] In order to solve the problem, crescent-shaped laundry anti-trap protrusion 16 for preventing laundry from being trapped between rotary drum 5 and lid 3b is installed at the lower half portion of lid 3b, where lid 3b overlaps with the rotary drum opening, such that the protrusion 16 projects out toward the inside of rotary drum 5.

[0017] Fig. 2 provides a plan view of lid 3b of water tub 3, as viewed from inside. As shown therein, laundry

loading/unloading opening 11 is disposed such that its center lies above the center of rotary drum 5 and laundry anti-trap protrusion 16 having its central axis below the central axis of rotary drum 5 is formed in crescent shape and projected toward the inside of rotary drum 5.

[0018] By having laundry anti-trap protrusion 16, laundry is prevented from going into the space between rotary drum 5 and lid 3b. As a result, the problem of laundry being trapped due to the off-centered arrangement of laundry loading/unloading opening 11 can be prevented.

[0019] Although slanted rotary drum 5 described above offers advantages such that it facilitates loading and unloading of laundry, and it allows for a higher water depth level even with a small quantity of water because supplied water in rotary drum 5 collects in the rear portion. The drum design also has a disadvantage such that laundry in rotary drum 5 would gather at the lowest point, which is the lower rear portion of rotary drum 5. This laundry's tendency to gather in the rear area is further augmented by rotation of the drum 5. Thus, it is not possible to provide a satisfactory degree of detergency to all laundry articles being washed by changing their positions in rotary drum 5. In the preferred embodiment of the present invention, however, the problem is solved by changing the positions of laundry articles in rotary drum 5 by way of controlling the rotation of rotary drum 5 driven by drum driving motor 4 and by way of agitation blades 9 provided on the inner cylindrical surface of rotary drum 5.

[0020] As described above, by disposing the laundry loading/unloading opening of the water tub such that its center lies above the rotational axis of the rotary drum, the inside of the rotary drum can be seen more extensively when the door, which is provided at a position corresponding to the laundry loading/unloading opening, is opened even though the diameters of the door and the laundry loading/unloading opening are designed to be smaller than that of the rotary drum opening. Therefore, areas with blind spots are made smaller, and laundry in the rotary drum can be seen more easily. As a result, it is highly unlikely that a user would fail to notice and take out laundry from the rotary drum so that a more convenient washing machine is obtained.

[0021] While the invention has been shown and described with respect to the preferred embodiment, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

Claims

1. A drum type washing machine comprising:

- a housing;
- a water tub disposed in the housing and in-

cludes a cylindrical body, the body having a base on one end and a lid for providing a laundry loading/unloading opening on the other end;

a cylindrical rotary drum disposed in the body of the water tub and having a closed bottom and at its top a rotary drum opening, the rotary drum opening being disposed on the same side as the lid of the water tub;

a motor installed at a center of the rotary drum; and

a door installed in the housing,

wherein the central axis of the laundry loading/unloading opening is positioned above a rotational axis of the rotary drum and the diameter of the laundry loading/unloading opening is smaller than that of the rotary drum opening; and the door is disposed to be substantially concentric with the laundry loading/unloading opening.

2. The washing machine of claim 1, further comprising a laundry anti-trap protrusion disposed at a lower portion of the lid where the lid extends inward beyond an open end of the rotary drum, wherein the protrusion is projected to inside the rotary drum.
3. The washing machine of claim 1, wherein the lid and the body of the water tub are seamlessly formed.

FIG. 1

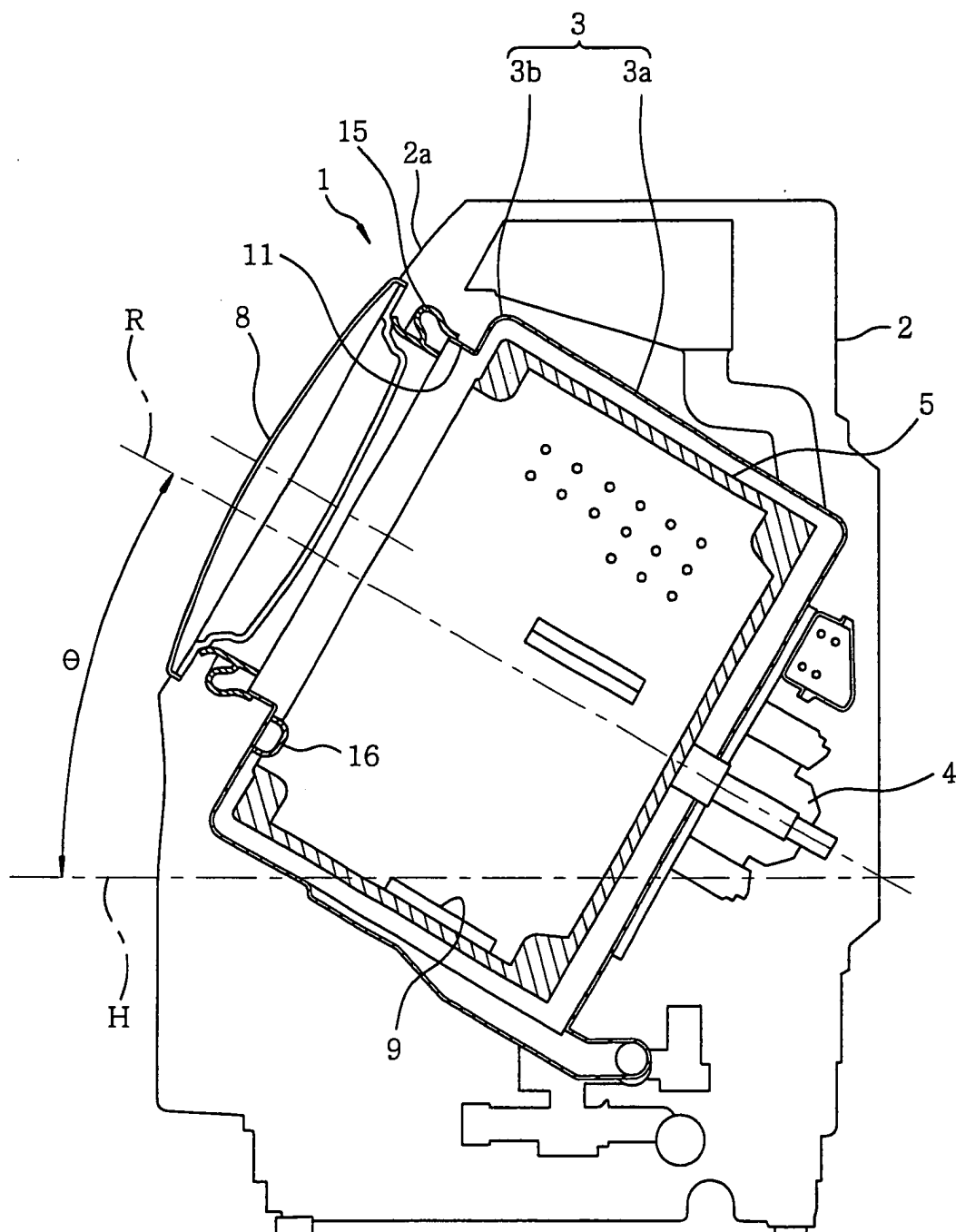


FIG. 2

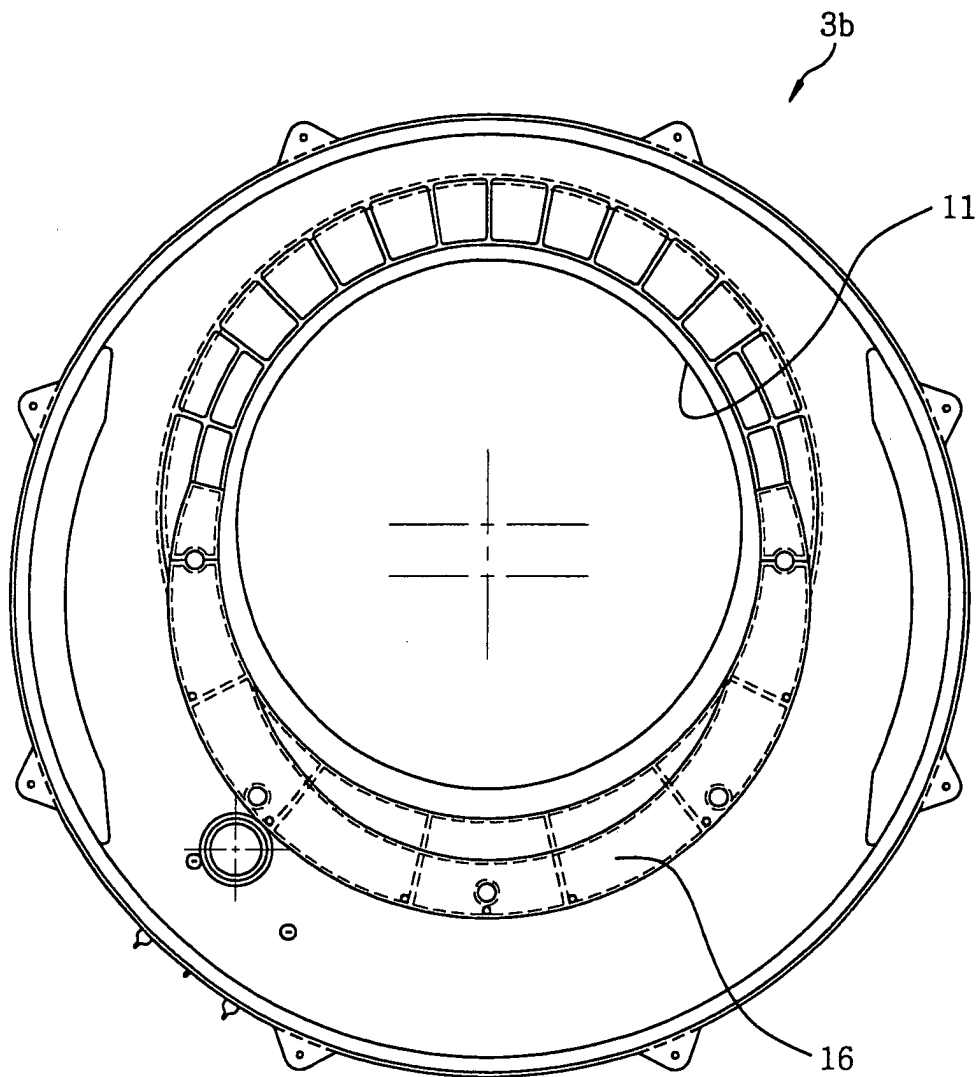


FIG.3
(PRIOR ART)

