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Washing machine

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**ABSTRACT OF THE DISCLOSURE**

Disclosed is a washing machine including an outer case, an outer tub disposed in the outer case to receive washing water, a rotational tub rotatably disposed in the outer tub, a pulsator rotating in the rotational tube to generate forced water current, a tub cover formed on an upper portion of the outer tub to guide the washing water to the rotational tub when the rotational tub and/or the pulsator rotate, a grille formed on an inner circumference of the tub cover, and a motor for transmitting driving force to the rotational tub and/or the pulsator.

AUSTRALIA

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## COMPLETE SPECIFICATION STANDARD PATENT

Invention Title:        **Washing machine**

The following statement is a full description of this invention, including the best method of performing it known to us:

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WASHING MACHINE

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a washing machine, and more particularly, to a washing machine that can improve the washing reliability thereof by preventing splash of water that may be caused by collision of the water with laundry during water supplying and permeating washing cycles.

Description of the Related Art

[0002] Generally, the washing machine is an electric apparatus used for removing dirt from laundry such as clothes, sheets and the like using a chemical reaction of the detergent as well as a mechanical action of a pulsator. General washing processes of the washing machine are comprised of an operation mode setting process automatically realized by detecting an amount and kind of laundry, a water supplying process for supplying water to a proper level in accordance with the amount and kind of laundry, and washing, rinsing and spinning processes that are controlled by a control part.

[0003] Washing machines can be classified into a variety of types according to their operating methods. For example, there are the following methods; a method for rotating a

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rotational/spinning tub by transmitting rotational power of a driving motor to a pulsator or spinning shaft via a power transmission belt and a pulley; a method for rotating a rotational/spinning tub in a different RPM during the respective washing and spinning processes by controlling an RPM of a BLDC (brushless direct current) motor without using a belt and pulley; a method having a different power transmission path for washing and spinning processes to rotate a pulsator at a low RPM during the washing machine and to rotate the pulsator and spinning tub at a high RPM; and a method for performing a permeating washing by injecting pumped water current into a rotational tub while rotating a rotational tub or pulsator in a direction at a high RPM. In addition to the aforementioned washing methods, there exist various other washing methods for washing laundry. The present invention relates to the operating method of performing a permeating washing by injecting pumped water current into a rotational tub while rotating a rotational tub or pulsator in a direction at a high RPM.

[0004] Generally, a washing machine employing the permeating washing method includes a pulsator integrally formed with a rotational tub. The pulsator and rotational tub are rotated at a high speed by driving means. The water in the rotational tub permeates the laundry by centrifugal force generated by the high RPM rotation of the rotational tub, in the course of which dirt is removed from the laundry. The water permeating the laundry is

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directed to an outer tub through a plurality of holes formed in the rotational tub and ascends along an inner circumference of the outer tub, after which it falls into the rotational tub. By falling into the rotational tub, the water strikes the laundry to perform the washing.

[0005] The permeating type washing machine is designed to perform the washing through two stages. The first stage allows the water to permeate the laundry and the second stage allows the water to strike the laundry, improving the washing efficiency as compared with other types of washing machines.

[0006] However, the permeating type washing machine has a drawback in that the water may not be fully introduced into the rotational tub as it is splashed to other directions by colliding with the laundry. This will generally occur when the laundry is projected above a tub cover.

[0007] In detail, when a large amount of laundry is loaded in the rotational tub, the laundry may be projected above the tub cover, for example, when a large-sized sheet, a pillow and the like are loaded in to the rotational tub, a portion of the laundry may be projected above the tub cover. Particularly, the pillow, since it contains air, it easily floats on the water. Therefore, the water ascending along the outer tub and being supplied to the rotational tub collides with the projected portion of the laundry, thereby splashing to an external side. This is called a "water-splashing phenomenon."

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[0008] . When the splashed water falls to the inner-bottom of the washing machine through a space between the outer tub and the case, it may cause an accident, such as a fire due to a short circuit between electrical components.

[0009] In addition, the splashed water may pollute an outer floor around the washing machine and cause a shortage of washing water, making it difficult to perform the effective washing.

[0010] Even for other types of washing machines where the laundry is loaded under a water supplying hole, the water supplied through the water supplying hole may splash between the tub and the case. The splashed water may cause a variety of problems as described above.

[0011] The applicant does not concede that the prior art discussed herein forms part of the common general knowledge in the art in Australia at the priority date of the present application.

SUMMARY OF THE INVENTION

[0012] Preferred embodiments of the present invention provide a washing machine that can prevent laundry from projecting above a tub cover, to thereby prevent water from splashing.

[0013] In addition, preferred embodiments of the present invention provide a washing machine that can prevent water from splashing by detecting laundry projecting above a tub cover and controlling a washing cycle in response to the detected signal.

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[0014] Additional advantages and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention.

[0015] In a first aspect, the present invention provides a washing machine comprising: an outer case; an outer tub disposed in the outer case to receive washing water; a rotational tub disposed in the outer tub and selectively rotatable; a pulsator rotating in the rotational tub to generate forced water current; a tub cover formed on an upper portion of the outer tub to guide the washing water to an inside of the rotational tub when the rotational tub and/or the pulsator rotate; a grille formed inwardly extending from an inner end of the tub cover; and a motor for transmitting driving force to the rotational tub and/or the pulsator; and opened space defined between the inner circumference of the tub cover and an outer side of the grille.

[0016] In another aspect of the present invention, there is provided a washing machine comprising: a case; an outer tub disposed in the case to receive washing water; a rotational tub disposed in the outer tub and selectively rotatable; a pulsator rotating in the rotational tub to generate forced water current; a tub cover formed on an upper portion of the outer tub; a grille formed inwardly extending from an inner circumference of the tub cover; an electrode sensor formed on an inner end portion of the

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grille, wherein the electrode sensor is placed across both ends of the grille, a control part for receiving a signal from the electrode sensor when laundry contacts the electrode sensor widely, disregarding a signal when the washing water contacts the electrode narrowly; and a motor controlled by the control part to transmit driving force to the rotational tub and/or the pulsator.

[0017] In still another aspect of the present invention, there is provided a washing machine comprising: an outer tub for receiving washing water; a rotational tube rotatably installed in the outer tub; a tub cover coupled on an upper portion of the outer tub; a grille formed inwardly extending from an inner circumference of the tub cover to prevent laundry from rising above the tub cover by the washing water; and a protecting cover for protecting an inner surface of the grille when laundry contacts the inner surface of the grille.

[0018] In still yet another aspect of the present invention, there is provided a washing machine comprising: an outer tub; a tub cover formed on an upper portion of the outer tub; and a grille formed inwardly extending from an inner circumference of the tub cover and having a plurality of passing holes, for preventing laundry from rising while allowing washing water to pass through the passing holes.

[0019] According to preferred embodiments of the present invention, since the grille is formed on the tub cover, the laundry cannot be projected above the tub cover, thereby

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preventing the water from splashing out during the water supplying and washing cycles. Therefore, any inadvertent accident that may be caused by the splashed water can be avoided.

[0020] In addition, even when the laundry is projected above the tub cover, the detecting member detects the fact to control the RPM of the driving motor, thereby preventing the splash of the water.

[0021] Furthermore, since the protecting cover prevents the grille from wearing, the laundry contacting the grille is not easily damaged.

[0022] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0023] The accompanying drawings illustrate exemplary embodiment(s) in accordance with the invention. In the drawings:

[0024] Fig. 1 is a sectional view of a washing machine according to a first embodiment of the present invention;

[0025] Fig. 2 is a bottom view of a tub cover depicted in Fig. 1;

[0026] Fig. 3 is an enlarged perspective view of a major portion of a washing machine depicted in Fig. 1;

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[0027] Fig. 4 is an enlarged perspective view of a major portion of a washing machine according to a second embodiment of the present invention;

[0028] Fig. 5 is an enlarged perspective view of a major portion of a washing machine according to a third embodiment of the present invention;

[0029] Fig. 6 is an enlarged perspective view of a major portion of a washing machine according to a fourth embodiment of the present invention;

[0030] Fig. 7 is a block diagram illustrating an operation of the fourth embodiment;

[0031] Fig. 8 is a view illustrating a state where laundry contacts a longitudinal side of a grille depicted in Fig. 6;

[0032] Fig. 9 is an enlarged perspective view of a major portion of a washing machine according to a fifth embodiment of the present invention;

[0033] Fig. 10 is a sectional view taken along the line A-A' ;

[0034] Fig. 11 is a perspective view of a protecting cover depicted in Fig. 10; and

[0035] Fig. 12 is a view illustrating a coupling state of a protecting cover with a grille according to a modified example of the present invention.

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DETAILED DESCRIPTION OF THE INVENTION

[0036] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0037] First Embodiment

[0038] Fig. 1 shows a washing machine according to a first embodiment of the present invention.

[0039] As shown in the drawing, a washing machine comprises an outer case 1 forming an outer appearance of the washing machine, an outer tub 2 disposed in the outer case 1 to receive washing water, a rotational tub 3 rotatably disposed in the outer tub 2, the rotational tub 3 being provided with a plurality of holes through which washing water can be directed to the outer tub 2, a pulsator 4 integrally formed on a center of the rotational tub 3 to rotate together with the rotational tub 3, a tub cover 5 coupled on an upper portion of the outer tub 2, a washing water supplying tube 8 on which a water supplying valve 9 is mounted to properly supply the washing water to the rotational tub 3, a washing water drain tube 6 on which a water drain valve 7 is mounted to properly drain the washing water, and a motor 13 for transmitting driving force to the rotational tub 3. In addition, a grille 11 for preventing the laundry from projecting

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above the tub cover 5 is formed on an inner circumference of the tub cover 5. The washing machine further comprises a plurality of tub supports 12 for supporting the outer tub 2.

[0040] In detail, the outer tub 2 is formed in a cylindrical shape having an opened top through which the laundry is loaded in the rotational tub 3. The rotational tub 3 is installed in the outer tub 2 and is rotated in clockwise and counterclockwise directions. The washing water stored in the rotational tub 3 can be directed to the outer tub 2 through the holes 10 formed on the rotational tub 3. The holes 10 function to allow the water permeating the laundry to be drained during a spinning cycle and to allow for the circulation of water between the rotational tub 3 and the outer tub 2 during a permeating washing cycle.

[0041] The pulsator 4 is integrally formed on a bottom of the rotational tub 3 to rotate together with the rotational tub 3.

[0042] The tub cover 5 is coupled on the upper portion of the outer tub 2 to function to guide the water supplied from the rotational tub 3 to the outer tub 2 to be redirected into the rotational tub 3. The grille 11 formed on the inner circumference of the tub cover 5 functions to suppress the projection of the laundry above the tub cover 5.

[0043] The grille 11 is disposed under the water supplying pipe 8 to further function to prevent the water from directly colliding with the laundry. That is, since the laundry can be elevated above the grille 11, even when the water is supplied

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right above the grille 11, the washing water does not directly collide with the laundry. Accordingly, the water is not splashed out over the tub cover.

[0044] The washing water flow during the washing cycle of illustrated embodiment will be described in more detail hereinafter.

[0045] The pulsator 4 and the rotational tub 3 that are integrally formed rotate at a high RPM by the motor 13. The washing water in the rotational tub 3 permeates the laundry to remove dirt from the laundry by the centrifugal force generated by the high RPM rotation of the rotational tub 3. The water permeating the laundry is directed to the outer tub 2 through the holes 11 of the rotational tub 3. The water directed to the outer tub 2 ascends along an inner circumference of the outer tub 2 by the centrifugal force. By the centrifugal force, the water stored in the rotational tub 3 rises in a U-shape as shown in the drawing.

[0046] However, the rise of the water is stopped by the tub cover 5 installed on the upper portion of the outer tub 2. In order to allow the water contacting the tub cover 5 to be effectively redirected into the rotational tub 3, a portion where vertical and horizontal surfaces of the tub cover 5 meet each other can be formed in a gentle curve. As described above, the water colliding with the tub cover 5 can be redirected into the

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rotational tub 3 to generate powerful water current colliding with the laundry, thereby removing dirt from the laundry.

[0047] That is, the inventive washing machine includes a first washing process for allowing the water to permeate the laundry by the centrifugal force and a second washing process for allowing the water to collide with the laundry while falling into the rotational tub 3. The first and second washing processes are repeatedly performed as a series of cycles. The washing can be further performed as the pulsator 4 collides with the laundry while rotating.

[0048] In the meanwhile, even during the water supply, the laundry is caught by the grille 11, not projecting above the tub cover 5. Therefore, the water being supplied through the water supplying tube 8 is not directly colliding with the laundry, thereby not splashing out over the tub cover 5. That is, the grille 11 prevents the water from overflowing the tub cover 5 during the water supplying process as well as the permeating washing process.

[0049] Fig. 2 shows a bottom view of the tub cover depicted in Fig. 1.

[0050] Referring to Fig. 1, the tub cover 5 is provided at a bottom with a structure for effectively directing the water supplied from the outer tub 2 to the rotational tub 3.

[0051] In detail, the tub cover 5 is provided at a bottom with first directional ribs 51 and second directional ribs 52.

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The first and second directional ribs 51 and 52 are formed in a symmetrical arrangement. As the rotational tub 3 is designed to rotate clockwise and counterclockwise, it is preferable that the first and second directional ribs 51 and 52 are formed to be inclined in an opposite direction to each other.

[0052] Also, the tub cover 5 is further provided with a water falling guide rib 55 for directing the water converted in its direction by the first directional ribs 51 toward the laundry loaded in the rotational tub 3. The water falling guide rib 55 is formed along an inner circumference of the tub cover 5. The tub cover 5 is further provided at a bottom with a dispersion preventing ribs 54 for preventing the water directed to the first directional ribs 51 and the falling guide rib 55 from dispersing.

[0053] In order to minimize the water splash that may be caused when the water converted in its direction by the first directional ribs 51 collides with the falling guide rib 55, the tub cover 5 is further provided with first holes 56. The first holes 56 are formed on portions where the first directional ribs 51 meet the falling guide rib 55.

[0054] In order to minimize the water splash that may be caused when the water converted in its direction by the second directional ribs 52 collides with the falling guide rib 55, the tub cover 5 is further provided with second holes 57. The second holes 57 are formed on portions where the second directional ribs 52 meet the falling guide rib 55.

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[0055] In order to prevent the first and second directional ribs 51 and 52 from being deformed by an eddy in the course of guiding the water, the tub cover 5 may be further provided with a plurality of reinforcing ribs connecting the first and second directional ribs 51 and 52.

[0056] Meanwhile, the grille 11 is formed under the water supplying tube to prevent the laundry from projecting above the tub cover 5. The grille 11 is disposed in an inside area of the tub cover 5. An opened space 14 is defined between the grille 11 and the tub cover 5 so as to prevent water from overflowing the grille 11 even when a large amount of water is supplied in a moment. That is, during the water supplying cycle or the permeating washing cycle, even when a large amount of water is supplied toward the grille 11 at a moment sufficient to overflow the grille, the water does not overflow the tub cover 5 but falls into the outer tub 2 through the opened space 14.

[0057] Fig. 3 shows an enlarged view of a major portion of the washing machine depicted in Fig. 1.

[0058] Referring to Fig. 3, there are shown the rotational tub 3 and the tub cover 5 formed on the upper portion of the rotational tub 3. The grille 11 is formed across an opening of the tub cover 5. The opened space 14 is defined between the grille 11 and the inner circumference of the tub cover 5 to prevent the washing water from overflowing.

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[0059] The grille 11 is designed to allow the water to pass through a plurality of meshes formed on the grille 11. When the laundry in the rotational tub 3 rises with the water, the grille 11 suppresses the laundry not to project above the tub cover 5. In order to prevent the water being supplied through the water supplying tube 8 from directly colliding with the laundry, the grille 11 is preferably disposed right under the water supplying tube 8.

[0060] Although the grille 5 is integrally formed with the tub cover 5, the present invention is not limited thereto. The grille 5 can be formed as a separate component and assembled with any one of the tub cover 5, the rotational tub 3 and the outer tub 2. However, it is most preferable that the grille 5 is assembled on the inner circumference of the tub cover 5 so that the grille 5 can be disposed right under the water supplying tube 8.

[0061] In addition, each mesh of the grille 11 is small enough for the laundry not to project above the tub cover 5 but large enough for the water not to splash out.

[0062] Second Embodiment

[0063] Fig. 4 shows a washing machine according to a second embodiment of the present invention.

[0064] This embodiment is identical to the first embodiment except for the structure of the grille. A grille 21 of this

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embodiment is also formed extending from an inner circumference of the tub cover 5 and is disposed under the water supplying tube 8. Each mesh of the grille 21 is relatively large-sized as compared with that of the first embodiment. Therefore, the washing water is prevented from overflowing without the opened space (see 14 of Fig. 3) proposed in the first embodiment.

[0065] Third Embodiment

[0066] Fig. 5 shows a washing machine according to a third embodiment of the present invention.

[0067] Referring to Fig. 5, this embodiment is identical to the first embodiment except for the structure of the grille. A grille of the embodiment is designed such that meshes are defined by a plurality of bars arranged in an identical direction, that is, one of lateral or longitudinal directions while the grille of the first embodiment is designed such that the meshes are formed in a matrix shape by a plurality of bars arranged in both lateral and longitudinal directions. An opened space 34 is also provided to prevent the overflow of the water.

[0068] Fourth Embodiment

[0069] Fig. 6 shows a washing machine according to a fourth embodiment of the present invention.

[0070] Referring to Fig. 6, the washing machine of this embodiment is provided with a rotational tub 3, a grille 41 and

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an opened space 44 like the washing machine of the first embodiment. Further, the washing machine includes first and second electrode sensors 42 and 43 formed on a grille 41. When the laundry contacts the first and second electrode sensors 42 and 43, the first and second electrode sensors 42 and 43 are electrically connected to each other, by which it is detected that the laundry ascends to a level of the grille 41. When the ascending of the laundry to the level of the grille 41 is detected, the RPM of the rotational tub 3 is lowered or the rotation of the rotational tub 3 is temporarily stopped, thereby preventing the water from splashing out.

[0071] The operation of the first and second electrode sensors will be described in more detail hereinafter.

[0072] The first and second electrode sensors 42 and 43 may be electrically connected to each other when the washing water irregularly rises or fluctuates during the water supplying or washing cycle or when the laundry contacts the longitudinal sides of the grille 41.

[0073] Since the former is a normal state, it can be ignored. That is, to detect a state where the laundry 48 ascends above a predetermined level, the electrode sensors 42 and 43 are designed not to detect a small amount of washing water contacting a small area of the grille 41 but to detect only the washing water continuously contacting a large area of the grille 41. That is, the electrode sensors 42 and 43 detects the laundry when the

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laundry projected above the tub cover 5 contacts an enough large portion of the longitudinal sides of the grille 41 for a predetermined time enough to change a resistance value. The electrode sensors 42 and 43 are provided to prevent the washing water from splashing out by detecting the laundry projected above the tub cover 5.

[0074] In detail, during the water supply cycle, even when the laundry is projected above the tub case 5 not having the grille, the water collides with the laundry, not splashing out. However, during the permeating washing cycle, the washing water collies with the laundry ascending above a predetermined level. In this case, since the water may splash out, the ascending of the laundry should be detected so that the RPM of the washing machine can controlled to prevent the splash of the water.

[0075] Fig. 7 shows a block diagram illustrating the operation of the fourth embodiment.

[0076] Referring to Fig. 7, a detecting part 45 defined by the electrode sensors 42 and 43 formed on one of the longitudinal sides is provided. A detecting signal generated by the detecting part 45 is transmitted to a control part 46. The control part 46 determines if the laundry ascends above a predetermined level in accordance with the detecting signal transmitted from the detecting part 45. When it is determined by the control part that the laundry ascends above the predetermined level, a motor driving part 47 lowers the RPM or stops the washing cycle.

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[0077] That is, the detecting part 45 generates a detecting signal and transmits the same to the control part 46. The control part 46 determines if the laundry ascends above a predetermined level in accordance with the detecting signal transmitted from the detecting part 45. When it is determined that the laundry ascends above the predetermined level, the control part 46 controls the motor driving part 47 such that it can lower the RPM of the motor or stops the rotation of the motor, thereby preventing the splash of the water.

[0078] Fig. 8 shows a state where the laundry contacts the longitudinal side of the grille.

[0079] In a state shown in Fig. 6, since the grille 41 catches the laundry, the splash problem of the washing water is not incurred.

[0080] However, in a state shown in Fig. 8, the laundry is not caught by the grille 41 but is projected above the tub cover 50. That is, since the laundry that was caught by the grille 41 during the water supplying cycle may be escaped out of the grille 41 during the washing cycle to contact the longitudinal side of the grille 41.

[0081] In this case, the laundry 48 contacts the sensors 42 and 43 formed on the longitudinal side of the grille 41 so that a predetermined detecting signal is transmitted to the control part. The control part controls the driving part in response to the detecting sensor such that the rotational force of the washing

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machine can be reduced, thereby preventing the splash of the water. In addition, the control part may stop the rotation of the rotational tub 3 in order for a user to rearrange the laundry not to be projected above the tub cover 5.

[0082] Meanwhile, the friction with the laundry may easily wear an inner surface of the grille 41. That is, since the inner surface of the grille 41 rubs with the laundry during the washing cycle, it is worn as the washing machine is used for a long time. When the inner surface of the grille 41 is worn, it becomes rough, causing damage of the laundry.

[0083] To prevent the laundry and grille from being damaged, the surface of the grille 41 is preferably coated with a metal material to have a smooth metal surface as protecting means. The protecting means may be a metal tape or be specially prepared and assembled on the grille 41.

[0084] Fifth Embodiment

[0085] This embodiment is identical to the fourth embodiment except that a structure for preventing damage of the grille as well as the laundry is further provided.

[0086] Fig. 9 is a perspective view of a tub cover of a washing machine according to a fifth embodiment of the present invention, and Fig. 10 is a sectional view taken along the line A-A' of Fig. 9.

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[0087] Referring to Figs. 9 and 10, a grille 51 is formed on a portion of an inner circumference of the tub cover. A protecting cover 60 for protecting the inner end of the grille 51 covers an inner end of the grille 51, which frequently contacts the laundry.

[0088] The protecting cover 60 is snap-fitted on the inner end 52 of the grille 51. That is, the protecting cover 60 is fitted in the inner end 52 while being elastically deformed. Therefore, the protecting cover 60 is preferably formed of an elastic material. The protecting cover 60 may be coupled on the inner end 52 by a screw or a hook member. In this case, the screw or the hook member may however deteriorates an appearance and cause the laundry from being damaged during the washing cycle while deteriorating the outer appearance. Therefore, it is preferable that the protecting cover 60 is coupled on the inner end 52 through a snap fitting.

[0089] In detail, the protecting cover 60 includes an upper fixing portion 61 for coupling on an upper end portion of the inner end 52, a coupling portion 62 for coupling on a lower end portion of the inner end 52, and an insertion end portion 63 gently curved to allow the coupling portion 62 to be easily inserted in the lower end portion 52. The protecting cover 60 is formed of the elastic material such as an elastic plastic, a stainless steel, and an elastic rubber.

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[0090] When the protecting cover 60 is formed of the elastic plastic or the elastic rubber, it may be worn. In this case, the elastic cover is replaced with a new one. Therefore, it is most preferable that the stainless steel is used for the protecting cover.

[0091] In detail, the inner end 52 of the grille 51 includes a first hook jaw 53 on which the fixing portion 61 is coupled, a second hook jaw 54 on which the coupling portion 62 is coupled, and a third hook jaw 55 formed adjacent to the first hook jaw 53 to prevent the protecting cover 60 from being separated.

[0092] The coupling process of the protecting cover 60 on the inner end 52 of the grille 51 will be described hereinafter.

[0093] The fixing portion 61 is first coupled on the first hook jaw 53, and the coupling portion 62 is coupled on the second hook jaw 54 through the snap fitting. At this point, since the insertion end portion 63 is gently curved, the coupling portion 62 is elastically deformed and fitted on the second hook jaw 53. In addition, the third hook jaw 55 supports the fixing portion 61 not to be separated from the first hook portion 53.

[0094] Fig. 11 is a perspective view of the protecting cover shown in Fig. 9.

[0095] Referring to Fig. 11, the fixing portion 61 bent in a round shape is formed at an upper end portion of the protecting cover 60 so as to be fixed to the upper side of the inner end 52 of the grille 51. At a lower end portion of the protecting cover

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60, the coupling portion 62 that can be elastically deformed is formed so as to be fixed to the lower side of the inner end 52 of the grille 51. The insertion end portion 63 is gently curved to allow the coupling portion 62 to be easily inserted in the lower end portion 52. Also, the insertion end portion 63 prevents the occurrence of scratch when the protecting cover 60 is inserted into the grille 51.

[0096] In the above-described structure, foreign substances may be accumulated between the protruded portions of the grille 52, particularly, between the first and third hook jaws 53 and 55. It is troublesome for the user to remove the accumulated alien substances out of the grille 51.

[0097] Sixth Embodiment

[0098] The sixth embodiment is identical to the fifth embodiment in many parts except that the structure of the inner end portion of the grille. In other words, the construction of the inner end portion of the grille is changed to prevent foreign substances from being accumulated.

[0099] Fig. 12 is a sectional view of the grille for illustrating that the protecting cover is fixed to the inner end portion of the grille according to a sixth embodiment of the present invention.

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[001001] Referring to Fig. 12, a first hook jaw 73 is formed on an upper portion of an inner end portion 72 of a grille 71 and a second hook jaw 74 is formed on a lower portion of the inner end portion 72 of the grille 71. A protecting cover 60 has an identical construction to that of the fifth embodiment.

[00101] Describing the coupling operation of the protecting cover 60, the first hook jaw 73 is positioned such that a fixing portion is hooked on the first hook jaw 73 and then a coupling portion 62 is coupled to the second hook jaw 74 in a snap-fitting way.

[00102] By the above construction, it can be prevented that foreign substances are accumulated between the first hook jaw (see reference numeral 53 of Fig. 10) and the third hook jaw (see reference numeral 55 of Fig. 10). Also, by making the fixing portion 61 large above a predetermined size unlike that of fifth embodiment, it can be prevented that the protecting cover 60 is easily separated. Accordingly, the drawback caused by omitting the third hook jaw 55 from the fifth embodiment can be overcome easily.

[00103] According to the above-described present invention, since the grille is formed on the tub cover, the laundry is inhibited from projecting above the tub cover, thereby preventing the water from splashing out during the water supplying and washing cycles. Therefore, any inadvertent accident that may be caused by the splashed water can be avoided.

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[00104] In addition, even when the laundry is projected above the tub cover, the detecting member detects the fact to control the RPM of the driving motor, thereby preventing the splash of the water.

[00105] Furthermore, since the protecting cover prevents the grille from wearing, the laundry contacting the grille is not easily damaged. In addition, each corners of the protecting cover is gently curved to prevent the laundry from being damaged.

[00106] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

[00107] As used herein, the term "comprise" and variations of the term, such as "comprising", "comprise" and "comprised", are not intended to exclude other additives, components, integers or steps.

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What is claimed is:

1. A washing machine comprising: an outer case; an outer tub disposed in the outer case to receive washing water; a rotational tub disposed in the outer tub and selectively rotatable; a pulsator rotating in the rotational tub to generate forced water current,

a tub cover formed on an upper portion of the outer tub to guide the washing water to an inside of the rotational tub when the rotational tub and/or the pulsator rotate;

a grille formed inwardly extending from an inner end of the tub cover;

a motor for transmitting driving force to the rotational tub and/or the pulsator; and opened space defined between the inner circumference of the tub cover and an outer side of the grille.

2. The washing machine according to claim 1, wherein a water supplying hole is formed right above the grille.

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3. The washing machine according to claim 1, further comprising an electrode sensor formed on an inner end portion of the grille, for detecting the laundry contacting the inner end portion of the grille.

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4. The washing machine according to claim 1, further comprising a protecting member for protecting an inner end of the grille.

5. The washing machine according to claim 1, further comprising a coating layer for protecting an inner surface of the grille.

6. A washing machine comprising: a case; an outer tub disposed in the case to receive washing water; a rotational tub disposed in the outer tub and selectively rotatable; a pulsator rotating in the rotational tub to generate forced water current, a tub cover formed on an upper portion of the outer tub; a grille formed inwardly extending from an inner circumference of the tub cover;

an electrode sensor formed on an inner end portion of the grille, wherein the electrode sensor is placed across both ends of the grille,

20 a control part for receiving a signal from the electrode sensor when laundry contacts the electrode sensor for a predetermined time period, disregarding a signal when the washing water contacts the electrodes momentarily; and

a motor controlled by the control part to transmit driving force to the rotational tub and/or the pulsator.

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7. The washing machine according to claim 6, wherein the control part determines the rise of the laundry only when receiving a detecting signal generated when the laundry contacts the electrode sensor.

8. The washing machine according to claim 6, wherein the electrode sensor comprises a pair of electrodes and detects current flow only when the laundry simultaneously contacts both the electrodes.

9. A washing machine comprising: a case; an outer tub disposed in the case to receive washing water; a rotational tub disposed in the outer tub and selectively rotatable; a pulsator rotating in the rotational tub to generate forced water current,

a tub cover coupled on an upper portion of the outer tub;

a grille formed inwardly extending from an inner circumference of the tub cover to prevent laundry from rising above the tub cover by the washing water; and

a protecting cover for protecting an inner surface of the grille when laundry contacts the inner surface of the grille.

10. The washing machine according to claim 10, wherein the protecting cover is of an elastic material.

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11. The washing machine according to claim 10, wherein the protecting cover is of an elastic material and is elastically coupled to the inner end of the grille.

12. The washing machine according to claim 10, wherein the protecting cover comprises:

a fixing portion formed curved from an upper portion of the protecting cover to be inserted into an upper end portion of the inner end of the grille;

a coupling portion formed curved from the upper portion of the protecting cover and inserted into a lower end portion of the inner end of the grille; and

an insertion end portion formed gently curved from a lower end portion of the protecting cover to allow the coupling portion to be easily inserted in the inner end of the grille.

13. The washing machine according to claim 10, wherein the protecting cover is snap-fitted to the grille.

20 14. The washing machine according to claim 10, wherein the inner end of the grille is provided with upper and lower hook jaws where the protecting cover is hooked.

25 15. The washing machine according to claim 10, wherein the inner end of the grille is provided at one or more sides thereof

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with two adjacent hook jaws to support an end of the protecting cover inserted.

16. A washing machine substantially as described herein, with reference to any one of the figures.

Dated: 21 November 2005

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Patent Attorneys for the Applicant

LG Electronics Inc.

Fig. 1

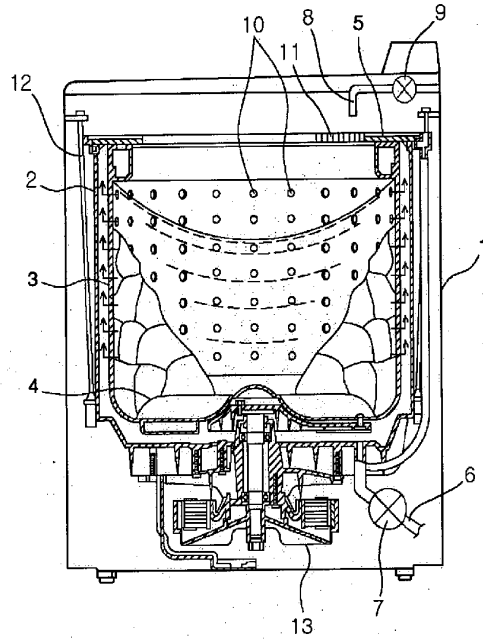


Fig. 2

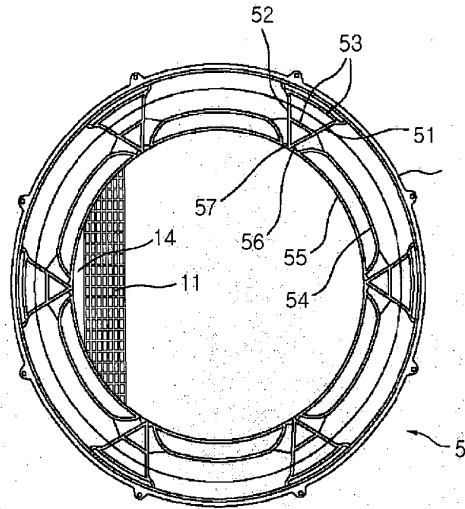


Fig. 3

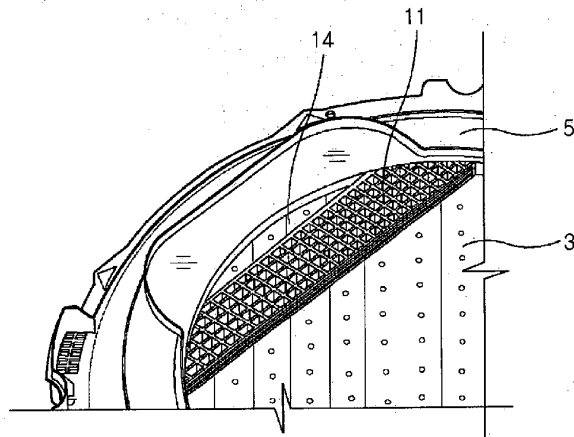


Fig. 4

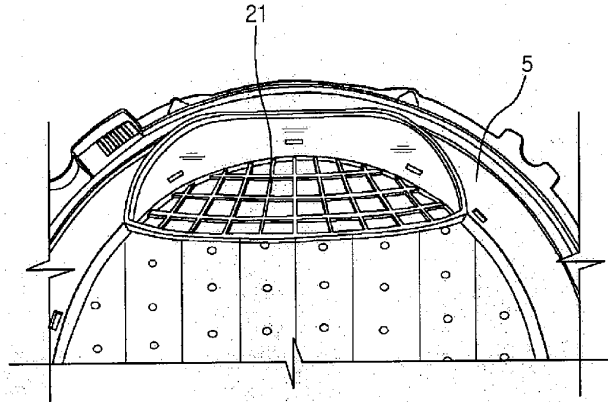


Fig. 5

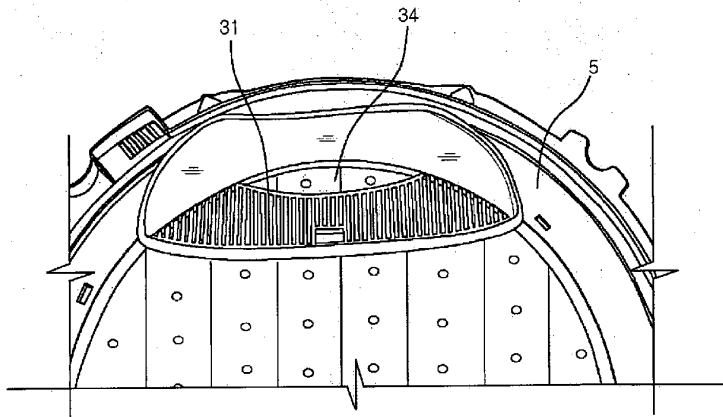


Fig. 6

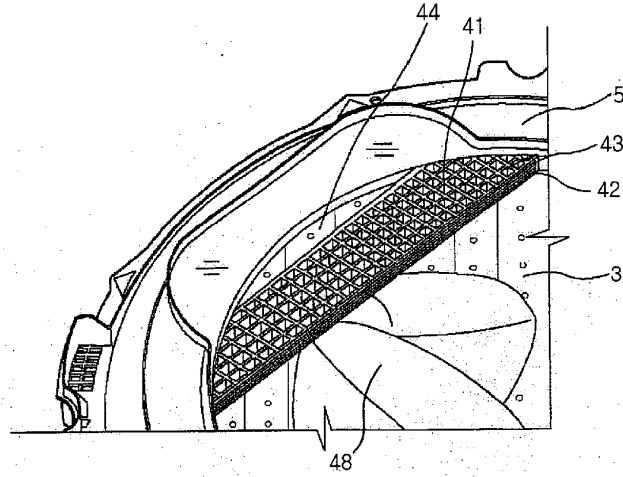


Fig. 7

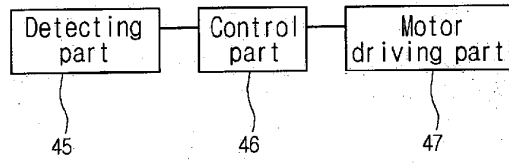


Fig. 8

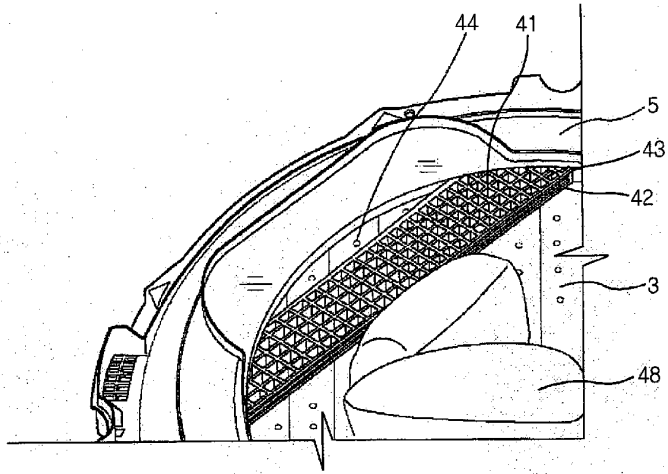


Fig. 9

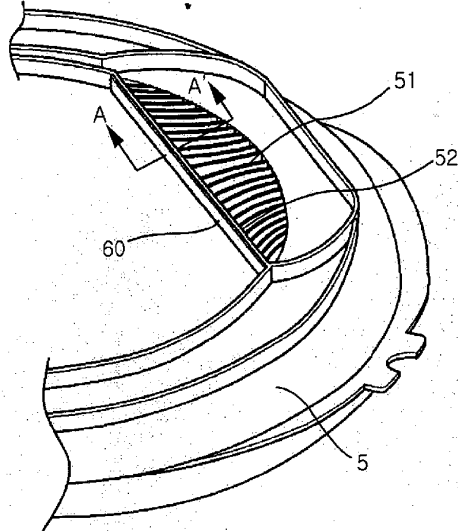


Fig. 10

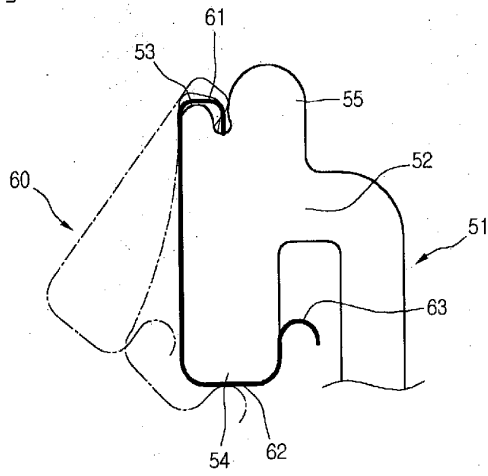


Fig. 11

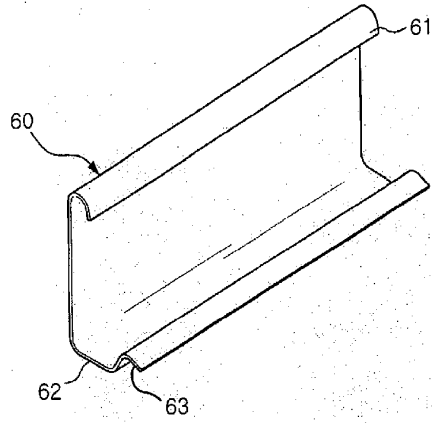


Fig. 12

