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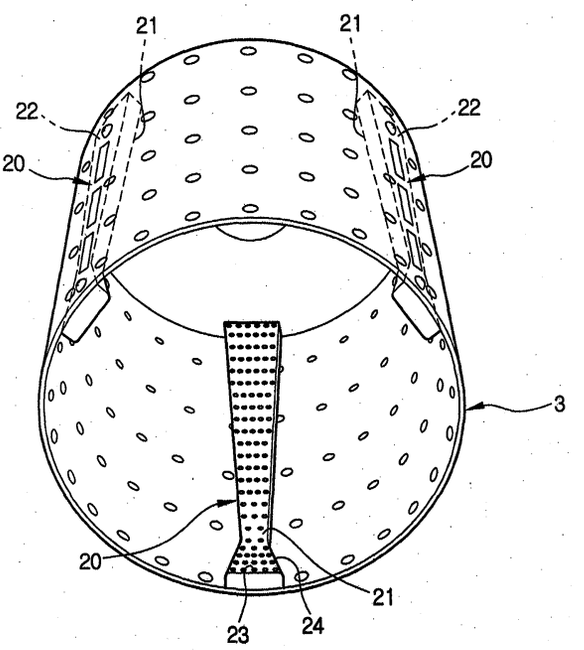
(54) Drum type washing machine

(57) A drum type washing machine including axially-extending lifters (20) arranged around an inner peripheral surface of a rotatable tub (3) which is upwardly inclined to allow easy laundry loading and unloading operations. The lifters each have a width gradually reducing as it extends from its rear end to its front end. Each lifter includes water spray holes at a top portion thereof. The water spray holes (23) are longitudinally arranged in rows at the top portion (21) of the lifter, and corresponding water spray holes in respective rows are laterally aligned. A width-enlarged portion (24) is provided at a front end of each lifter so that wash water is effectively sprayed through the water spray holes at the front end portion of the lifter arranged at a relatively high level. Opposite side surfaces of each lifter have a planar or curved surface structure.

FIG 2



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Description

[0001] The present invention relates to a drum type washing machine, and more particularly, but not exclusively to a drum type washing machine in which axially-extending lifters arranged around an inner peripheral surface of a rotatable tub upwardly inclinedly installed to allow easy laundry loading and unloading operations have an improved structure, thereby being capable of achieving an improvement in wash performance.

[0002] A conventional washing machine generally includes a housing forming an outer appearance of the washing machine, a cylindrical water tub installed in the housing and adapted to contain wash water, a cylindrical rotatable tub rotatably installed in the water tub and adapted to wash laundry contained therein, a drive motor arranged in the rear of the water tub and adapted to rotate the rotatable tub, and a door hingably mounted to a front wall of the housing.

[0003] Various lifters are protruded from an inner peripheral surface of the rotatable tub to a desired height while being arranged to be circumferentially spaced apart from one another around the rotatable tub and to extend axially along the inner peripheral surface of the rotatable tub. When the rotatable tub rotates, the laundry and wash water in the rotatable tub are raised by the lifters in a sequential fashion, and then dropped, so that the laundry is washed.

[0004] Openings are provided at respective front ends of the water tub and rotatable tub such that they are opened and closed by the door. When the door is open, it is possible to put laundry into the rotatable tub through the openings or to take the laundry out of the rotatable tub through the openings. When the door is closed, the water tub and rotatable tub are sealed against the outside of the door. In this state, a wash cycle can be carried out.

[0005] In the drum type washing machine having the above mentioned configuration, loading or unloading of laundry is carried out through the door mounted to the front wall of the housing. In order to carry out the loading or unloading of laundry through the opening of the rotatable tub after opening the door, however, the user must bend his body to lower his posture because the housing of the above-mentioned drum type washing machine typically has a height much lower than peoples' average height, and the opening of the rotatable tub is forwardly directed. For this reason, there is inconvenience.

[0006] In order to eliminate or at least address such inconvenience, improved drum type washing machines have recently been developed. In such a drum type washing machine, the rotatable tub is upwardly inclined such that the opening thereof is upwardly directed, so that the user can perform loading and unloading of laundry without bending his body too much.

[0007] In such a structure in which the rotatable tub is inclined, a relatively large amount of laundry is positioned at the rear end portion of the rotatable tub, whereas a relatively small amount of laundry is positioned at the front end portion of the rotatable tub. In particular, since the lifters on the inner peripheral surface of the rotatable tub have a constant height throughout the length of the rotatable tub, the laundry positioned at the rear end portion of the rotatable tub is stacked up to a level considerably higher than the height of the lifters, whereas the laundry positioned at the front end portion of the rotatable tub is stacked to a level lower than the height of the lifters.

[0008] When the rotatable tub rotates in such a state, the laundry positioned at a level higher than the height of the lifters at the rear end portion of the rotatable tub may not be lifted by the lifters, so that it is ineffectively washed. On the other hand, the amount of laundry lifted by the lifters at the front end portion of the rotatable tub is relatively small. As a result, the lifters operate inefficiently.

[0009] Furthermore, the laundry not lifted by the lifters at the rear end portion of the rotatable tub may be entangled as the lifters are rotated along with the rotatable tub. As a result, the laundry may be damaged. There is also inconvenience in that the user must disentangle the entangled laundry after completion of the washing process. Meanwhile, the laundry distributed in a relatively small amount at the front end portion of the rotatable tub is easily lifted by the lifters, and then moved toward the rear end portion of the rotatable tub. As a result, the laundry tends to bunch up at the rear end portion of the rotatable tub even more.

[0010] When the laundry is mainly positioned at the rear end portion of the rotatable tub, dynamic unbalance also occurs because a relatively large load is applied to the rear end portion of the rotatable tub, whereas a relatively small load is applied to the front end portion of the rotatable tub. As a result, the rotating operation of the rotatable tub is inefficiently carried out.

[0011] Since the front end portion of each lifter is rotated at a level higher than that of the rear end portion of the lifter, because the rotatable tub is upwardly inclined toward the front wall of the housing, wash water raised by the lifter flows toward the rear end portion of the lifter. For this reason, the wash water is mainly sprayed by the rear end portions of the lifters, while little wash water is sprayed by the front end portions of the lifters. As a result, the laundry positioned at the front end portion of the rotatable tub is insufficiently doused with the wash water.

[0012] Embodiments of the present invention address the problems involved with the above mentioned conventional drum type washing machine. Embodiments of the invention aim to provide a drum type washing machine in which axially-extending lifters arranged around an inner peripheral surface of a rotatable tub which is upwardly inclined have an improved structure, thereby achieving an improvement in wash performance.

[0013] In accordance with an aspect of the present in-

vention, there is provided a drum type washing machine including: a housing; a rotatable tub rotatably positioned in the housing; and at least one lifter positioned on an inner peripheral surface of the rotatable tub and extending axially along the rotatable tub, the lifter having, at a rear end portion thereof, a width larger than that at a front end portion of the lifter.

[0014] In accordance with another aspect of the present invention, there is provide a drum type washing machine comprising: a housing; a rotatable tub rotatably positioned in the housing and upwardly inclined toward a front wall of the housing at an inclination angle; a drive motor arranged in a rear of the rotatable tub, adapted to rotate the rotatable tub; and at least one lifter on an inner peripheral surface of the rotatable tub extending axially along the rotatable tub, wherein the rotatable tub has, at the rear thereof, an inner peripheral surface area, on which laundry is positioned, smaller than that at a front thereof.

[0015] The rotatable tub may be upwardly inclined toward a front wall of the housing. The lifter may have a width gradually reducing as it extends from the rear end thereof to the front end of the lifter.

[0016] The lifter may include, at a top portion thereof, water spray holes for downwardly spraying wash water raised by the lifter.

The water spray holes may be longitudinally arranged in rows at the top portion of the lifter. Corresponding water spray holes in respective rows may be laterally aligned.

[0017] The lifter may include, at a front end thereof, with a width-enlarged portion. The width-enlarged portion may have water spray holes so that a relatively large amount of wash water may be sprayed at the front end of the lifter, which is arranged at a relatively high level. Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0018] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

FIG. 1 is a sectional view schematically illustrating a drum type washing machine according to an embodiment of the present invention;

FIG. 2 is a perspective view of a rotatable tub from FIG. 1, in which lifters having opposite planar side surfaces and a width gradually reducing in a forward direction in accordance with a first embodiment of the present invention are arranged on the inner peripheral surface of the rotatable tub; and

FIG. 3 is a perspective view of another rotatable tub, in which lifters having opposite curved side surfaces and a width gradually reducing in a forward direction in accordance with a second embodiment of the present invention are arranged on the inner peripheral surface of the rotatable tub.

[0019] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0020] FIG. 1 is a sectional view schematically illustrating the configuration of a drum type washing machine according to the present invention. As shown in FIG. 1, the drum type washing machine according to the present invention includes a housing 1 having an approximately box shape to define an outer appearance of the washing machine, a drum-shaped water tub 2 installed in the housing 1 and adapted to contain wash water, a drum-shaped rotatable tub 3 rotatably positioned in the water tub 2 and including spin-dry holes 4 at a peripheral wall of the rotatable tub, and a drive motor 5 adapted to rotate the rotatable tub 3, in order to wash and spin-dry laundry contained in the rotatable tub 3.

[0021] Openings 2a and 3a are provided at respective front ends of the water tub 2 and rotatable tub 3, in order to allow laundry to be put into the rotatable tub 3 and to be taken out of the rotatable tub 3. A door 6 is hingably mounted to a front wall of the housing 1, so as to open and close the openings 2a and 3a of the water tub 2 and rotatable tub 3.

[0022] Installed at the top of the housing 1 are a water supply pipe 7 for receiving wash water from an external water supply source, and a detergent container 8 for containing detergent, and mixing the detergent with the wash water supplied via the water supply pipe 7. A drain pump 9 and a drain hose 10 are installed at the bottom of the housing 1, in order to externally drain wash water after completion of a wash cycle.

[0023] The drive motor 5 is fixedly mounted to a rear end of the water tub 2 outside the water tub 2. A rotatable shaft 5a, which is connected to the drive motor 5 at one end thereof, is fixedly coupled to a rear end of the rotatable tub 3 at the other end of the rotatable shaft, so that it transmits a rotating force from the drive motor 5 to the rotatable tub 3, thereby causing the rotatable tub 3 to rotate.

[0024] The rotatable tub 3 is upwardly inclined at a certain angle toward the front wall of the housing 1, in order to allow the user to perform loading and unloading of laundry without bending his body excessively Similar to the rotatable tub 3, the water tub 2 is upwardly inclined at a certain angle toward the front wall of the housing 1, while being suspended in the housing 1.

[0025] It is advantageous that the inclination angle α of the rotatable tub 3 be as large as possible, in order to conveniently perform loading and unloading of laundry in front of the housing 1. However, where the incli-

nation angle α is excessively large, the amount of laundry positioned at a rear end portion of the rotatable tub 3 increases excessively, so that a degradation in wash performance occurs. Accordingly, it is desirable to determine the inclination angle α of the rotatable tub 3 within a range from about 5° to 15°, taking into consideration the convenience in laundry loading and unloading operations, and the wash performance.

[0026] Lifters 20 are arranged on an inner peripheral surface of the rotatable tub 3 such that they are circumferentially uniformly spaced apart from one another around the rotatable tub 3 while extending axially along the rotatable tub 3. As the rotatable tub 3 rotates, the lifters 20 raise laundry contained in the rotatable tub 3, along with wash water, and then release the raised laundry and wash water at a certain level, thereby causing the laundry and wash water to be dropped. Thus, the laundry is washed.

[0027] In order to prevent the laundry contained in the rotatable tub 3 from bunching up at the rear end portion of the rotatable tub 3, as compared to the front end portion of the rotatable tub 3, due to the upward inclination of the rotatable tub 3 toward the front wall of the housing 1, the lifters 20 have a width gradually reducing as they extend from the rear end of the rotatable tub 3 to the front end thereof. Such a structure of the lifters 20 will be described hereinafter, with reference to FIGS. 2 and 3.

[0028] FIG. 2 is a perspective view of the rotatable tub, in which lifters having opposite planar side surfaces and a width gradually reducing in a forward direction in accordance with a first embodiment of the present invention are arranged on the inner peripheral surface of the rotatable tub. In FIG. 2, the lifters are designated by the reference numeral 20.

[0029] As shown in FIG. 2, the lifters 20 are arranged on the inner peripheral surface of the rotatable tub 3 such that they are circumferentially uniformly spaced apart from one another around the rotatable tub 3 while extending axially from the rear end of the rotatable tub 3 to the front end thereof, that is, throughout the length of the rotatable tub 3, in order to upwardly lift laundry contained in the rotatable tub 3.

[0030] Each lifter 20 has a constant height throughout the length of the rotatable tub 3 while having, at a rear end thereof, a larger width than that at a front end of the rotatable tub. Each lifter 20 has a width gradually reducing as it extends from the rear end of the tub to the front end thereof. Each lifter 20 also has opposite planar side surfaces.

[0031] Here, the rear end of each lifter 20 corresponds to the rear end of the rotatable tub 3 adjacent to the rear wall of the housing 1, whereas the front end of each lifter 20 corresponds to the front end of the rotatable tub 3 adjacent to the door 6.

[0032] Since the lifters 20 each have, at the rear end thereof, a relatively larger width than at the front end thereof, the amount of laundry positioned at the rear end portion of the rotatable tub 3 is correspondingly reduced, so that the laundry not positioned at the rear end portion of the rotatable tub 3 is positioned at the front end portion of the rotatable tub 3 where the lifters 20 have a smaller width. Accordingly, it is possible to prevent laundry from bunching up only at the rear end portion of the rotatable tub 3. Thus, laundry can be uniformly distributed in the rotatable tub 3. That is, although the rotatable tub 3 has an upwardly inclined structure, the laundry contained in the rotatable tub 3 is uniformly distributed throughout the length of the rotatable tub 3.

[0033] In accordance with the above described structure of the lifters 20, the area where the laundry is positioned between adjacent lifters 20 has a height at the rear end portion of the rotatable tub 3 larger than that at the front end portion of the rotatable tub 3 so that the laundry is uniformly distributed throughout the length of the rotatable tub 3. Accordingly, it is possible to rapidly and effectively wash the laundry. Also, the rotatable tub 3 can rotate in a dynamically stable state.

[0034] Since the lifters 20 each have a width gradually reducing as it extends from the rear end thereof to the front end thereof, they push the laundry from the rear end of the rotatable tub 3 to the front end thereof, as the tub rotates. Accordingly, the laundry positioned at the front end is prevented from shifting toward the rear end portion of the rotatable tub 3 at a level lower than the front end portion of the rotatable tub 3.

[0035] Each lifter 20 also has a structure to spray wash water. That is, each lifter 20 has a downwardly-opened hollow structure for receiving wash water in its interior. Further, water spray holes 23 are provided at a top portion 21 of each lifter 20. Each lifter 20 is also opened at a bottom portion 22 to communicate with openings (not shown) formed at a portion of the rotatable tub 3 where the lifter 20 is arranged. Accordingly, wash water is introduced into each lifter 20 via the opened bottom portion 22 at the bottom side of the rotatable tub 3, and then downwardly sprayed through the water spray holes 23 at the top side of the rotatable tub 3. Thus, the wash water, which is mixed with detergent, can effectively permeate into the laundry, so that the laundry can be more rapidly washed. Although not shown in the drawings, spray holes may also be provided at the opposite side portions of each lifter 20, so as to laterally spray wash water.

[0036] Here, the bottom portion 22 of each lifter 20 contacts the inner peripheral surface of the rotatable tub 3, whereas the top portion 21 of each lifter 20 is spaced apart from the inner peripheral surface of the rotatable tub 3 by a maximum distance.

[0037] The water spray holes 23 of each lifter 20 are longitudinally arranged in rows. Corresponding water spray holes 23 in respective rows are laterally aligned.

[0038] Each lifter 20 has a width-enlarged portion 24 at the front end of the lifter, in order to spray a sufficient amount of wash water at the front end portion of the rotatable tub 3 at a relatively high level. The width-en-

larged portion 24 has a length much smaller than the overall length of the lifter 20, in order to prevent a reduction in the effect obtained by the structure of the lifter 20 having a width gradually reducing as it extends from the rear end of the rotatable tub 3 to the front end thereof.

[0039] The width-enlarged portion 24 has, at a front end thereof corresponding to the front end of the lifter 20, a width approximately equal to the width of the rear end of the lifter 20, that is, the largest width of the lifter 20. By virtue of the width-enlarged portion 24, it is possible to provide an increased number of water spray holes 23, and thus, to spray a sufficient amount of wash water onto the laundry positioned at the front end portion of the rotatable tub 3.

[0040] In accordance with the above described arrangement of the water spray holes 23, the wash water introduced into each lifter 20 through its bottom portion 22 at the bottom side of the rotatable tub 3 can be uniformly sprayed through the water spray holes 23 throughout the length of the lifter 20. Thus, the laundry uniformly distributed between the rear and front ends of the rotatable tub 3 can be effectively doused by the wash water, which is mixed with detergent.

[0041] Now, a process for washing laundry by the drum type washing machine having the above configuration according to embodiments of the present invention will be described.

[0042] First, the user opens the door 6, and puts laundry into the rotatable tub 3 which is upwardly inclined. At this time, the user can conveniently perform these operations without lowering his posture. Since the area between adjacent lifters 20 at the rear end portion of the rotatable tub 3 is smaller than that at the front end portion of the rotatable tub 3, the laundry contained in the rotatable tub 3 is uniformly distributed throughout the length of the rotatable tub 3.

[0043] Thereafter, the user closes the door 6, and operates a control panel (not shown) to operate the washing machine. As the washing machine operates, a water supply cycle is begun. That is, wash water mixed with detergent is introduced into the water tub 2 via the water supply pipe 7 and detergent container 8, so that it fills a lower portion of the water tub 2. When a desired amount of wash water corresponding to the amount of laundry to be washed is supplied, the water supply cycle is completed. After completion of the water supply cycle, the drive motor 5 alternatingly rotates the rotatable tub 3 in clockwise and counterclockwise directions, along with the rotatable shaft 5a. Thus, the laundry contained in the rotatable tub 3 is washed.

[0044] As the rotatable tub 3 rotates in such a wash cycle, the laundry is uniformly distributed throughout the length of each lifter 20, so that the load applied to the lifter 20 is uniform throughout the length of the lifter 20. Accordingly, the laundry can be effectively washed. Also, the rotatable tub 3 is maintained in a dynamically balanced state, so that it can be stably rotated.

[0045] When the lifters 20 are sequentially moved to a level adjacent to the top of the rotatable tub 3 while lifting the laundry during rotation of the rotatable tub 3, the laundry is released from the lifters 20, and then dropped, so that it is washed. Simultaneously, the wash water mixed with detergent is introduced into each lifter 20 through its bottom portion 22 at the bottom side of the rotatable tub 3, and then downwardly sprayed through the water spray holes 23 provided at the top portion of the lifter 20, so that the wash water permeates into the laundry.

[0046] Since the width-enlarged portion 24 having a relatively large number of water spray holes 23 is provided at the front end of each lifter 20, it is possible to spray a sufficient amount of wash water even at the front end portion of the lifter 20 arranged at a relatively high level.

[0047] After completion of the wash cycle, the laundry is rinsed and spin-dried through rinse and spin-dry cycles. Thus, washing of the laundry is completed.

[0048] After completion of the washing of the laundry, the user again opens the door 6, and takes the laundry out of the rotatable tub 3. At this time, the user can conveniently perform these operations without lowering his posture too much because the rotatable tub 3 is upwardly inclined.

[0049] FIG. 3 is a perspective view of the rotatable tub, in which lifters having opposite curved side surfaces and a width gradually reducing in a forward direction in accordance with a second embodiment of the present invention are arranged on the inner peripheral surface of the rotatable tub. In FIG. 3, the lifters are designated by reference numeral 20a.

[0050] The lifters 20a according to the second embodiment have the same structure as those of the first embodiment, except that their opposite side surfaces are curved, so that they have a similar function and effect as that of the lifters 20 according to the first embodiment. The lifters 20a provide an improvement because their curved surfaces feel soft and smooth.

[0051] As is apparent from the above description, in the drum type washing machine according to embodiments of the present invention, a rotatable tub is upwardly inclined toward the front wall of the housing. Also, each lifter has a width gradually reducing as it extends from its rear end to its front end. Accordingly, laundry contained in the rotatable tub can be uniformly distributed throughout the length of the lifter. Thus, it is possible to rapidly and effectively carry out a wash process.

[0052] By virtue of such structures in the drum type washing machine according to embodiments of the present invention, the laundry can be stably lifted by the lifters. Accordingly, the rotatable tub can be rotated in a dynamically stable state.

[0053] In addition, the laundry is not entangled or lumped. Accordingly, the rotatable tub is rotated in a balanced state during a spin-dry process. It is also unnecessary to disentangle the washed laundry.

[0054] In the drum type washing machine according

to embodiments of the present invention, each lifter includes, at its front end, a width-enlarged portion, in order to provide a sufficient number of water spray holes at the front end of the lifter. Accordingly, wash water mixed with detergent can be sufficiently sprayed even at the front end portion of each lifter, so that even the laundry positioned at the front end portion of the rotatable tub arranged at a relatively high level can be rapidly and effectively washed.

[0055] Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0056] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0057] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0058] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A drum type washing machine comprising:

a housing (1);
a rotatable tub (3) rotatably positioned in the housing; and
at least one lifter (20) on an inner peripheral surface of the rotatable tub extending axially along the rotatable tub, the lifter having, at a rear end portion thereof, a width larger than another width at a front end portion thereof.

2. The drum type washing machine according to claim 1, wherein the rotatable tub (3) is upwardly inclined toward a front wall of the housing at an inclination angle, and the lifter (20) has a width gradually decreasing as the lifter extends from the rear end thereof to the front end thereof.

3. The drum type washing machine according to claim 2, wherein the inclination angle is between about 5 degrees and about 15 degrees.

4. The drum type washing machine according to any preceding claim, wherein the lifter (20) includes, at a top portion (21) thereof, a plurality of water spray holes (23) which downwardly spray wash water raised by the lifter.

5. The drum type washing machine according to claim 4, wherein the water spray holes (23) are longitudinally arranged in a plurality of rows at the top portion (21) of the lifter, and corresponding water spray holes in respective rows are laterally aligned.

6. The drum type washing machine according to any preceding claim, wherein the lifter (20) includes, at a front end thereof, a width-enlarged portion (24).

7. The drum type washing machine according to claim 6, wherein the width-enlarged portion (24) has a plurality of water spray holes which spray a relatively large amount of wash water at the front end of the lifter which is higher than a rear portion of the lifter.

8. The drum type washing machine according to any preceding claim, wherein the lifter has opposing planar side surfaces.

9. The drum type washing machine according to any preceding claim, wherein the lifter has opposing curved side surfaces.

10. The drum type washing machine according to any preceding claim, further comprising:

another lifter (20),

wherein the lifters are positioned around the rotatable tub (3) such that the lifters are circumferentially spaced uniformly apart from one another.

11. The drum type washing machine according to any preceding claim, wherein the lifter has a constant height extending from a first end to a second end of the rotatable tub.

12. The drum type washing machine according to any preceding claim, wherein an area between adjacent lifters is greater at a first end of the rotatable tub than at a second end of the rotatable tub.

13. The drum type washing machine according to any preceding claim, wherein the width of the lifter at the rear portion imparts a force moving laundry toward the front portion of the lifter as the rotatable tub rotates.

14. The drum type washing machine according to any preceding claim, wherein the rear portion having a larger width than the front portion includes a greater number of water spray holes.

15. The drum type washing machine according to claim 14, wherein wash water is sprayed evenly throughout a length of the lifter.

16. The drum type washing machine according to any one of claims 6-15, wherein the width of the width-enlarged portion is approximately equal to a width of the rear end portion of the lifter.

17. A drum type washing machine comprising:

a housing (1);
a rotatable tub (3) rotatably positioned in the housing and upwardly inclined toward a front wall of the housing at an inclination angle;
a drive motor (5) arranged in a rear of the rotatable tub, adapted to rotate the rotatable tub; and
at least one lifter (20) on an inner peripheral surface of the rotatable tub extending axially along the rotatable tub,

wherein the rotatable tub has, at the rear thereof, an inner peripheral surface area, on which laundry is positioned, smaller than that at a front thereof.

18. The drum type washing machine according to claim 17, wherein the lifter has, at a rear thereof, a width larger than that at a front thereof, and
wherein the inner peripheral surface area of the rotatable tub at the rear thereof is smaller than that at the front thereof.

19. The drum type washing machine according to claim 17 or 18, wherein the lifter includes a plurality of water spray holes (23) which downwardly spray wash water raised by the lifter,
wherein the water spray holes are positioned at a top (21) of the lifter.

20. The drum type washing machine according to claim 19, wherein the lifter includes, at the front thereof, a width-enlarged portion (24) having more water spray holes than the rear of the lifter.

21. The drum type washing machine according to claim 19 or 20, wherein the lifter includes a hollow structure open at an end (22) facing an outer peripheral surface of the rotatable tub and which receives wash water.

22. The drum type washing machine according to claim 21, wherein the lifter is open at the end facing the outer peripheral surface of the rotatable tub and in communication with openings formed on the outer peripheral surface of the rotatable tub.

23. The drum type washing machine according to claim 21 or 22, wherein wash water introduced into the lifter is sprayed through the water spray holes (23).

24. The drum type washing machine according to any of claims 20 to 23, wherein a density of the water spray holes is greater in the width-enlarged portion (24) than a remainder of the lifter.

25. The drum type washing machine according to any one of claims 17-24, wherein the lifter includes at least two opposing side surfaces along a length of the lifter, the side surfaces having a smooth, curved shape.

FIG 1

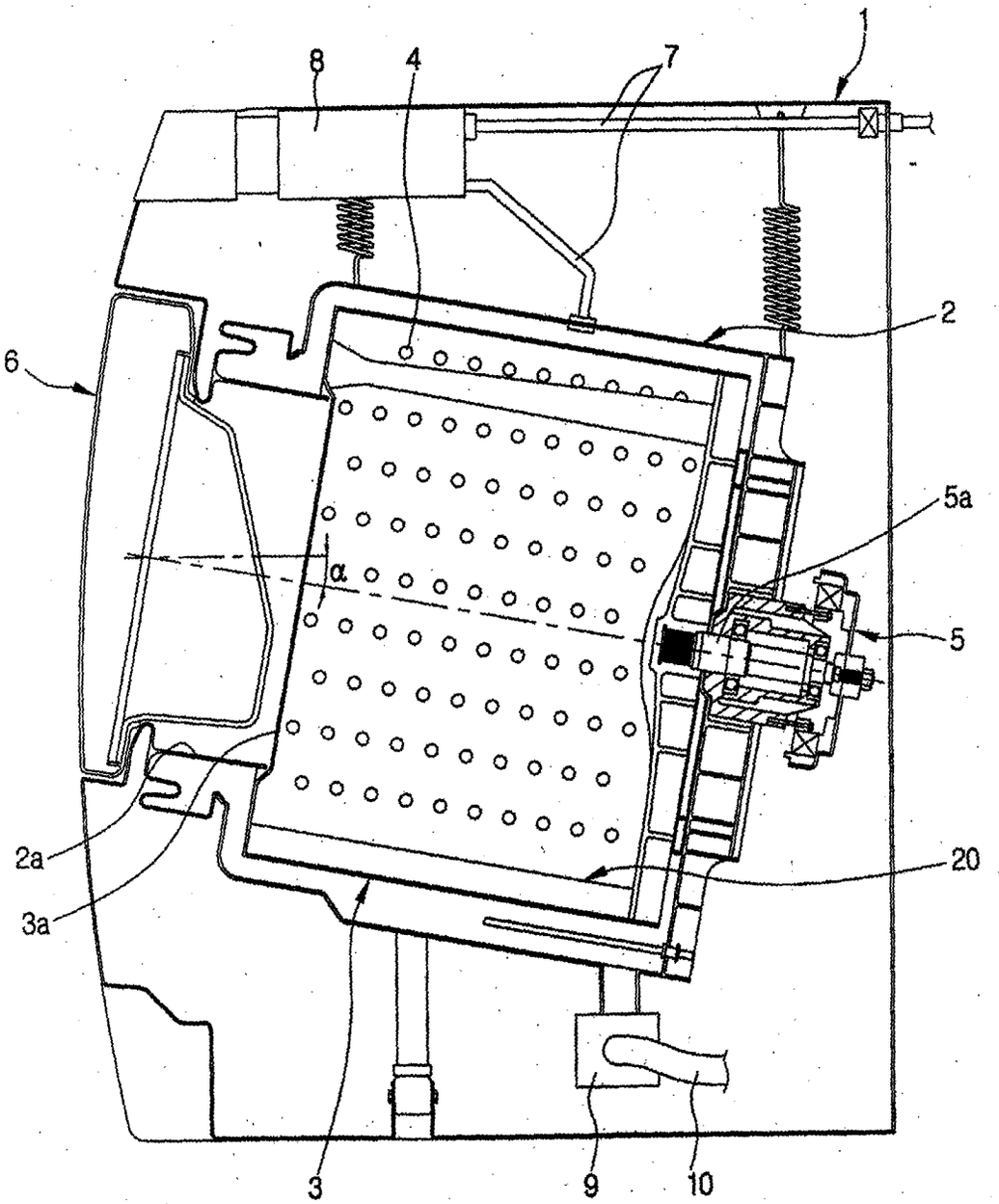

FIG 2

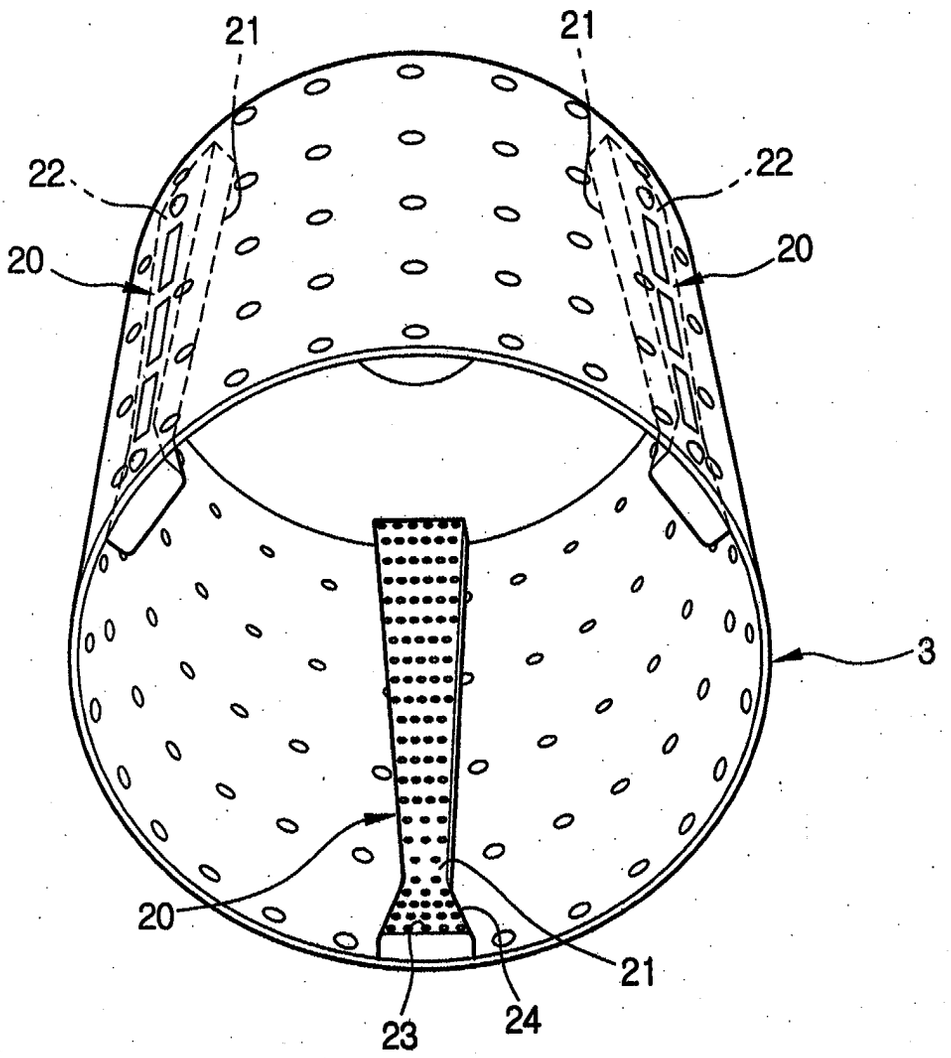

FIG 3