

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
20 September 2007 (20.09.2007)

PCT

(10) International Publication Number  
**WO 2007/105843 A1**

(51) International Patent Classification:  
*D06F 25/00* (2006.01)

(21) International Application Number:  
PCT/KR2006/000950

(22) International Filing Date: 16 March 2006 (16.03.2006)

(25) Filing Language: Korean

(26) Publication Language: English

(71) Applicant (for all designated States except US): **LG ELECTRONICS INC.** [KR/KR]; 20, Yeouido-dong, Yongdeungpo-ku, Seoul 150-010 (KR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LIM, Hee Tae** [KR/KR]; #2326-603 Seohae Apt., Lilac Village, Wonsang-dong, Buchun-si, Kyungki-do 420-030 (KR). **CHANG, Jae Won** [KR/KR]; #1241-1005 Mokryun Apt., 1091-1, Sanbon-dong, Kunpo-si, Kyungki-do 435-040 (KR).

(74) Agent: **PARK, Byung Chang**; 301 Woojin Bldg., 1445-2 Seocho-dong, Seocho-ku, Seoul 137-070 (KR).

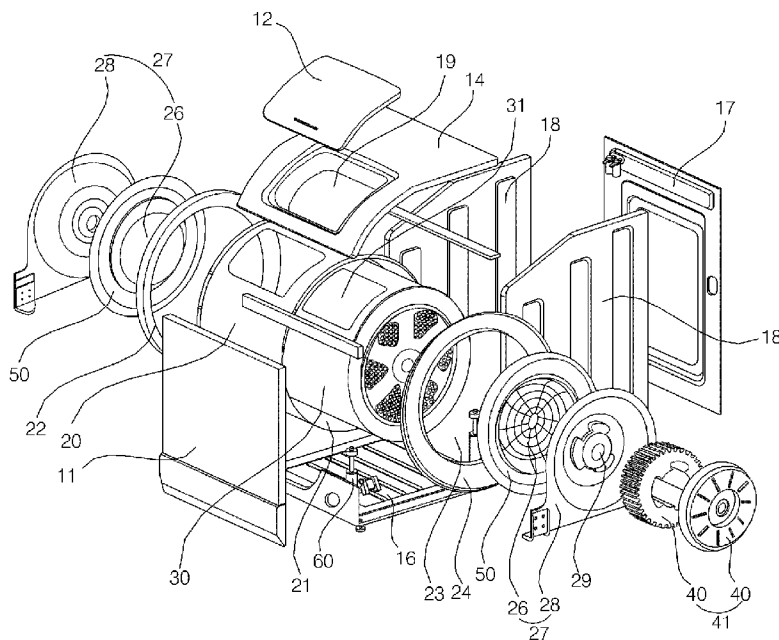
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:  
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TOP-LOADING DRUM TYPE WASHING MACHINE



(57) Abstract: Provided is a top-loading drum type washing machine. The washing machine includes a cabinet having an opening through which laundry comes in and out; a tub installed at the cabinet and having an opening through which the laundry comes in and out; a drum positioned inside the tub and having an opening through which the laundry comes in and out; a door provided at the drum, and opening and closing the opening of the drum; a motor for rotating the drum; a side assembly for supporting a pivot of the drum; a buffer unit connected between the side assembly and the tub; and a suspension connected between the side assembly and the cabinet. The washing machine has an effect of positioning a maximal capacity of a drum at a cabinet of the same size.



WO 2007/105843 A1

## Description

### TOP-LOADING DRUM TYPE WASHING MACHINE

#### Technical Field

[1] The present invention relates to a top-loading drum type washing machine, and more particularly, to a top-loading drum type washing machine in which a tub is integrated with a cabinet of the same size, thereby increasing capacities of a drum housing laundry and the tub.

[2]

#### Background Art

[3] FIG. 1 is a cross-sectional view illustrating an internal structure of a conventional drum type washing machine, and FIG. 2 is a cross-sectional view taken along a line II-II of FIG. 1.

[4] As shown in FIG. 1 or 2, the conventional drum type washing machine includes a cabinet 1 having a base 1a and a door 1b; a tub 2 provided and fixed inside the cabinet 1; a drum 3 rotatably installed inside the tub 2 and rotating laundry (m) and washing water by a lift 3a; a motor 4 for rotating the drum 3; and a spring 5, a damper 6, and a balancer 7 for reducing vibration transmitted to the tub 2.

[5] The drum 3 has a plurality of through-holes 3b for introducing the washing water stored in the tub 2, inside the drum 3. The lift 3a is provided at an inner side surface of the drum 3. The lift 3a rotating together with the drum 3 moves the laundry (m) loaded inside the drum 3, together with the washing water.

[6] The tub 2 is spaced apart from an inner side surface of the cabinet 1. Both upper ends of the tub 2 are connected by the spring 5 and are locked inside the cabinet 1. The damper 6 is hinged and connected to the tub 2 and the base 1a, and is supported by an upper surface of the base 1a. The spring 5 and the damper 6 offset the vibration transmitted from the tub 2 to the cabinet 1.

[7] A door 1b of the cabinet 1 is rotatably provided in front to input the laundry (m). Openings 2c and 3c are provided on front surfaces 2d and 3d of the tub 2 and the drum 3, respectively, to communicate with a through-hole (not shown) opened by the door 1b.

[8] A gasket 8 is installed between a front surface 1d of the cabinet 1 having the door 1b and a front surface 2d of the tub 2 to prevent a leakage of the washing water. The gasket 8 makes airtight a space between an inner surface of the cabinet 1 and the front surface 2d of the tub 2.

[9] The motor 4 is provided on a rear surface of the tub 2, and rotates the drum 3 provided inside the tub 2.

[10] The balancer 7 balancing the rotating drum 3 is installed at the drum 3. The balancer 7 having a predetermined weight provides centrifugal force to the drum rotating at a high speed at the time of drying, and suppresses the vibration of the drum 3.

[11] However, the above-described conventional drum type washing machine has a drawback in that the cabinet 1 is excessively large in volume compared to a capacity of the drum 3 where washing is substantially performed.

[12] In other words, there is a drawback in that since the tub installed inside the cabinet 1 are spaced apart at its front surface (a) and both side surfaces (b) from the cabinet 1, the drum 3 is reduced in volume when the cabinet 1 is constant in size.

[13] The above-described conventional drum type washing machine has a drawback in that since the bearing supporting a rotating drum shaft is provided only in rear of the drum, a load applied to the bearing relatively increases, thereby deteriorating the bearing in durability.

[14]

## **Disclosure of Invention**

### **Technical Problem**

[15] Accordingly, the present invention is to solve at least the problems and disadvantages of the background art.

[16] The present invention is to provide a top-loading drum type washing machine for maximizing a capacity of a washing drum in a cabinet of the same size.

### **Technical Solution**

[17] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, there is provided a top-loading drum type washing machine. The washing machine includes a cabinet having an opening through which laundry comes in and out; a tub installed at the cabinet and having an opening through which the laundry comes in and out; a drum positioned inside the tub and having an opening through which the laundry comes in and out; a door provided at the drum, and opening and closing the opening of the drum; a motor for rotating the drum; a side assembly for supporting a pivot of the drum; a buffer unit connected between the side assembly and the tub; and a suspension connected between the side assembly and the cabinet.

[18] The side assembly, the buffer unit, and the suspension may be provided at both sides of the drum, respectively.

[19] The cabinet may have a door for opening and closing its opening.

[20] The tub may be adhered and fixed at least one side surface thereof to an inner surface of the cabinet.

- [21] The tub may be adhered and fixed at a part of an upper and outer circumference surface thereof to an upper and inner surface of the cabinet, and the opening of the cabinet and the opening of the tub are provided at the adhered part.
- [22] The tub may include a tub body disposing the drum inside thereof and opened at its side surfaces; and a tub cover assembled to each of both side surfaces of the tub body and having the opening.
- [23] The side assembly may include a tub bracket through which the pivot of the drum passes; and a bearing housing assembled to a side surface of the tub bracket, allowing a passage of the pivot of the drum, and supporting the pivot.
- [24] The buffer unit is installed between the tub bracket and the tub cover.
- [25] The motor is installed at an outer side surface of the bearing housing, and further comprising a sub bearing housing supporting the motor and fixed to the bearing housing
- [26] The suspension is installed between the bearing housing and the cabinet.
- [27] The washing machine may further include a sealing unit provided between the opening of the cabinet and the opening of the tub.
- [28] The sealing unit may be formed of rubber.
- [29] A liquid balancer for keeping a balance of the rotating drum may be provided at the drum.

[30]

### **Advantageous Effects**

- [31] A top-loading drum type washing machine according to the present invention has an effect in that a tub is directly installed at a cabinet, thereby allowing a design of the drum with a maximal volume within the cabinet of a predetermined size.
- [32] The top-loading drum type washing machine according to the present invention has an effect in that a door is provided at the drum to open and close an opening of the drum, thereby preventing laundry inside the drum from being escaped through the opening of the drum.
- [33] The top-loading drum type washing machine according to the present invention has an effect in that the door opens and closes the opening of the drum in a sliding manner, thereby getting larger a capacity of the drum than when the door opens and closes the opening of the drum in a rotating manner.
- [34] The top-loading drum type washing machine according to the present invention has an effect in that the opening of the tub and the opening of the cabinet are communicated in succession and are sealed, thereby making it unnecessary to employ a conventional gasket used to connect the cabinet with the tub.
- [35] The top-loading drum type washing machine according to the present invention has

an effect in that the tub is integrally assembled with the cabinet and its rigidity increases, thereby making lightweight a balancer suppressing a vibration of the drum at the time of drying.

[36] The top-loading drum type washing machine according to the present invention has an effect in that a bearing supporting a pivot of the drum is positioned at each of both side surfaces of the tub to reduce a load and a moment applied to each bearing and minimize a repulsive force of the bearing, thereby increasing a durability of the top-loading drum type washing machine.

[37]

### **Brief Description of the Drawings**

[38] The invention will be described in detail with reference to the following drawings in which like numerals refer to like elements.

[39] FIG. 1 is a cross-sectional view illustrating an internal structure of a conventional drum type washing machine;

[40] FIG. 2 is a cross-sectional view taken along a line II-II of FIG. 1;

[41] FIG. 3 is a partial cutaway perspective view illustrating an internal structure of a top-loading drum type washing machine according to the present invention;

[42] FIG. 4 is a development perspective view illustrating main parts of a top-loading drum type washing machine according to the present invention;

[43] FIG. 5 is a front cross-sectional view illustrating a top-loading drum type washing machine according to the present invention; and

[44] FIG. 6 is a side cross-sectional view illustrating a top-loading drum type washing machine according to the present invention.

[45]

### **Best Mode for Carrying Out the Invention**

[46] Preferred embodiments of the present invention will be described in a more detailed manner with reference to the drawings.

[47] FIG. 3 is a partial cutaway perspective view illustrating an internal structure of a top-loading drum type washing machine according to the present invention, FIG. 4 is a development perspective view illustrating main parts of the top-loading drum type washing machine according to the present invention, FIG. 5 is a front cross-sectional view illustrating the top-loading drum type washing machine according to the present invention, and FIG. 6 is a side cross-sectional view illustrating the top-loading drum type washing machine according to the present invention.

[48] As shown in FIGS. 3 to 6, the top-loading drum type washing machine according to the present invention includes a cabinet 10 forming an exterior shape; a tub 20 directly installed at the cabinet 10 to maximize an internal capacity of a drum 20; the drum 30

positioned and performing a wash within the tub 20; a motor 41 having a rotor 40 and a stator 40', installed at one side of the tub 20 and rotating the drum 30; a side assembly 27 positioned at a side of the tub 20, and constituting a side surface of the tub 20 and at the same time, supporting a pivot of the drum 30; a buffer unit 50 connecting between the side assembly 27 and the tub 20, and sealing the tub 20 and at the same time, cutting off vibration transmitted from the side assembly 27 to the tub 20; and a suspension connecting between the side assembly 27 and the cabinet 10, and reducing vibration and impact generated in rotational motion of the drum 30.

[49] The side assembly 27, the buffer unit 50, and the suspension 60 are provided at both side surfaces of the drum 30 in a symmetric manner on the basis of the drum 30, respectively.

[50] In the top-loading drum type washing machine, openings 19 and 22 are sequentially provided on an upper end of the cabinet 10 and an upper end of the tub 20 to come in and out laundry at an upper side, and an opening 31 is provided at one side of the drum 30 and up/down communicates with the openings 19 and 22 of the cabinet 10 and the tub 20.

[51] The drum 30 should necessarily have a door 32 for preventing the laundry inside the drum from being escaped to a space between the tub 20 and the drum 30.

[52] As sliding along a door guide 33 provided on an inner circumference surface of the drum 30, the door 32 of the drum 30 opens and closes the opening 31.

[53] The door 32 of the drum 30 can be opened and closed in a sliding manner directly by a user. Of course, a separate door driving unit (not shown) can be provided such that it opens and closes the door in the sliding manner.

[54] It is desirable that the cabinet 10 includes a door 12 provided at the opening 19 to protect the user of the top-loading drum type washing machine in the rotation of the drum 30.

[55] The door 12 of the cabinet 10 is fixed to a hinge provided at one side of the opening 19. While rotating, the door 12 opens and closes the opening 19.

[56] The tub 20 can include a door for stopping spattering washing water outside from the tub 20 through the opening 22. However, a sealing unit 35 is provided in an exemplary embodiment of the present invention and thus, the door covering the opening 22 of the tub 20 is not separately required.

[57] In other words, the sealing unit 35 for sealing between the opening 19 of the cabinet and the opening 22 of the tub 20 is provided so as to seal an inner part of the tub 20 and prevent the washing water inside the drum 20 from being spattered outside through the opening 22. It is more effective that the sealing unit 35 is formed of rubber as the rubber can perform a buffer function.

[58] The cabinet 10 has a top cover 14 with the opening 19 on its top surface 13, and has

a base 16 fixing the suspension 60, that is, the damper on its bottom surface 15. The top and bottom surfaces 13 and 15 constitute the external shape of the top-loading drum type washing machine, together with a front surface 11, a side surface 18, and a rear surface 17.

- [59] The tub 20 includes a tub body 21 with the opening 22, opened at its both sides to communicate with the opening 19 of the top cover 14, and connecting directly to an inner side of the top surface 13 of the cabinet 10; a tub cover 24 having an opening 23 at its center, and connecting to each of the both side surfaces of the tub body 21 to cover the drum 30; a tub bracket 26 for closing the opening 23 of the tub cover 24; and a bearing housing 28 positioned at an outer side surface of the tub bracket 26, and supporting a drum shaft 42.
- [60] The side assembly includes the tub bracket 26 and the bearing housing 28, and makes the tub cover 24 airtight together with the buffer unit 50.
- [61] In the tub body 22, the tub 20 is adhered and fixed at its part of an upper and outer circumference surface to an upper and inner surface of the cabinet 10, and the openings 19 and 22 of the cabinet and the tub are provided at the adhered part of the cabinet and the tub. The opening 23 of the tub cover 24 is made airtight by the buffer unit 50 and the side assembly 27. The bearing housing 28 is assembled to an outer surface of the tub bracket 26 by a screw 25. The bearing housing 28 includes a bearing (not shown) to smoothly rotate the drum shaft 42. The drum shaft 42 is supported by the bearing.
- [62] The buffer unit 50 is to buffer the vibration or impact that is generated from the drum 30 and the motor 41 and is transmitted to the tub body 22 at the time of washing and drying. The buffer unit 50 is formed of elastic material that shrinks and relaxes depending on the vibration or impact. The buffer unit 50, a side gasket 50, is provided along an outer circumference of the tub bracket 26 to seal the opening 23 of the tub cover 24.
- [63] The motor 41 is installed at an outer surface of any one side of the bearing housings 28 provided at both sides of the tub body 22. A sub bearing housing 29 having a bearing (not shown) to smoothly rotate the drum shaft 42 connecting with the motor 41 is fixed to an outer surface of the bearing housing 28.
- [64] The drum 30 is rotated by the drum shaft 42. A plurality of lifters 37 for moving the laundry are provided on an inner surface of the drum 30.
- [65] Balancers 34 are provided at both side surfaces of the drum 30. The balancers 34 perform a balancing function of suppressing the vibration of the drum 30 caused by the one-sidedness of the laundry at the time of drying. Specifically, when the vibration or impact is transmitted to the tub body 22 integrally assembled to the cabinet 10, the tub body 22 itself is not only vibrated but also, due to the addition of a self weight of the cabinet 10, the tub 20 increases in rigidity. Thus, the balancer 34 can employ even a

balancer of small weight.

- [66] The suspension 60 is constituted of the damper. The damper 60 is positioned between the bearing housing 28 of the side assembly 27 and the base 16 of the cabinet 10, and is fixed to a damper bracket (not shown) connecting to each of the bearing housing 28 and the base 16. The damper 60 is provided by two at each bearing housing 28. As a result, the top-loading drum type washing machine according to an exemplary embodiment of the present invention has four dampers 60.
- [67] An operation of the top-loading drum type washing machine will be described below.
- [68] First, when the door 12 of the cabinet 10 is lifted up, the opening 19 of the cabinet 10 and the opening 22 of the tub 20 are opened up/down.
- [69] When the door 32 of the drum 30 is slid and moved in the direction of opening the opening 31, the opening 31 of the drum 30 up/down communicates with the opening 19 of the cabinet 10 and the opening 22 of the tub 20. When the user inputs the laundry through the opening 19 of the cabinet 10, the laundry is put in the drum 30 through the opening 19 of the cabinet 10, the opening of the tub 20, and the opening 31 of the drum 30.
- [70] After that, when the door 32 of the drum 30 is slid in the direction opposite to when the opening 31 of the drum 30 is opened, the door 32 of the door 30 makes the opening 31 of the drum 30 airtight. When the door 12 of the cabinet 10 is shut down, the door 12 of the cabinet 10 makes the opening 19 of the cabinet 10 airtight.
- [71] In the top-loading drum type washing machine, the laundry is housed, the washing water is supplied, and the motor 41 is driven, thereby executing a washing stroke.
- [72] When the motor 41 is driven, the drum shaft 42 rotates while supported by the bearing housing 28 and the sub bearing housing 29, and rotates the drum 30. The drum 30 rotates together with the door 32, washing the laundry.
- [73] Meantime, in the top-loading drum type washing machine, when the drum 30 rotates as above, it causes the vibration. The vibration is transmitted to the suspension 60 through the bearing housing 28 and the tub bracket 26, and is buffered by the suspension 60.
- [74] As above, after the execution of the washing stroke, the top-loading drum type washing machine executes a rinse stroke or a dry stroke. Upon the completion of all strokes of the top-loading drum type washing machine, the motor 41 stops rotating the drum 30 such that the opening 31 of the drum 30 is positioned under the opening 19 of the cabinet 10 and the opening of the tub 20.
- [75] After that, if the door 12 of the cabinet 10 is lifted up, the opening 19 of the cabinet 10 and the opening 22 of the tub 20 are opened up/down.
- [76] If the door 32 of the drum 30 is again slid and moved in the direction of opening the

opening 31, the opening 31 of the drum 30 up/down communicates with the opening 19 of the cabinet 10 and the opening 22 of the tub 20. When the user puts his/her hand or a plier in and puts the laundry out the opening 19 of the cabinet 10, the opening 22 of the tub 20, and the opening 31 of the drum 30, the laundry inside the drum 30 is taken outside the top-loading drum type washing machine through the opening 31 of the drum 30, the opening 22 of the tub 20, and the opening 19 of the cabinet 10, sequentially.

[77]

### **Industrial Applicability**

[78] The above constructed and operating top-loading drum type washing machine according to the present invention has an advantage in that a tub is directly installed at a cabinet, thereby allowing a design of the drum with a maximal volume within the cabinet of a predetermined size.

[79] The top-loading drum type washing machine according to the present invention has an advantage in that a door is provided at the drum to open and close an opening of the drum, thereby preventing laundry inside the drum from being escaped through the opening of the drum.

[80] The top-loading drum type washing machine according to the present invention has an advantage in that the door opens and closes the opening of the drum in a sliding manner, thereby getting larger a capacity of the drum than when the door opens and closes the opening of the drum in a rotating manner.

[81] The top-loading drum type washing machine according to the present invention has an advantage in that the opening of the tub and the opening of the cabinet are communicated in succession and are sealed, thereby making it unnecessary to employ a conventional gasket used to connect the cabinet with the tub.

[82] The top-loading drum type washing machine according to the present invention has an advantage in that the tub is integrally assembled with the cabinet and its rigidity increases, thereby making lightweight a balancer suppressing a vibration of the drum at the time of drying.

[83] The top-loading drum type washing machine according to the present invention has an advantage in that a bearing supporting a pivot of the drum is positioned at each of both side surfaces of the tub to reduce a load and a moment applied to each bearing and minimize a repulsive force of the bearing, thereby increasing a durability of the top-loading drum type washing machine.

[84] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in

the art are intended to be included within the scope of the following claims.

[85]

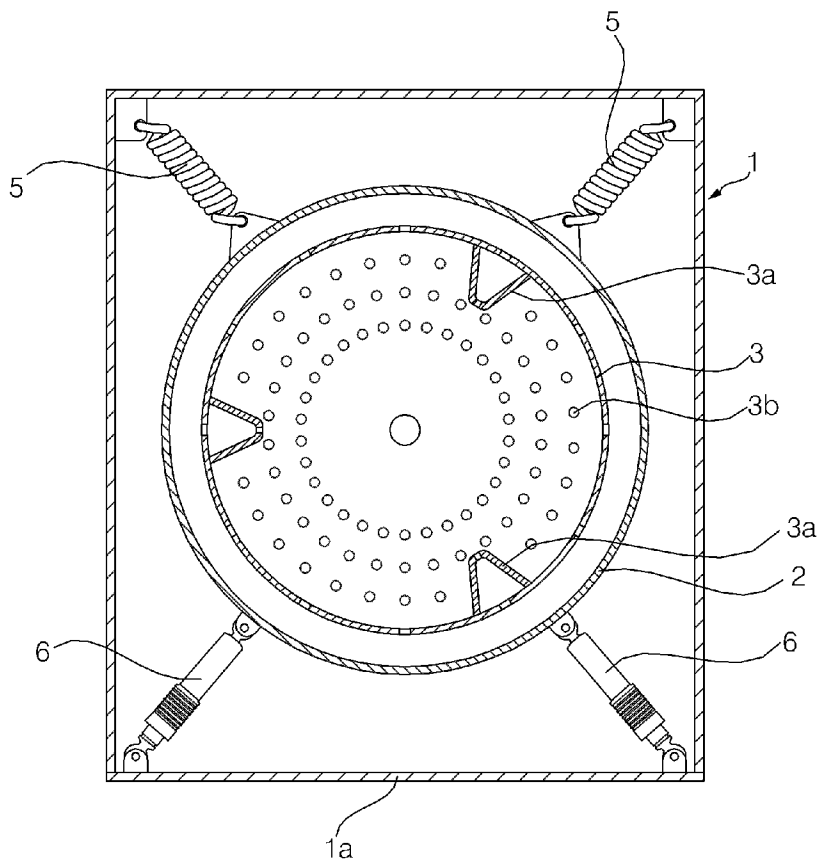
## Claims

- [1] A top-loading drum type washing machine comprising:  
a cabinet having an opening through which laundry comes in and out;  
a tub installed at the cabinet and having an opening through which the laundry comes in and out;  
a drum positioned inside the tub and having an opening through which the laundry comes in and out;  
a door provided at the drum, and opening and closing the opening of the drum;  
a motor for rotating the drum;  
a side assembly for supporting a pivot of the drum;  
a buffer unit connected between the side assembly and the tub; and  
a suspension connected between the side assembly and the cabinet.
- [2] The washing machine of claim 1, wherein the side assembly, the buffer unit, and the suspension are provided at both sides of the drum, respectively.
- [3] The washing machine of claim 1 or 2, wherein the cabinet has a door for opening and closing its opening.
- [4] The washing machine of claim 1 or 2, wherein the tub is adhered and fixed at least one side surface thereof to an inner surface of the cabinet.
- [5] The washing machine of claim 4, wherein the tub is adhered and fixed at a part of an upper and outer circumference surface thereof to an upper and inner surface of the cabinet, and the opening of the cabinet and the opening of the tub are provided at the adhered part.
- [6] The washing machine of claim 1 or 2, wherein the tub comprises:  
a tub body disposing the drum inside thereof and opened at its side surfaces; and  
a tub cover assembled to each of both side surfaces of the tub body and having the opening.
- [7] The washing machine of claim 6, wherein the side assembly comprises:  
a tub bracket through which the pivot of the drum passes; and  
a bearing housing assembled to a side surface of the tub bracket, allowing a passage of the pivot of the drum, and supporting the pivot.
- [8] The washing machine of claim 7, wherein the buffer unit is installed between the tub bracket and the tub cover.
- [9] The washing machine of claim 7, wherein the motor is installed at an outer side surface of the bearing housing, and further comprising a sub bearing housing supporting the motor and fixed to the bearing housing.
- [10] The washing machine of claim 7, wherein the suspension is installed between the bearing housing and the cabinet.

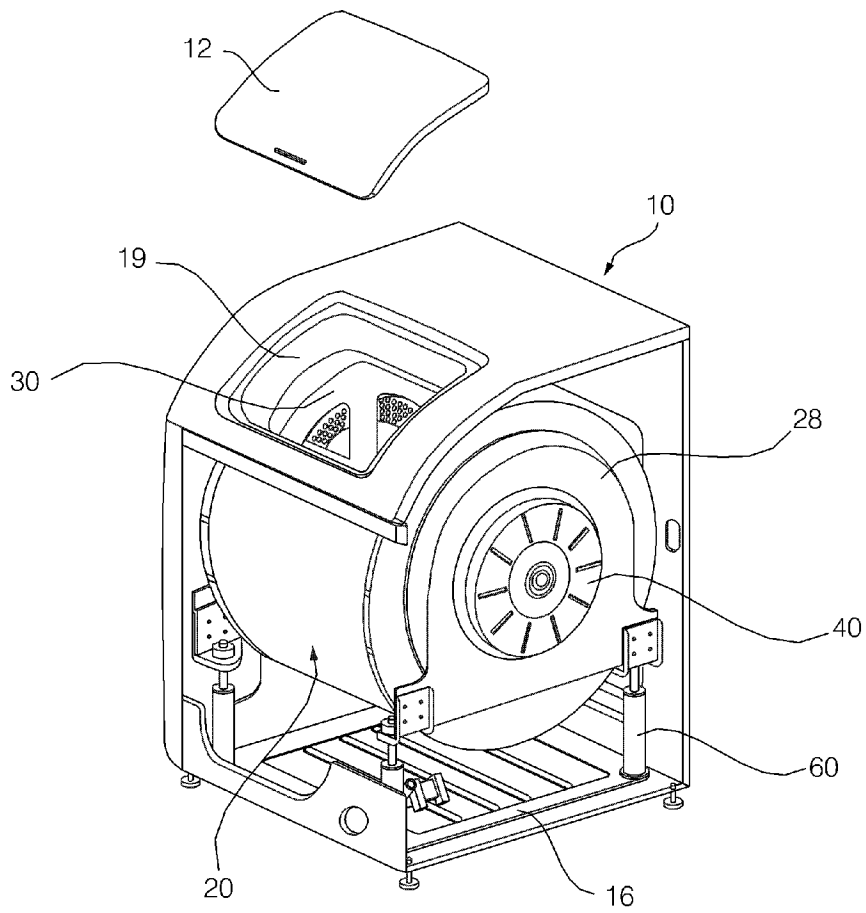
- [11] The washing machine of claim 1 or 2, further comprising a sealing unit provided between the opening of the cabinet and the opening of the tub.
- [12] The washing machine of claim 11, wherein the sealing unit is formed of rubber.
- [13] The washing machine of claim 1 or 2, wherein a liquid balancer for keeping a balance of the rotating drum is provided at the drum.



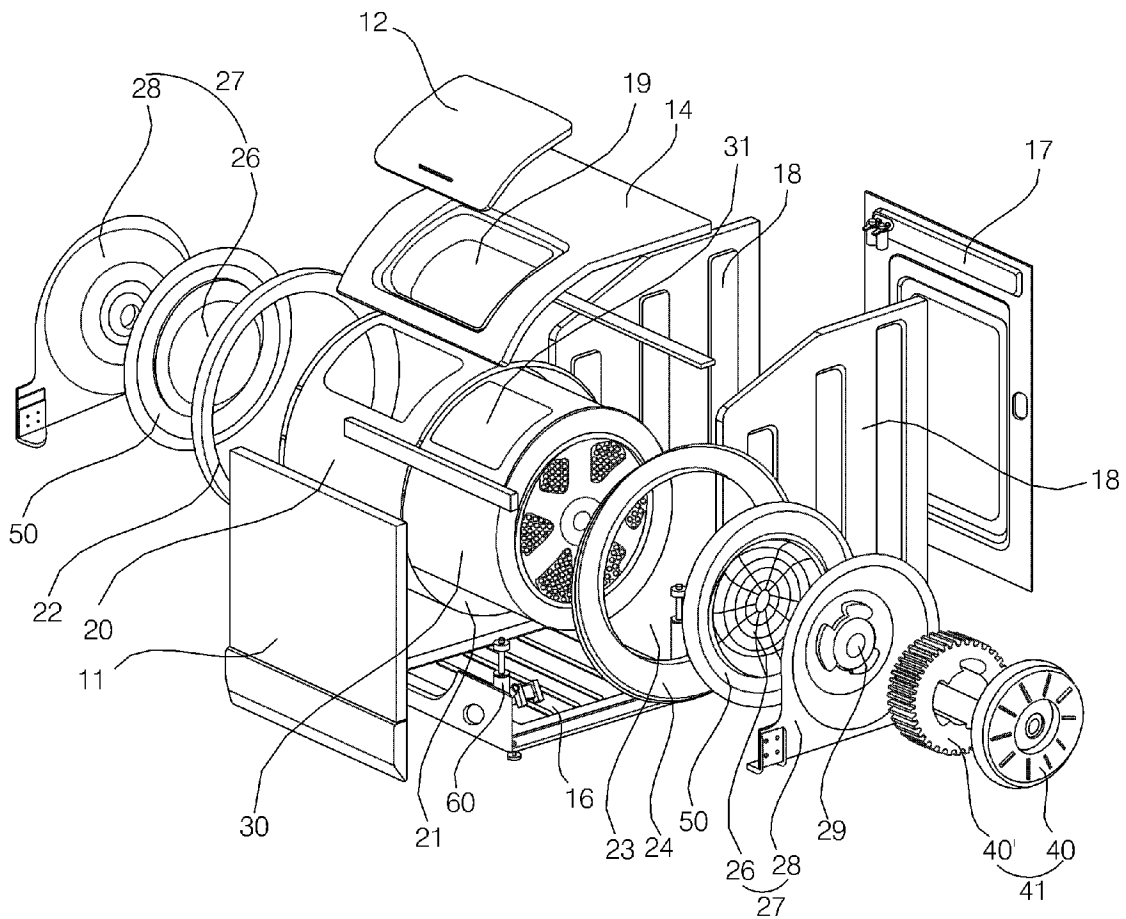
[Fig. 2]



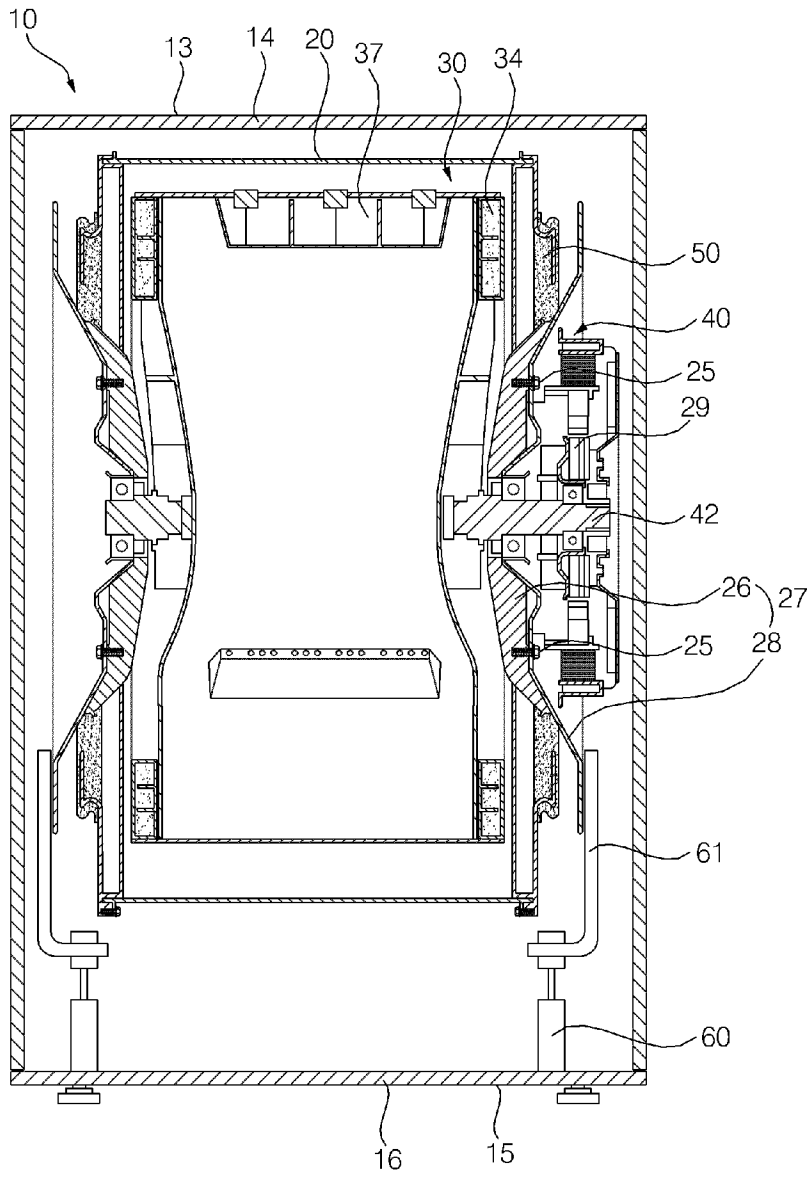
[Fig. 3]



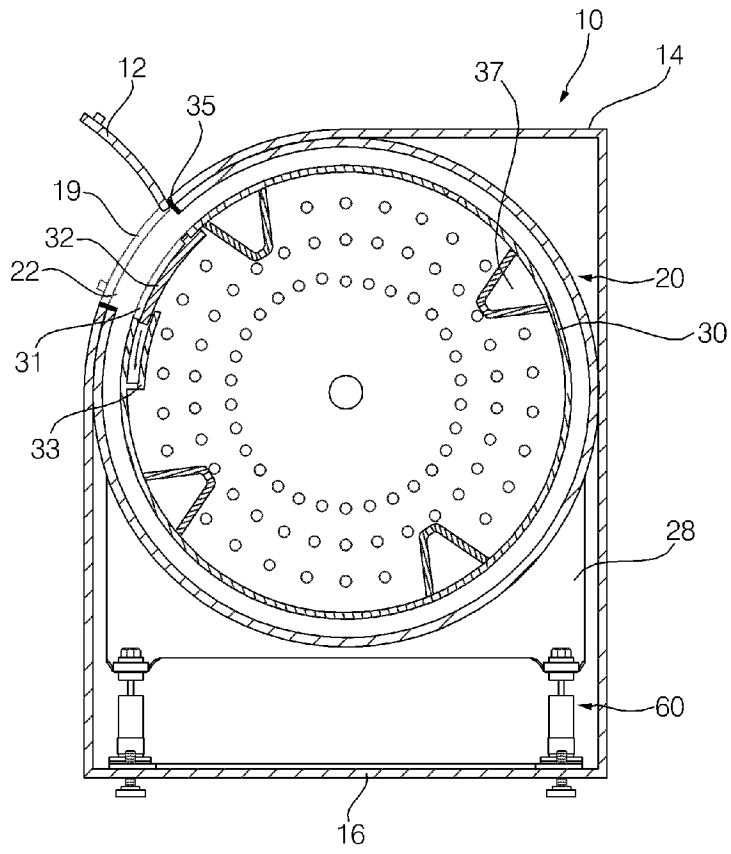
[Fig. 4]



[Fig. 5]



[Fig. 6]



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR2006/000950**A. CLASSIFICATION OF SUBJECT MATTER***D06F 25/00(2006.01)i*

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC8 : D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
KR,JP IPC as aboveElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKIPASS(KIPO internal) "top-loading", "absorb", "suspension"**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2003-93790 A (SANYO ELECTRIC CO LTD) 2 April 2003 See the detailed statement [0012]-[0021]; figs 1,2	1
A	JP 2004-188172 A (SANYO ELECTRIC CO LTD) 8 July 2004 See the detailed statement [0017]-[0020]; figs 1-3	1
A	JP 2003-103095 A (SANYO ELECTRIC CO LTD) 8 April 2003 See figs 6,7	1
E	KR 10-2006-42684 A (LG ELECTRONICS INC.) 15 May 2006 See the claims 1-12; figs 4-6	1-13

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

15 DECEMBER 2006 (15.12.2006)

Date of mailing of the international search report

**15 DECEMBER 2006 (15.12.2006)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office  
920 Dunsan-dong, Seo-gu, Daejeon 302-701,  
Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, Dong Kuk

Telephone No. 82-42-481-8452



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/KR2006/000950

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP2003-093790A	02.04.2003	CN1408932	09.04.2003
		CN1408932A	09.04.2003
		EP01295978A1	26.03.2003
		EP1295978A1	26.03.2003
		JP15093790	02.04.2003
		JP2003093790A2	02.04.2003
		KR1020030027678	07.04.2003
		KR2003027678A	07.04.2003
		US06782722	31.08.2004
		US20030056555A1	27.03.2003
		US2003056555AA	27.03.2003
		US6782722BB	31.08.2004
		-----	
JP2004-188172A	08.07.2004	None	
-----			
JP2003-103095A	08.04.2003	CN1185382C	19.01.2005
		CN1410620	16.04.2003
		CN1410620A	16.04.2003
		EP01298242A1	02.04.2003
		EP1298242A1	02.04.2003
		JP15103095	08.04.2003
		JP2003103095A2	08.04.2003
		JP3605061B2	22.12.2004
		KR1020030027764	07.04.2003
		KR2003027764A	07.04.2003
		US20030061841A1	03.04.2003
		US2003061841A1	03.04.2003
		US2003061841AA	03.04.2003
US7073356BB	11.07.2006		
-----			
KR102006042684A	15.05.2006	None	