



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
11.12.2019 Bulletin 2019/50

(51) Int Cl.:
D06F 37/04 (2006.01)

(21) Application number: **18747637.9**

(86) International application number:
PCT/CN2018/075364

(22) Date of filing: **06.02.2018**

(87) International publication number:
WO 2018/141298 (09.08.2018 Gazette 2018/32)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD TN

(30) Priority: **06.02.2017 CN 201710065692**

(71) Applicant: **Qingdao Haier Drum Washing Machine Co., Ltd.**
Qingdao, Shandong 266101 (CN)

(72) Inventors:
• **ZHAO, Zhiqiang**
Qingdao
Shandong 266101 (CN)
• **XU, Sheng**
Qingdao
Shandong 266101 (CN)

(74) Representative: **HGF Limited**
4th Floor
Merchant Exchange
17-19 Whitworth Street West
Manchester M1 5WG (GB)

(54) **DRUM WASHING MACHINE**

(57) A drum washing machine includes a washing machine housing (1). A washing drum is disposed in the washing machine housing (1) and includes a front washing drum (21) and a rear washing drum (22), and the front washing drum (21) is sealedly connected to the rear washing drum (22) and is operative to rotate relative to the rear washing drum (22). The front washing drum (21) is operative to rotate along with a motor (4), and the rear washing drum (22) is at rest when the front washing drum (21) is rotating along with the motor (4).

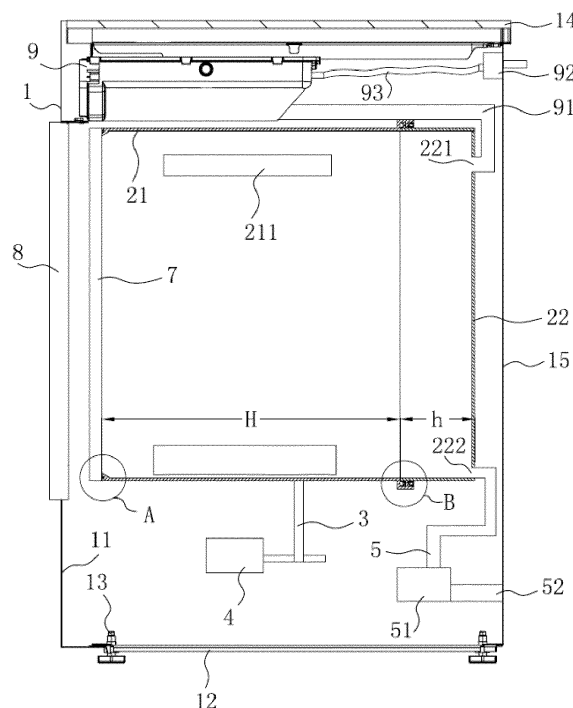


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to the technical field of washing machines, for example, to a drum washing machine.

BACKGROUND

[0002] A drum washing machine in the related art includes an inner drum and an outer drum. A user can keep the inner drum of the washing machine clean in a washing and maintenance process of the washing machine, but the outer drum is sleeved outside the washing drum (i.e., the inner drum), so that an interlayer, namely a washing machine groove, is disposed between the inner drum and the outer drum. The washing machine groove is a harboring site for dirt, and the user cannot remove the inner drum and the outer drum on his/her own to clean an outer wall of the inner drum and an inner wall of the outer drum. Furthermore, the residual water in the inner drum and outer drum that is left from the operation of the washing machine is not easy to clean and evaporate, leading to the growth of a large amount of bacteria on the drum walls. As time proceeds, more and more areas would be attached with dirt, and the dirt also sticks more and more fast to the drum walls. This would cause secondary pollution to the clothes, seriously threatening the health of consumers. Therefore, the user needs to periodically ask a professional technician for professional washing of the washing machine to clean the washing machine, which is time-consuming and labor-consuming.

[0003] Therefore, it is a technical problem that needs to be solved by those skilled in the art to provide a washing machine that is able to solve the problem that the washing machine drum in the related art needs to be periodically cleaned.

SUMMARY

[0004] The present invention provides a drum washing machine, which can solve the problem that a washing machine drum in the related art needs to be cleaned periodically.

[0005] There is provided drum washing machine that includes a washing machine housing. A washing drum is disposed in the washing machine housing and includes a front washing drum and a rear washing drum. The front washing drum is sealedly connected to the rear washing drum and is operative to rotate relative to the rear washing drum. The front washing drum is operative to rotate along with a motor, and the rear washing drum is at rest when the front washing drum is rotating along with the motor.

[0006] The washing drum according to the present invention includes a front washing drum and a rear washing drum. The front washing drum can rotate relative to the

rear washing drum, and the front washing drum is dynamically and sealedly connected to the rear washing drum. Then clothes and water in the washing drum are driven to rotate to lift clothes, and then let the clothes fall and be beaten, thereby achieving the function of washing clothes. Because the washing drum is not divided into an inner drum and an outer drum, the outer wall of the washing drum cannot be filled with water, especially water after washing. Thus, dirt can be prevented from being accumulated on the outer wall of the washing drum, the outer wall of the washing drum is free from needing cleaning. In addition, water that is present between the inner drum and the outer drum of the original washing drum is also saved, thereby further saving water.

[0007] Optionally, the rear washing drum has a length smaller than the front washing drum.

[0008] The length of the rear washing drum is less than that of the front washing drum so that the rear washing drum can rotate when there is sufficient water, ensuring the washing cleaning rate.

[0009] Optionally, the washing machine housing is provided with a loading port, a door and window is disposed at the loading port, and a sealing door is further arranged on a side of the front washing drum adjacent to the door and window and is configured to seal the washing drum. A sealing groove is defined in a side wall of the front washing drum contacting the sealing door or in a side wall of the sealing door contacting the front washing drum, and a first sealing ring is disposed in the sealing groove.

[0010] The sealing door, the sealing groove, and the first sealing ring are arranged to seal the front washing drum, so that washing water is prevented from flowing out in a rotating process of the front washing drum. Thus, the washing machine is ensured to complete a washing task and is protected from water leakage, electric leakage, short circuit, and other like faults.

[0011] Optionally, the sealing door is connected to the front washing drum.

[0012] The sealing door is connected to the front washing drum to separate the sealing door from the door and window. When the washing machine is in a rotating and operating, the sealing door rotates along with the front washing drum, effectively solving the problem of a poor sealing effect between the door window and the front washing drum.

[0013] Optionally, a water inlet valve is disposed on the housing of the washing machine and is connected to a detergent box via a water inlet pipeline, and the detergent box is connected to the water inlet hole via a water injection pipe.

[0014] Optionally, a central axis of the washing drum is inclined relative to the horizontal plane, and forms an angle α between the central axis and the horizontal plane, where $0 \leq \alpha < 90^\circ$.

[0015] The inclined-type drum washing machine can better meet user's needs that clothes can be taken out without stooping. The drum has a certain angle of incli-

nation relative to the horizontal plane, thereby making it convenient to take out and put in clothes.

[0016] Optionally, the front washing drum is a no-porous structure drum.

[0017] Optionally, at least one lifting rib is arranged on an inner side wall of the rear washing drum.

[0018] A plurality of lifting ribs may be arranged inside the rear washing drum, so that the clothes inside the rear washing drum can be better lifted, fall down, and be beaten for washing purposes.

[0019] Optionally, the front washing drum is connected to the rear washing drum via a rotary bearing, and a second sealing ring is disposed between the front washing drum and the rear washing drum.

[0020] Optionally, a limiting ring having an F-shaped cross-section is disposed at a joint of the front washing drum and the rear washing drum.

[0021] The limiting ring includes a first vertical limiting ring body, a first transverse limiting ring body disposed on top of the first vertical limiting ring body, and a second transverse limiting ring body parallel to the first transverse limiting ring body.

[0022] The second sealing ring may be disposed between the first transverse limiting ring body and the second transverse limiting ring body, the rotary bearing may be disposed in a space formed by the first vertical limiting ring body, the second transverse limiting ring body, and an outer wall of the rear washing drum.

[0023] The sealing ring is arranged between the first transverse limiting ring body and the second transverse limiting ring body, namely the sealing ring is arranged in a rectangular closed space formed by the first transverse limiting ring body, the second transverse limiting ring body, the first vertical limiting ring body, and a lower drum. The rotary bearing is arranged in a space formed by the first vertical limiting ring body, the second transverse limiting ring body, and an outer wall of the lower drum. Such an arrangement not only plays a good sealing role, but also ensures that the rear washing drum is operative to rotate relative to the front washing drum.

[0024] Optionally, the second sealing ring is a lip-shaped sealing ring.

[0025] The lip-shaped sealing ring has a self-sealing effect. The lip is acted by working pressure to make the lip compress a sealing coupling surface, the abrasion loss can be automatically compensated, and therefore the lip-shaped sealing ring has a better sealing performance.

[0026] Optionally, a water inlet hole and a water outlet hole are disposed in the rear washing drum, and the water outlet hole is communicated with a drain valve via a drain connecting pipe.

[0027] Because the rear washing drum does not rotate, the problem that the joint cannot be aligned or water leaks after alignment would not occur when the water inlet hole and the water outlet hole are arranged on the rear washing drum.

BRIEF DESCRIPTION OF DRAWINGS

[0028]

5 FIG. 1 is a schematic diagram of a drum washing machine of Embodiment 1 according to the present invention;

10 FIG. 2 is a partial enlarged view of part A of FIG. 1;

FIG. 3 is a partial enlarged view of part B of FIG. 1;

15 FIG. 4 is a schematic diagram of a drum washing machine of Embodiment 2 according to the present invention;

FIG. 5 is a partial enlarged view of part C of FIG. 4; and

20 FIG. 6 is a partial enlarged view of part C of FIG. 4 in another embodiment according to the present invention.

[0029] In the drawings:

25 1. Washing machine housing; 11. Front panel; 12. Chassis; 13. Ground foot; 14. Upper table panel; 15. Rear backplate; 21. Front washing drum; 211. Lifting rib; 212. Sealing groove; 213. Limiting ring; 2131. First vertical limiting ring body; 2132. First transverse limiting ring body; 2133. Second transverse limiting ring body; 22. Rear washing drum; 221. Water inlet hole; 222. Water outlet hole; 3. Belt; 4. Motor; 5. Drain connecting pipe; 51. Drain valve; 52. Drain pipe; 61. First sealing ring; 62. Second sealing ring; 7. Sealing door; 8. Door and window; 9. Detergent box; 91. Water injection pipe; 92. Water inlet valve; 93. Water inlet pipeline; 10. Rotary bearing.

DETAILED DESCRIPTION

40 Embodiment 1

[0030] As illustrated in FIGS. 1 to 3, the present embodiment provides a drum washing machine which does not require periodical cleaning of dirt on an outer wall or an inner wall of a washing drum, making it more water-saving. The drum washing machine includes a washing machine housing 1, and a washing drum is arranged in the washing machine housing 1 and is configured for rotating to wash clothes. The washing drum includes a front washing drum 21 and a rear washing drum 22. The front washing drum 21 is dynamically and sealedly connected to the rear washing drum 22, and the front washing drum 21 can rotate relative to the rear washing drum 22. The rear washing drum 22 is at rest in a rotating process of the front washing drum 21, and water in the washing drum can be ensured to rotate along with the front washing drum 21 to perform washing of the clothes. The front washing drum 21 is connected to the motor 4 via a

belt 3, and the front washing drum 21 is operative rotate along with the motor 4; that is, the belt 3 rotates along with the motor 4. When the motor 4 drives the front washing drum 21 to rotate, the rear washing drum 22 is at rest, and because the rear washing drum 22 is at rest, there is no need to position water injection and water drainage. Therefore, in the present embodiment, the rear washing drum 22 is provided with a water inlet hole 221 and a water outlet hole 222, and the water outlet hole 222 is connected to the drain valve 51 via the drain connecting pipe 5. After the washing is finished, sewage enters the drain pipe 52 through the water outlet hole 222 and the drain valve 51 and is discharged out of the washing machine.

[0031] In order to make the water in the washing drum rotate with the front washing drum 21, in the present embodiment, the length h of the rear washing drum 22 is less than the length H of the front washing drum 21. The length of the rear washing drum 22 can be as small as possible, but it should be noted that the length of the rear washing drum 22 should not affect the arrangement of the water outlet hole 222 and the water inlet hole 221. The rear washing drum 22 may be flexibly fixed in the washing machine housing 1 by a spring or a damper, or may be firmly fixed in the washing machine housing 1 with complete rigidity.

[0032] In the present embodiment, the rear washing drum 22 and the front washing drum 21 are both non-porous drums, that is, no hole is provided in a side wall of both the rear washing drum and the front washing drum, and the rear washing drum 22 is provided with the water inlet hole 221 and the water outlet hole 222. Such structure can ensure that the front washing drum 21 can be filled with water or drained without being positioned after rotation. Dirt is prevented from being accumulated on the wall of the drum due to water flowing out from the side wall holes. Furthermore, the front washing drum 22 and the rear washing drum 21 are not soaked by water, so that the front washing drum 21 is not subjected to resistance of water passing through holes in the rotating process, providing smoother rotation.

[0033] In addition, the front washing drum 21 may be a non-porous structure drum. After water inflow is finished, the drain pump or the drain valve is not started and is in a sealed state. Detergent and washing water are sealed in the front washing drum and the rear washing drum, and clothes to be washed are also placed in the front washing drum and the rear washing drum. Such structure can realize the integrated design of the water drum and the laundry drum, preventing water from flowing out of the outer wall of the washing drum to cause dirt to be accumulated on the outer wall, thereby further saving water.

[0034] A side of the washing machine housing 1 is provided with a loading port, and a door and window 8 is arranged at the loading port. A side of the front washing drum 21 adjacent to the door and window 8 is further provided with a sealing door 7 for sealing the washing

drum, and the sealing door 7 is hingedly connected to the front washing drum 21 so as to ensure that the sealing door 7 is able to be opened. A sealing groove 212 is defined in the side wall of the front washing drum 21 contacting the sealing door 7 or in a side wall of the sealing door 7 contacting the front washing drum 21, and a first sealing ring 61 (referring to FIG. 2) is disposed in the sealing groove 212. Thus, after it is closed, the sealing door 7 can realize static sealing with the front washing drum 21, thereby ensuring that the washing drum is not subject to water leakage. The user opens the door and window 8 and then opens the sealing door 7, so that the washed clothes can be taken out or the clothes to be washed can be put in.

[0035] In other embodiments, the sealing door 7 may also be connected to the door and window 8, and can rotate relative to the door and window 8, that is, the sealing door 7 is connected to the door and window 8 via a shaft, and can block a front end of the front washing drum 21 to make the sealing door 7 and the front washing drum 21 form a sealing chamber to prevent washing water from flowing out. Therefore, the sealing door 7 can be opened by opening the door and window 8, and the clothes can be put in and taken out, providing a more convenient washing machine for the user.

[0036] At least one lifting rib 211 is arranged on an inner side wall of the front washing drum 21. The lifting ribs 211 are provided for the purpose of lifting the clothes to allow the clothes to then rapidly fall during the washing process, so that the clothes inside can be better lifted, and fall so as to be beaten for washing purposes.

[0037] To ensure that the rear washing drum 22 can rotate relative to the front washing drum 21, in the present embodiment, the rear washing drum 22 is connected to the front washing drum 21 via a rotary bearing 10. The rear washing drum 22 is sleeved on an inner ring of the rotary bearing 10, the front washing drum 21 is engaged with an outer ring of the rotary bearing 10, and a second sealing ring 62 is disposed between the front washing drum 21 and the rear washing drum 22.

[0038] As illustrated in FIG. 3, in order to prevent water leakage at the joint between the front washing drum 21 and the rear washing drum 22, a limiting ring 213 having an F-shaped cross-section is disposed at the joint between the front washing drum 21 and the rear washing drum 22. The limiting ring 213 includes a first vertical limiting ring body 2131, a first transverse limiting ring body 2132 disposed on top of the first vertical limiting ring body 2131, and a second transverse limiting ring body 2133 disposed parallel with the first transverse limiting ring body 2132. The second sealing ring 62 is disposed between the first transverse limiting ring body 2132 and the second transverse limiting ring body 2133, and the rotary bearing 10 is disposed in a space formed by the first vertical limiting ring body 2131, the second transverse limiting ring body 2133, and an outer wall of the rear washing drum 22. The second sealing ring 62 is a lip-shaped sealing ring. The limiting ring 213 is inte-

grated with the front washing drum 21, and such structure can improve the sealing effect between the front washing drum 21 and the limiting ring 213.

[0039] The front washing drum 21 is connected to the rear washing drum 22 via the rotary bearing 10, so that the front washing drum 21 can be effectively ensured to rotate relative to the rear washing drum 22. Furthermore, the sealing ring is arranged between the rear washing drum 22 and the front washing drum 21, so that water in the washing drum can be prevented from flowing out of the washing drum to affect the operation of the washing machine.

[0040] When the front washing drum 21 rotates and is in low-speed washing, the rotating speed is 0-200 r/min; and when in high-speed dewatering and drying, the rotating speed is 600-1800 rpm. The second sealing ring 62 may be a lip-shaped sealing ring, and such sealing ring has a self-sealing effect. The lip is acted by working pressure to make the lip compress a sealing coupling surface, and the abrasion loss can be automatically compensated. The working pressure originated from the pre-compression force of the front washing drum 21 and the rear washing drum 22, the self-gravity of the front washing drum 21, and the working pressure of the internal liquid. The second sealing ring 62 may be the shape of Y, V, U, J or L.

[0041] The rotary connection (dynamic connection) between the front washing drum 21 and the rear washing drum 22 is a bearing connection, the front washing drum 21 and the rear washing drum 22 are respectively connected to an outer ring and an inner ring of the bearing. The rotary bearing can be selected from various types, and the rotary bearing 9 includes all bearings, such as ball bearings and roller bearings. The bearing type in the present embodiment may be a tapered roller bearing, a cylindrical roller bearing, a ball roller bearing, or the like. The tapered roller bearing is selected in the present embodiment, and the tapered ball bearing includes a bearing inner ring, a bearing bracket, tapered rollers, and a bearing outer ring.

[0042] As illustrated in FIG. 1, the drum washing machine is filled with water through a water inlet valve 92 provided on the washing machine housing 1. The water inlet valve 92 is communicated to a tap water pipeline and is communicated to a detergent box 9 through a water inlet pipeline 93, and the detergent box 9 is communicated to the water inlet hole 221 through a water injection pipe 91. The tap water sequentially passes through the water inlet valve 92, the water inlet pipe 93 and the detergent box 9, and then enters the rear washing drum 22.

[0043] The bottom of the washing machine housing 1 is further provided with a chassis 12, the bottom of the chassis 12 is provided with ground feet 13 for supporting the whole washing machine, and the top of the washing machine housing 1 is provided with an upper table panel 14.

Embodiment 2

[0044] The difference between the present embodiment and Embodiment 1 is that a central axis of a washing drum is arranged inclined relative to the horizontal plane.

[0045] As illustrated in FIG. 4, in order to facilitate the taking out and putting in of clothes, a central axis of the washing drum is inclined relative to the horizontal plane, and an angle formed between the central axis of the washing drum and the horizontal plane is α , and $0 \leq \alpha < 90^\circ$.

[0046] As illustrated in FIG. 5, the rotary bearing 10 in the present embodiment is a cylindrical roller bearing. In other embodiments, the rotary bearing 10 may also be a ball bearing (referring to FIG. 6).

INDUSTRIAL APPLICABILITY

[0047] The drum washing machine in the present invention does not need periodical cleaning of dirt on an outer wall or an inner wall of a washing drum, so that it is more water-saving.

Claims

1. A drum washing machine, comprising a washing machine housing (1), wherein a washing drum is disposed in the washing machine housing (1) and comprises a front washing drum (21) and a rear washing drum (22), wherein the front washing drum (21) is sealedly connected to the rear washing drum (22) and is operative to rotate relative to the rear washing drum (22), the front washing drum (21) is operative to rotate along with a motor (4), wherein the rear washing drum (22) is at rest in response to the front washing drum (21) rotating along with the motor (4).
2. The drum washing machine of claim 1, wherein the rear washing drum (22) has a smaller length than the front washing drum (21).
3. The drum washing machine of claim 1 or 2, wherein the washing machine housing (1) is provided with a loading port, and a door and window (8) is disposed at the loading port, a sealing door (7) is further arranged on a side of the front washing drum (21) adjacent to the door and window (8) and is configured to seal the washing drum, wherein a sealing groove (212) is defined in a side wall of the front washing drum (21) contacting the sealing door (7) or in a side wall of the sealing door (7) contacting the front washing drum (21), and a first sealing ring (61) is disposed in the sealing groove (212).
4. The drum washing machine of claim 3, wherein the sealing door (7) is connected to the front washing drum (21).

5. The drum washing machine of claim 1, wherein a central axis of the washing drum is inclined relative to a horizontal plane, the central axis forming an angle of α with the horizontal plane, where $0 \leq \alpha < 90^\circ$.
5
6. The drum washing machine of claim 1, wherein the front washing drum (21) is a drum of a non-porous structure.
7. The drum washing machine of claim 3, wherein the front washing drum (21) is connected to the rear washing drum (22) via a rotary bearing (10), and a second sealing ring (62) is disposed between the front washing drum (21) and the rear washing drum (22).
10
15
8. The drum washing machine of claim 7, wherein a limiting ring (213) having an F-shaped cross-section is disposed at a joint of the front washing drum (21) and the rear washing drum (22);
20
wherein the limiting ring (213) comprises a first vertical limiting ring body (2131), a first transverse limiting ring body (2132) disposed on top of the first vertical limiting ring body (2131), and a second transverse limiting ring body (2133) parallel to the first transverse limiting ring body (2132);
25
wherein the second sealing ring (62) is disposed between the first transverse limiting ring body (2132) and the second transverse limiting ring body (2133), the rotary bearing (10) is disposed in a space formed by the first vertical limiting ring body (2131), the second transverse limiting ring body (2133), and an outer wall of the rear washing drum (22).
30
9. The drum washing machine of claim 8, wherein the second sealing ring (62) is a lip-shaped sealing ring.
35
10. The drum washing machine of claim 1, wherein the rear washing drum (22) is provided with a water inlet hole (221) and a water outlet hole (222), wherein the water outlet hole (222) is communicated with a drain valve (51) via a drain connecting pipe (5).
40
45
50
55

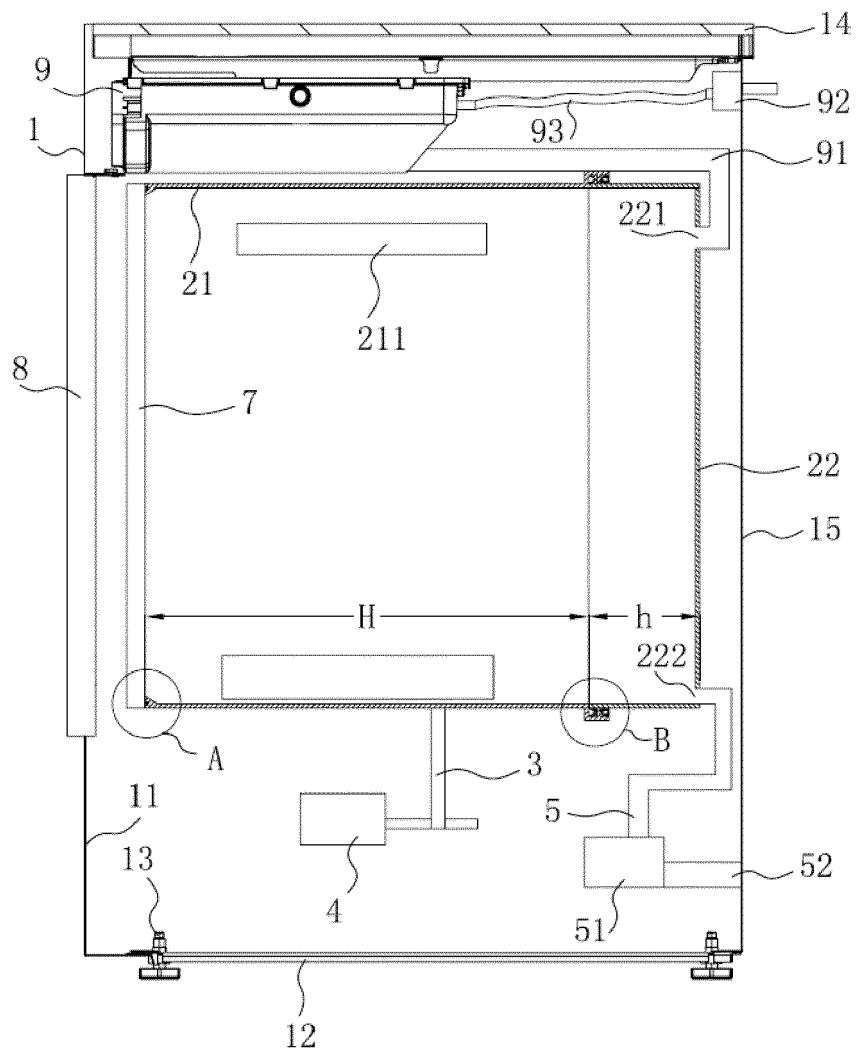


FIG. 1

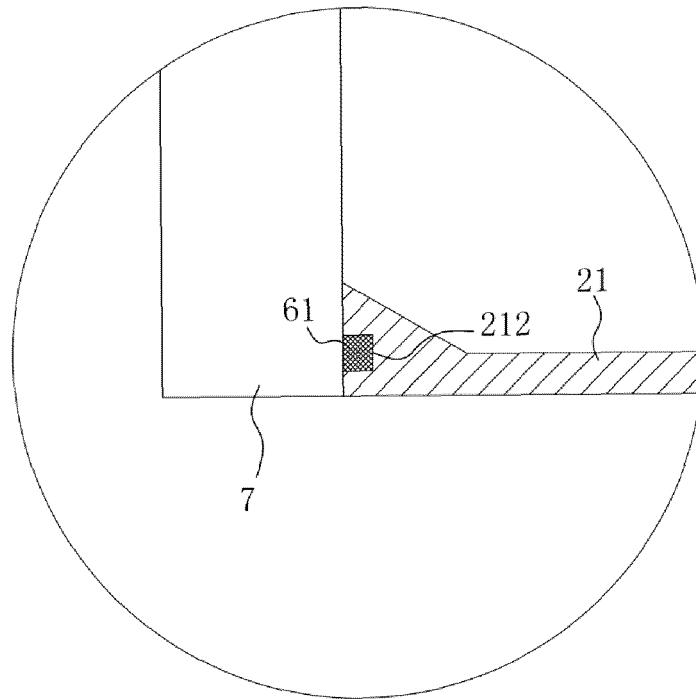


FIG. 2

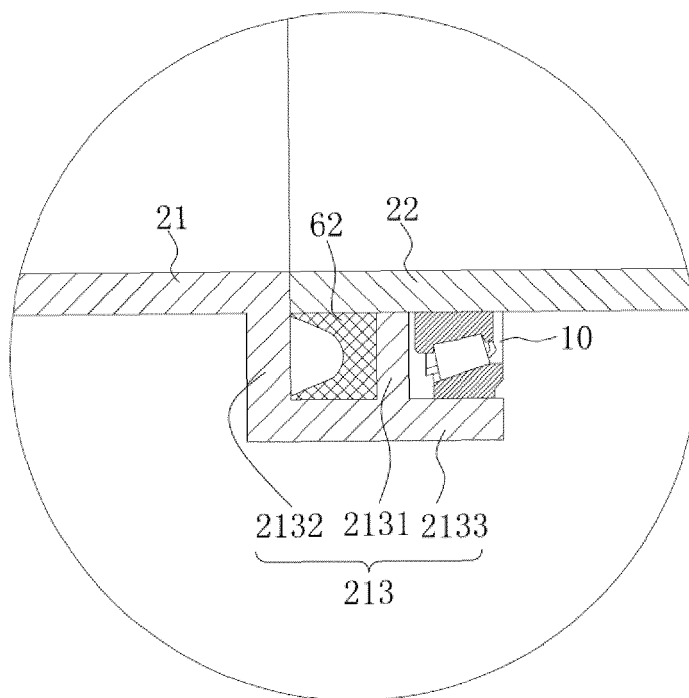


FIG. 3

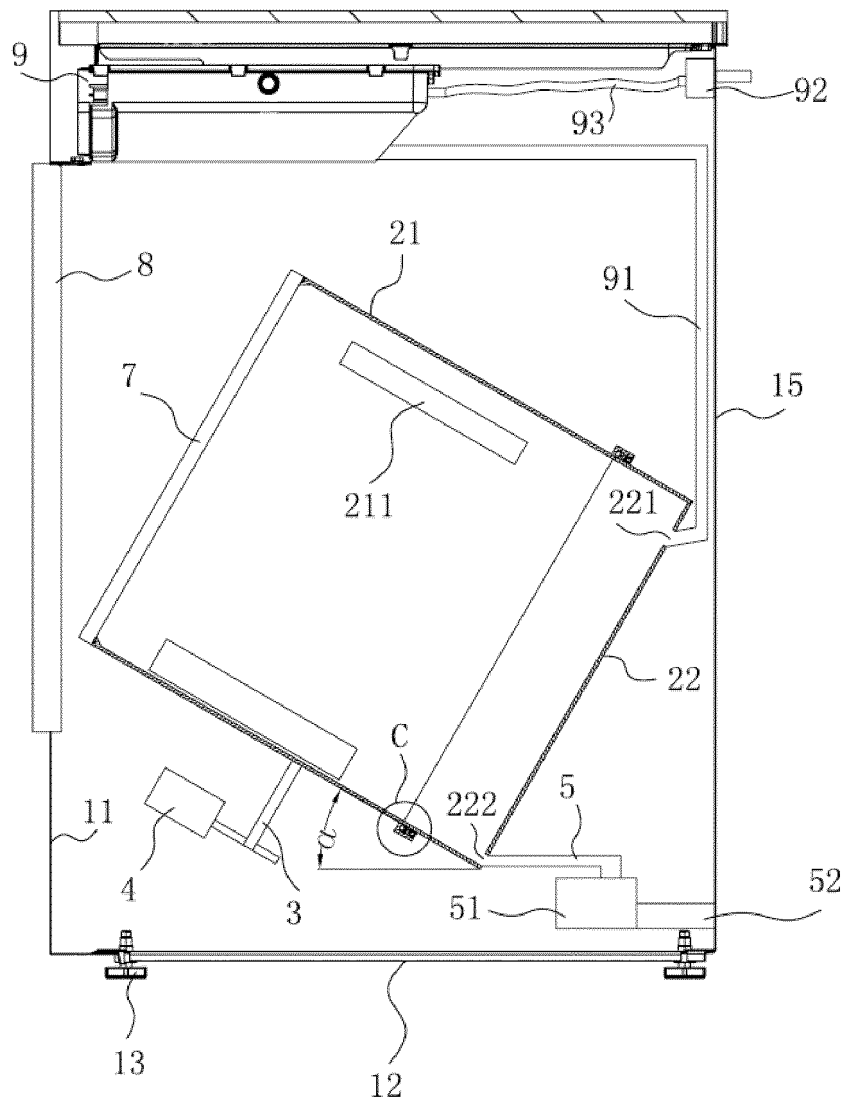


FIG. 4

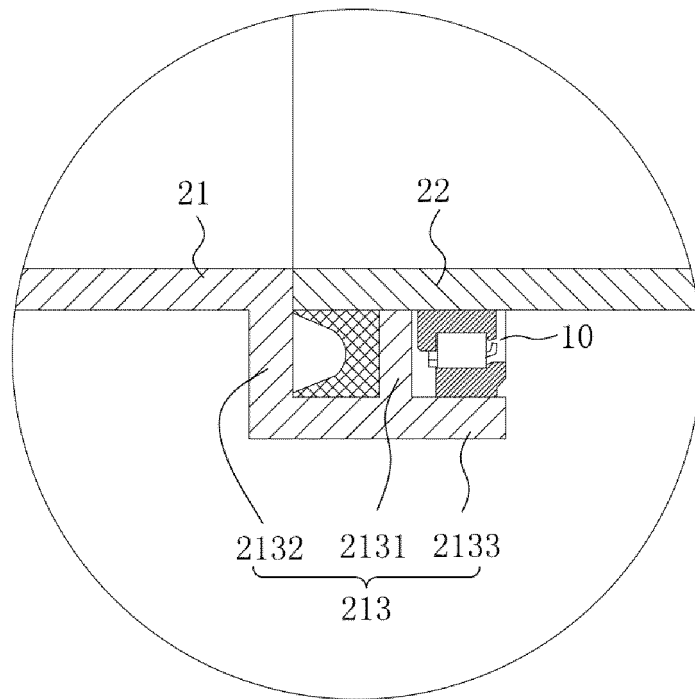


FIG. 5

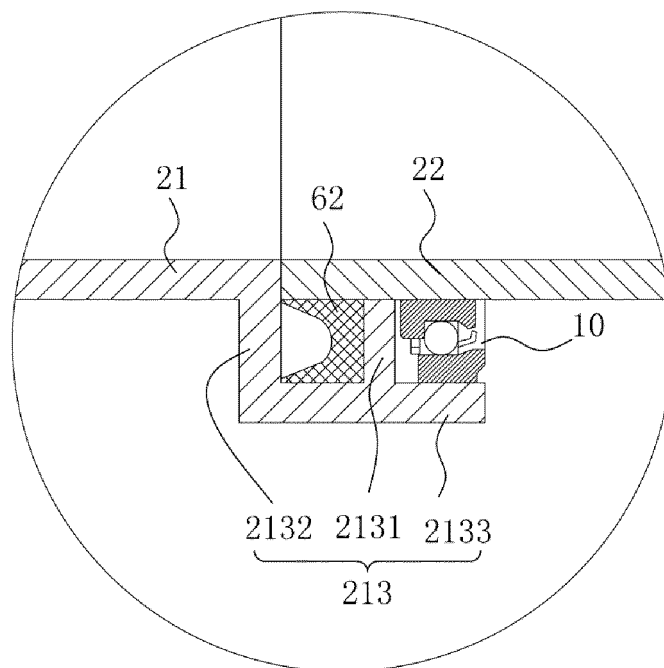


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/075364

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/04 (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)

D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI; EPODOC; CNKI; CNABS; CNTXT: 第一, 第 1, 前, 上, 第二, 第 2, 后, 下, 筒, 桶, 转动, 旋转, 电机, 马达, 电动机, 无孔, 节水, 节约, 节省, 密封, 密闭, 封闭, 无孔, First, one, front, tub, drum, barrel, cask, bucket, roller, tumbler, second+, another, behind, other, rotat+, spin+, running, motor, pump, airproof, obturat+, hole+, bore+, aperture+, finestra+, orifice+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 2294988 Y (HAIER GROUP CO., LTD. et al.) 21 October 1998 (21.10.1998), description, page 2, lines 2-22, and figures 1-3	1-10
A	JP 61141398 A (TOSHIBA CORP.) 28 June 1986 (28.06.1986), entire document	1-10
A	JP 59228892 A (TOSHIBA K.K.) 22 December 1984 (22.12.1984), entire document	1-10
A	JP 2015029546 A (TOSHIBA CORP. et al.) 16 February 2015 (16.02.2015), entire document	1-10

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

* Special categories of cited documents:	"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
"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	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search 27 April 2018	Date of mailing of the international search report 08 May 2018
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer ZHANG, Zhen Telephone No. (86-10) 62084588

Form PCT/ISA/210 (second sheet) (July 2009)

5

10

15

20

25

30

35

40

45

50

55

INTERNATIONAL SEARCH REPORT Information on patent family members			International application No. PCT/CN2018/075364	
Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date	
CN 2294988 Y	21 October 1998	None		
JP 61141398 A	28 June 1986	None		
JP 59228892 A	22 December 1984	JP H0255075 B2	26 November 1990	
		JP S6036904 A	25 February 1985	
		GB 2141744 B	17 December 1986	
		CA 1218538 A	03 March 1987	
		GB 2141744 A	03 January 1985	
		US 4711104 A	08 December 1987	
		KR 1019890004927 B1	30 November 1989	
JP 2015029546 A	16 February 2015	None		