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(54) **WASHING APPARATUS, AND METHOD FOR DETERMINING THAT DRUM OF WASHING APPARATUS IS UNLOCKED**

(57) Provided are washing appliance and a determination method for unlocking of a drum of washing appliance. The determination method includes that: a drum motor (3) drives a drum to rotate at a set power output, and it is determined that a locking structure (2) unlocks the drum when an output current of the drum motor (3) is smaller than a set current. Whether the locking structure (2) unlocks the drum or not can be accurately determined through the above determination, therefore the accuracy of unlocking the drum can be improved. The washing appliance includes a drum for containing washing water, and a drum motor (3) for driving the drum to rotate, and a locking structure (2) unlocking the drum.

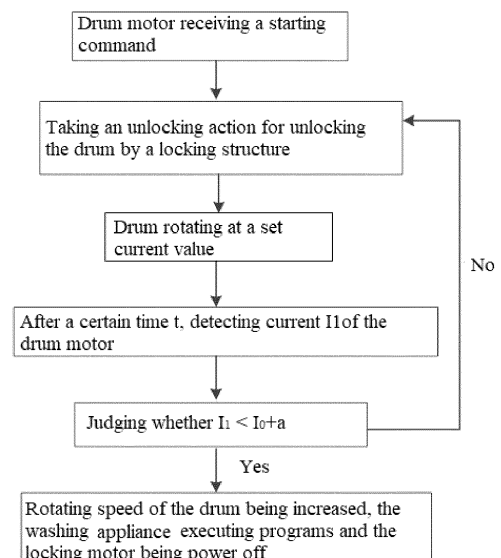


FIG. 1

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Description

TECHNICAL FIELD

[0001] The invention belongs to the field of household appliances, and particularly relates to washing appliance and a determination method for unlocking of a drum of washing appliance.

BACKGROUND

[0002] At present, commonly used drum washing machines are side-opening-door type washing machines. When the side-opening-door type washing machines are used, a user needs to bend down or squat down to put laundry into a drum from a side door of the washing machine or take out the laundry in the drum, and the use experience of the user (especially for the old) is affected.

[0003] Therefore, a top-opening-door type drum washing machine is provided for application. A drum door is also arranged in the circumferential direction of the drum corresponding to a top opening door of the washing machine. When the drum door rotates to a position corresponding to the top opening door, the drum is unlocked. Disclosed in CN02160752.4 is an automatic positioning method and device for a drum door of a drum washing machine. The automatic positioning method includes: when a drum of a washing machine stops rotating after an original washing program is finished or interrupted, determining the position of the drum door of the washing machine by a position determination device. If it is determined that the drum door is at a normal opening position, keeping a motor for driving the drum to rotate in a stopped state; and if it is determined that the drum door is not be at the normal opening position, starting the motor to run at a low speed until the position determination device is determined that the drum door is at the normal opening position, and enabling the motor to stop rotating. According to the automatic positioning method and device for the drum door, the drum door of the drum washing machine can be automatically positioned at the normal opening position after automatic washing is finished, and the washing machine is more friendly and convenient to use for users. Disclosed in CN03105194.4 is a drum washing machine in which the rotational position of a drum is fixed with a simple structure. An engaging groove part is provided at the outer circumferential edge of a rotor of an external gear type motor which is directly connected with a main shaft of a drum, and a drum unlocking device is arranged right below the shaft. The drum unlocking device has a structure that an unlocking pin moves up and down along with the rotation of a torque motor. The unlocking pin moves to be embedded into a slotted hole of the engaging groove part so as to unlock the drum at the unlocking position. However, in the automatic positioning method and device for the drum door of the drum washing machine and the drum type washing machine, it is not disclosed whether the drum is success-

fully unlocked is determined when the drum reaches a normal opening position where a drum door leaves and the drum is in an unlocking position, resulting in the influence of the accuracy of drum unlocking.

[0004] In view of this, the present invention is provided.

SUMMARY

[0005] The technical problem to be solved by the invention is to overcome the defect of low accuracy of drum unlocking in the prior art. A washing appliance and a determination method for unlocking of a drum of washing appliance are provided.

[0006] In order to solve the technical problem, the basic idea of the technical solution adopted by the invention is as follows.

[0007] According to one aspect of the invention, provided is a determination method for unlocking of a drum of washing appliance, wherein the washing appliance is provided with a drum motor for driving a drum to rotate and a locking structure, the drum motor drives the drum to rotate at a set power output, and it is determined that the locking structure unlocks the drum if an output current of the drum motor is smaller than a set current.

[0008] Further, the locking structure takes an unlocking action for unlocking the drum, the drum motor drives the drum to rotate at the set power output, and an output current of the drum motor is detected to obtain the output current I_1 of the drum motor after the drum rotates for a certain time t .

[0009] If $I_1 < I_0 + a$, the locking structure unlocks the drum, wherein a is a set value, and I_0 is a rated current of the drum motor; and if $I_1 > I_0 + a$, the locking structure fails to unlock the drum.

[0010] Further, the drum motor drives the drum to rotate at the set power output, the locking structure takes an unlocking action for unlocking the drum, and an output current of the drum motor is detected to obtain the output current I_1 of the drum motor after the drum rotates for a certain time t .

[0011] If $I_1 < I_0 + a$, the locking structure unlocks the drum, wherein a is a set value, and I_0 is a rated current of the drum motor; and if $I_1 > I_0 + a$, the locking structure fails to unlock the drum.

[0012] Further, the locking structure includes a spring bolt, and a locking motor driving the spring bolt to stretch out and draw back in a radial direction, and a rotor of the drum motor is provided with a locking groove.

[0013] After the drum rotates for a certain time t , the locking motor drives the spring bolt to be detached from the locking groove, the spring bolt is reset, and the locking structure unlocks the drum.

[0014] Preferably, after the spring bolt is detached from the locking groove, an output power of the drum motor is increased, and a rotating speed of the drum is increased. The washing appliance starts to execute any one or any combination of a washing program, a rinsing program and a dewatering program, and the locking mo-

tor is powered off to stop working.

[0015] Further, S1, taking an unlocking action for unlocking the drum by the locking structure, driving the drum to rotate by the drum motor at a set power output, and detecting an output current of the drum motor to obtain an output current value I_1 of the drum motor after the drum rotates for a certain time t ;

[0016] S2, comparing the output current value I_1 of the drum motor with the sum of a rated current and a set value, and if $I_1 < I_0 + a$, executing a step S3; and if $I_1 > I_0 + a$, executing a step S5;

[0017] S3, if it is determined that the locking motor drives the spring bolt to be detached from the locking groove, the spring bolt is reset, and the locking structure unlocks the drum, executing a step S4;

[0018] S4, after the spring bolt is detached from the locking groove, increasing the output power of the drum motor, increasing the rotating speed of the drum, and starting to execute any one or any combination of a washing program, a rinsing program and a dewatering program by the washing appliance, and enabling the locking motor to be powered off to stop working; and S5, the drum motor driving the drum to continuously rotate at the set power output, and executing the step S1 again.

[0019] Further, in step S1, driving the drum to rotate by the drum motor at a set power output, taking an unlocking action for unlocking the drum by the locking structure, and detecting an output current of the drum motor to obtain an output current value I_1 of the drum motor after the drum rotates for a certain time t ;

[0020] S2, comparing the output current value I_1 of the drum motor with the sum of a rated current and a set value, and if $I_1 < I_0 + a$, executing a step S3; and if $I_1 > I_0 + a$, executing a step S5;

[0021] S3, if it is determined that the locking motor drives the spring bolt to be detached from the locking groove, the spring bolt is reset, and the locking structure unlocks the drum, executing a step S4;

[0022] S4, after the spring bolt is detached from the locking groove, increasing the output power of the drum motor, increasing the rotating speed of the drum, starting to execute any one or any combination of a washing program, a rinsing program and a dewatering program by the washing appliance, and enabling the locking motor to be powered off to stop working; and

[0023] S5, the drum motor driving the drum to continuously rotate at the set power output, and executing the step S1 again.

[0024] Further, after the locking structure fails to unlock the drum, and if it is detected that the number of times that the locking structure fails to unlock the drum exceeds the set number of times, the locking structure stops unlocking, and the washing appliance sends out an alarm signal.

[0025] Another object of the invention is to provide washing appliance to achieve the purpose of improving the accuracy of unlocking the drum. In order to achieve

the purpose, the washing appliance is provided. The washing appliance includes a drum for containing washing water and a drum motor for driving the drum to rotate. The washing appliance is applied to the determination method for unlocking of the drum of the washing appliance provided by the above technical solution, and the washing appliance is provided with a locking structure unlocking the drum.

[0026] Further, the drum is a sealed container for containing washing water in appliance executing a washing program of the washing appliance.

[0027] Further, the drum is rotatably mounted in an outer barrel of the washing appliance, and the locking structure is mounted on an outer barrel bottom. The locking structure includes a spring bolt, and a locking motor for driving the spring bolt to stretch out and draw back in a radial direction. A rotor of the drum motor is provided with a locking groove matched with the spring bolt, and the spring bolt is inserted into or detached from the locking groove under the drive of the locking motor.

[0028] After the above technical solution is adopted, compared with the prior art, the invention has the following beneficial effects.

1. According to the determination method for unlocking of the drum of the washing appliance which is provided with the drum motor for driving the drum to rotate and the locking structure, the drum motor drives the drum to rotate at the set power output, and it is determined that the locking structure unlocks the drum when the output current of the drum motor is smaller than the sum of the rated current and the set value. Through the determination, the accuracy of unlocking the drum can be improved.

2. According to the determination method for unlocking of the drum of the washing appliance, if the output current I_1 of the drum motor is smaller than the set current $I_0 + a$, the locking structure unlocks the drum; and if the output current I_1 of the drum motor is greater than the set current $I_0 + a$, the locking structure fails to unlock the drum.

3. The drum of the washing appliance provided by the invention is the sealed container for containing washing water when the washing appliance executes the washing program, the drum is rotatably mounted in the outer barrel of the washing appliance, and the locking structure is mounted on the outer barrel.

[0029] The specific embodiments of the invention are further described in detail below in combination with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] As part of the present invention, the drawings

are used to provide further understanding of the present invention, illustrative embodiments of the present invention and their description are used to interpret the present invention, but do not constitute improper limitations of the present invention. Obviously, the accompanying drawings described below are only some embodiments, and for those of ordinary skill in the art, other drawings can be obtained according to these drawings without any creative labor. In the drawings:

Fig. 1 is a flow diagram of a determination method for unlocking of a drum of washing appliance provided by one embodiment of the invention;

Fig. 2 is a flow diagram of a determination method for unlocking of a drum of washing appliance provided by another embodiment of the invention;

Fig. 3 is a structural schematic diagram of washing appliance provided by the embodiments of the invention; and

Fig. 4 is an enlarged view of Fig. 3 at the A position.

[0031] In the drawings, 1, outer barrel; 101, outer barrel bottom; 2, locking structure; 201, locking motor; 202, spring bolt; 3, drum motor; 301, rotor; and 302, locking groove.

[0032] It should be noted that these drawings and text descriptions are not intended to limit the scope of the invention in any way, but to illustrate the concept of the invention for those skilled in the art by referring to particular embodiments.

DETAILED DESCRIPTION

[0033] In order to make the purpose, the technical solution and the advantages of the embodiments of the invention clearer, the technical solutions in the embodiments are clearly and completely described in combination with the drawings in the embodiments of the invention, and the following embodiments are used for illustrating the invention, but are not used for limiting the scope of the invention.

[0034] In the description of the invention, it should be noted that the orientation or position relationship indicated by terms such as "upper", "lower", "front", "rear", "left", "right", "vertical", "inner", "outer" and the like is the orientation or position relationship shown in the drawings, only for the convenience of describing the invention and simplifying the description, rather than indicating or implying that the device or element referred to must have a specific orientation and be constructed and operated in a specific orientation, and therefore cannot be understood as a limitation of the present invention.

[0035] In the description of the invention, it should be noted that unless specified and limited, the terms "mounted", "connected" and "connection" should be understood in a broad sense, for example, the connection can be fixed connection, detachable connection, or integrated connection; the connection can be mechanical connec-

tion or electric connection; and the connection can be direct connection or indirect connection through an intermediate medium. For those of ordinary skill in the field, the specific meanings of the terms in the invention can be understood in specific situations.

[0036] As shown in Fig. 1 and Fig. 2, according to one aspect of the invention, provided is a determination method for unlocking of a drum of washing appliance. The washing appliance is provided with a drum motor 3 for driving a drum to rotate and a locking structure 2. The drum motor 3 drives the drum to rotate at a set power output, and it is determined that the locking structure 2 unlocks the drum if an output current of the drum motor 3 is smaller than the sum of the rated current and the set value.

[0037] In the above technical solution of the embodiments of the invention, the locking structure 2 on the washing appliance is used for unlocking the drum from the locking position of the drum. The locking structure 2 takes an unlocking action for unlocking the drum. The drum motor 3 drives the drum to rotate at the set power output, and it is determined that the locking structure 2 unlocks the drum if the output current of the drum motor 3 is smaller than a set current. Whether the locking structure 2 unlocks the drum can be accurately determined through the above determination, so that the accuracy of unlocking the drum can be improved.

[0038] It should be noted that in the above solution, the locking structure 2 unlocks the drum from the locking position of the drum. The locking position of the drum refers to a position where the drum door is in a normal open. The drum motor 3 drives the drum to rotate at an ultra-low speed at a small set power output.

[0039] As shown in Fig. 1, in the embodiments of the invention, the locking structure 2 takes an unlocking action for unlocking the drum, the drum motor 3 drives the drum to rotate at a set power output, and an output current of the drum motor 3 is detected to obtain the output current I_1 of the drum motor 3 after the drum rotates for a certain time t .

[0040] If $I_1 < I_0 + a$, the locking structure 2 unlocks the drum, wherein a is a set value, and I_0 is a rated current of the drum motor; and if the $I_1 > I_0 + a$, the locking structure 2 fails to unlock the drum.

[0041] In the embodiments of the invention, it is provided how to determine whether the drum is unlocked from the locking position of the drum. In the above technical solution, firstly the locking structure 2 takes an unlocking action for unlocking the drum, then the drum motor 3 drives the drum to rotate at a set power output, and the output current of the drum motor 3 is detected after the drum rotates for a certain time t . If the output current of the drum motor 3 is smaller than the sum of the rated current and the set value, it is indicated that the locking structure 2 unlocks the drum. If the output current of the drum motor 3 is greater than the sum of the rated current and the set value, it is indicated that the locking structure 2 fails to unlock the drum. Through the comparison, it

can be accurately determined that the drum is unlocked; and the accuracy of unlocking the drum is improved.

[0042] As shown in Fig. 2, in the embodiments of the invention, the drum motor 3 drives the drum to rotate at a set power output, the locking structure 2 takes an unlocking action for unlocking the drum, and an output current of the drum motor 3 is detected to obtain the output current I_1 of the drum motor 3 after the drum rotates for a certain time t .

[0043] If $I_1 < I_0 + a$, the locking structure 2 unlocks the drum, wherein a is a set value, and I_0 is a rated current of the drum motor; and if the $I_1 > I_0 + a$, the locking structure 2 fails to unlock the drum.

[0044] In the embodiments of the invention, it is provided how to determine whether the drum is unlocked from the locking position of the drum. In the above technical solution, the drum motor 3 is started firstly, the drum motor drives the drum to rotate at a set power output, the locking structure 2 takes an unlocking action for unlocking the drum; the output current of the drum motor 3 is detected after the drum motor drives the drum to rotate for a certain time t at the set power output. If the output current of the drum motor 3 is smaller than the sum of the rated current and the set value, it is indicated that the locking structure 2 unlocks the drum. If the output current of the drum motor 3 is greater than the sum of the rated current and the set value, it is indicated that the locking structure 2 fails to unlock the drum. Through the comparison, it can be accurately determined that the drum is unlocked, and the accuracy of unlocking the drum is improved.

[0045] As shown in Fig. 1 and Fig. 2, in the embodiments of the invention, the locking structure 2 includes a spring bolt 202 and a locking motor 201 for driving the spring bolt 202 to stretch out and draw back in a radial direction, and a rotor 301 of the drum motor 3 is provided with a locking groove 302.

[0046] After the drum rotates for a certain time t , the locking motor 201 drives the spring bolt 202 to be detached from the locking groove 302, the spring bolt 202 is reset, and the locking structure 2 unlocks the drum.

[0047] Preferably, after the spring bolt 202 is detached from the locking groove 302, the output power of the drum motor 3 is increased, the rotating speed of the drum is increased, the washing appliance starts to execute any one or any combination of a washing program, a rinsing program and a dewatering program, and the locking motor 201 is powered off to stop working.

[0048] In the embodiments of the invention, the locking motor 201 drives the spring bolt 202 to be detached from the locking groove 302 and the spring bolt 202 returns to the original position, the locking structure 2 stops unlocking the drum, the drum is detached from the locking position of the drum, and the output power of the drum motor 3 is increased. The output power of the drum motor 3 is larger than a set power of the drum motor 3, so that the rotating speed of the drum is increased; and then, the washing appliance starts to execute any one or any

combination of a washing program, a rinsing program and a dewatering program. Meanwhile, the locking motor 201 is powered off to stop working.

[0049] In the embodiments of the invention, after the locking structure 2 fails to unlock the drum, the drum motor 3 drives the drum to continuously rotate at the set power output, and it is determined again whether the locking structure 2 unlocks the drum.

[0050] In the embodiments of the invention, after unlocking of the locking structure 2 fails, the locking structure 2 unlocks the drum again in order to enable the drum to leave the locking position of the drum and the washing appliance to execute a washing program, a rinsing program, a dewatering program and the like. So the probability that the locking structure 2 unlocks the drum successfully is increased.

[0051] It should be noted that the drum motor 3 and the locking motor 201 are both controlled by a controller. The controller controls the drum motor 3 to start rotation and increase an output power and the like. The controller controls the locking motor 201 to start and controls the locking motor 201 to drive the spring bolt 202 to stretch out and draw back.

[0052] As shown in Fig. 1, in the embodiments of the invention, S1, the locking structure 2 takes an unlocking action for unlocking the drum, the drum motor 3 drives the drum to rotate at a set power output, and an output current of the drum motor 3 is detected to obtain an output current value I_1 of the drum motor 3 after the drum rotates for a certain time t ; S2, the output current value I_1 of the drum motor 3 is compared with the sum of a rated current and a set value, and if $I_1 < I_0 + a$, a step S3 is executed; and if $I_1 > I_0 + a$, a step S5 is executed;

[0053] S3, if it is determined that the locking motor 201 drives the spring bolt 202 to be detached from the locking groove 302, the spring bolt is reset, and the locking structure 2 unlocks the drum, and a step S4 is executed;

[0054] S4, after the spring bolt 202 is detached from the locking groove 302, the output power of the drum motor 3 is increased, and the rotating speed of the drum is increased, the washing appliance starts to execute any one or any combination of a washing program, a rinsing program and a dewatering program, and the locking motor 201 is powered off to stop working; and

[0055] S5, if the drum motor 3 drives the drum to continuously rotate at the set power output, the step S1 is executed again.

[0056] In the embodiments of the invention, the determination method for unlocking of the drum of the washing appliance is as follows.

[0057] A washing machine is started, the drum motor 3 receives a starting command, firstly the locking structure 2 takes an unlocking action for unlocking a drum, and then the drum motor 3 starts to drive the drum to rotate at a set power output. After the drum rotates for a certain time t , an output current of the drum motor is detected to obtain an output current value I_1 of the drum motor. If the output current value of the drum motor is

smaller than the sum of a rated current value and the set value, it is determined that the locking motor 201 drives the spring bolt 202 to be detached from the locking groove 302, so the locking structure 2 unlocks the drum. After the spring bolt 202 is detached from the locking groove 302, the output power of the drum motor 3 is increased, so that the rotating speed of the drum is increased, the washing appliance starts to execute a washing program, a rinsing program, a dewatering program and the like. Meanwhile, the locking motor 201 is powered off to stop working. If the output current value of the drum motor 3 is greater than the sum of the rated current value and the set value, the locking structure 2 fails to unlock the drum, the drum motor 3 drives the drum to continuously rotate at the set power output, and the unlocking condition of the drum is determined again.

[0058] As shown in Fig. 2, in the embodiments of the invention, S1, the drum motor 3 drives the drum to rotate at a set power output, the locking structure 2 takes an unlocking action for unlocking the drum, and an output current of the drum motor 3 is detected to obtain an output current value I_1 of the drum motor 3 after the drum rotates for a certain time t ;

[0059] S2, the output current value I_1 of the drum motor 3 is compared with the sum of a rated current value and a set value, and if $I_1 < I_0 + a$, a step S3 is executed; and if $I_1 > I_0 + a$, a step S5 is executed;

[0060] S3, if it is determined that the locking motor 201 drives the spring bolt 202 to be detached from the locking groove 302, the spring bolt 202 is reset, and the locking structure 2 unlocks the drum, a step S4 is executed;

[0061] S4, after the spring bolt 202 is detached from the locking groove 302, the output power of the drum motor 3 is increased, and the rotating speed of the drum is increased, the washing appliance starts to execute any one or any combination of a washing program, a rinsing program and a dewatering program, and the locking motor 201 is powered off to stop working; and S5, if the drum motor drives the drum to continuously rotate at the set power output, executing the step S1 again.

[0062] In the embodiments of the invention, the drum motor 3 receives a starting command, the drum motor 3 is started to drive a drum to rotate at a set power output, the locking structure 2 takes an unlocking action for unlocking the drum, and the output current of the drum motor is detected to obtain an output current value I_1 of the drum motor after the drum motor drives the drum to rotate for a certain time t at the set power output. If the output current value of the drum motor is smaller than the sum of a rated current value and the set value, it is determined that the spring bolt 202 is detached from the locking groove 302 by the locking motor 201, and the locking structure 2 unlocks the drum. After the spring bolt 202 is detached from the locking groove 302, the output power of the drum motor 3 is increased, so that the rotating speed of the drum is increased, and the washing appliance starts to execute a washing program, a rinsing pro-

gram, a dewatering program and the like. Meanwhile, the locking motor 201 is powered off to stop working. If the output current value of the drum motor 3 is greater than the sum of the rated current value and the set value, the locking structure 2 fails to unlock the drum, the drum motor 3 drives the drum to continuously rotate at the set power output, and the unlocking condition of the drum is determined again.

[0063] In the embodiments of the invention, the drum motor 3 drives the drum to rotate at a set power output. After the drum rotates for a certain time t which is greater than the starting time of the drum motor 3, and the locking structure 2 takes an unlocking action for unlocking the drum.

[0064] In the embodiments of the invention, the rotating time of the drum is longer than the starting time of the drum motor 3, so that the drum motor 3 drives the drum to rotate according to the set value at the set power output, and the accuracy of unlocking the drum is improved.

[0065] In the embodiments of the invention, after the locking structure 2 fails to unlock the drum, and if it is detected that the number of times that the locking structure 2 fails to unlock the drum exceeds the set number of times, the locking structure 2 stops unlocking, and the washing appliance sends out an alarm signal.

[0066] In the embodiments of the invention, if it is detected that the locking structure 2 fails to unlock the drum for multiple times and the number of times of failure exceeds the number of times set by a system, the locking structure 2 is controlled to stop unlocking, and the washing appliance gives an alarm to warn that the washing appliance breaks down, so the error rate of unlocking the drum is reduced.

[0067] Another object of the invention is to provide washing appliance to achieve the purpose of improving the accuracy of unlocking the drum. In order to achieve the purpose, the washing appliance is provided. The washing appliance includes a drum for containing washing water and a drum motor 3 for driving the drum to rotate. The washing appliance is applied to the determination method for unlocking of the drum appliance provided by the above technical solution, and the washing appliance is provided with a locking structure 2 for unlocking the drum.

[0068] In the embodiments of the invention, the locking structure 2 arranged on the washing appliance can unlock the drum for containing washing water from the locking position of the drum, so that the drum door is not in the normal opening position, and the accuracy of unlocking the drum by the locking structure 2 is improved by determining whether the locking structure 2 successfully unlocks the drum.

[0069] In the embodiments of the invention, the drum is a sealed container for containing washing water when the washing appliance executes a washing program.

[0070] In the embodiments of the invention, the washing appliance includes a drum and an outer barrel, and the drum is used for containing washing water.

[0071] In the embodiments of the invention, a lifting rib is arranged on the side wall of the drum, and a containing cavity is formed in the lifting rib. A first through hole communicating with the inner space of the drum and a second through hole communicating with a gap between the drum and the outer barrel are formed in the wall of the containing cavity. A control structure for controlling the first through hole and/or the second through hole to be opened and closed is arranged in the containing cavity. Through the arrangement, liquid in the drum is discharged, wherein the drum is hole-free. When the first through hole and/or the second through hole are/is closed, the interior of the drum is in a closed state, so that washing water in the drum is prevented from splashing to the inner wall of the outer barrel. When the first through hole and the second through hole are opened, the interior of the drum is in an open state, and washing water in the drum is discharged into the gap between the drum and the outer barrel.

[0072] As shown in Fig. 3 and Fig. 4, in the embodiments of the invention, the drum is rotatably mounted in the outer barrel of the washing appliance, and the locking structure 2 is mounted on an outer barrel bottom 101.

[0073] In the embodiments of the invention, the drum is rotatably mounted in an outer barrel of the washing appliance as an inner barrel. The locking structure 2 mounted on the outer barrel bottom can unlock the drum from a locking position, the drum is unlocked to leave the locking position, and the drum door of the drum is unlocked to leave a normal opening position.

[0074] As shown in Fig. 3 and Fig. 4, in the embodiments of the invention, the locking structure 2 includes a spring bolt 202 and a locking motor 201 for driving the spring bolt 202 to stretch out and draw back in a radial direction. A rotor 301 of the drum motor 3 is provided with a locking groove 302 matched with the spring bolt 202, and the spring bolt 202 is inserted into or detached from the locking groove 302 under the drive of the locking motor 201.

[0075] In the embodiments of the invention, the locking structure takes the unlocking action for unlocking the drum. After the drum rotates for a certain time t , the locking motor 201 drives the spring bolt 202 to be detached from the locking groove 302, and the locking structure 2 unlocks the drum. After the spring bolt 202 is detached from the locking groove 302 to unlock the drum, the locking motor is reset, and the drum motor 3 is powered off to stop working.

[0076] It should be noted that the spring bolt 202 of the locking structure 2 can be a motor shaft of the locking motor 201.

[0077] In another embodiment of the invention, the washing appliance includes a drum for containing washing water, and the locking structure 2 mounted on a shell of the washing appliance. The locking structure 2 includes a spring bolt 202 and a locking motor 201 for driving the spring bolt 202 to stretch out and draw back in a radial direction, a rotor 301 of the drum motor 3 is pro-

vided with a locking groove 302 matched with the spring bolt 202, and the spring bolt 202 is inserted into or detached from the locking groove 302 under the drive of the locking motor 201.

[0078] In another embodiment of the invention, the washing appliance includes a drum and an outer barrel, and the outer barrel is used for containing washing water. The locking structure 2 can be mounted on the outer barrel of the washing appliance, a rotor 301 of the drum motor 3 is provided with a locking groove 302 matched with the spring bolt 202, and the spring bolt 202 is inserted into or detached from the locking groove 302 under the drive of the locking motor 201.

[0079] The above are only the preferred embodiments of the invention, and do not limit the invention in any form. Although the invention has been disclosed as above in the preferred embodiments, the preferred embodiments are not used to limit the invention. Any person skilled in the patent can use the technical contents mentioned above to make some changes or modifications to equivalent embodiments without departing from the scope of the technical solution of the present invention, however, any simple modifications, equivalent changes and modifications made to the above embodiments according to the technical essence of the invention without departing from the contents of the technical solution of the invention still belong to the scope of the solution of the invention.

30 Claims

1. A determination method for unlocking of a drum of washing appliance, the washing appliance comprising a drum motor for driving a drum to rotate and a locking structure, comprising:

driving the drum to rotate at a set power output by the drum motor, and
determining that the locking structure unlocks the drum when an output current of the drum motor is smaller than a set current.

2. The determination method for unlocking of the drum of the washing appliance according to claim 1, wherein the locking structure takes an unlocking action for unlocking the drum, the drum motor drives the drum to rotate at the set power output, and the output current of the drum motor is detected to obtain the output current I_1 of the drum motor after the drum rotates for a certain time t ;
if $I_1 < I_0 + a$, the locking structure unlocks the drum, wherein a is a set value, and I_0 is a rated current of the drum motor; and if the $I_1 > I_0 + a$, the locking structure fails to unlock the drum.
3. The determination method for unlocking of the drum of the washing appliance according to claim 2, wherein the drum motor drives the drum to rotate at

the set power output, the locking structure generates the unlocking action for unlocking the drum, and after the drum rotates for a certain time t , the output current of the drum motor is detected to obtain the output current I_1 of the drum motor;

if $I_1 < I_0 + a$, the locking structure unlocks the drum, wherein a is a set value, and I_0 is a rated current of the drum motor; and if the $I_1 > I_0 + a$, the locking structure fails to unlock the drum.

4. The determination method for unlocking of the drum of the washing appliance according to claim 2 or 3, wherein the locking structure comprises a spring bolt, and a locking motor for driving the spring bolt to stretch out and draw back in a radial direction, and a rotor of the drum motor is provided with a locking groove;

after the drum rotates for a certain time t , the locking motor drives the spring bolt to be detached from the locking groove, the spring bolt is reset, and the locking structure unlocks the drum;

preferably, after the spring bolt is detached from the locking groove, an output power of the drum motor is increased, a rotating speed of the drum is increased, the washing appliance starts to execute any one or any combination of a washing program, a rinsing program and a dewatering program, and the locking motor is powered off to stop working.

5. The determination method for unlocking of the drum of the washing appliance according to claim 4, comprising

S1, generating an unlocking action for unlocking the drum by the locking structure, driving the drum to rotate by the drum motor at a set power output, and after the drum rotates for a certain time t , detecting an output current of the drum motor to obtain an output current value I_1 of the drum motor;

S2, comparing the output current value I_1 of the drum motor with a set current value, and if $I_1 < I_0 + a$, executing a step S3; and if $I_1 > I_0 + a$, executing a step S5;

S3, if it is determined that the locking motor drives the spring bolt to be detached from the locking groove, the spring bolt is reset, and the locking structure unlocks the drum, executing a step S4;

S4, after the spring bolt is detached from the locking groove, the output power of the drum motor is increased, and the rotating speed of the drum is increased, starting to execute any one or any combination of a washing program, a rinsing program and a dewatering program by the

washing appliance, and enabling the locking motor to be powered off to stop working; and S5, if the drum motor drives the drum to continuously rotate at the set power output, executing the step S1 again.

6. The determination method for unlocking of the drum of the washing appliance according to claim 4, comprising

S1, driving the drum to rotate by the drum motor at a set power output, generating an unlocking action for unlocking the drum by the locking structure, and after the drum rotates for a certain time t , detecting an output current of the drum motor to obtain an output current value I_1 of the drum motor;

S2, comparing the output current value I_1 of the drum motor with a set current value, and if $I_1 < I_0 + a$, executing a step S3; and if $I_1 > I_0 + a$, executing a step S5;

S3, if it is determined that the locking motor drives the spring bolt to be detached from the locking groove, the spring bolt is reset, and the locking structure unlocks the drum, executing a step S4;

S4, after the spring bolt is detached from the locking groove, the output power of the drum motor is increased, and the rotating speed of the drum is increased, starting to execute any one or any combination of a washing program, a rinsing program and a dewatering program by the washing appliance, and enabling the locking motor to be powered off to stop working; and S5, if the drum motor drives the drum to continuously rotate at the set power output, executing the step S1 again.

7. The determination method for unlocking of the drum of the washing appliance according to any one of claims 1-6, wherein, after the locking structure fails to unlock the drum, if it is detected that the number of times that the locking structure fails to unlock the drum exceeds the set number of times, the locking structure stops unlocking, and the washing appliance sends out an alarm signal.

8. Washing appliance, comprising a drum for containing washing water, and a drum motor for driving the drum to rotate, and the washing appliance is **characterized by** being applied to the determination method for unlocking of the drum of the washing appliance according to any one of claims 1-7, and the washing appliance is provided with a locking structure unlocking the drum.

9. The washing appliance according to claim 8, wherein

the drum is a sealed container for containing washing water when the washing appliance executes a washing program.

10. The washing appliance according to claim 8 or 9, 5
wherein the drum is rotatably mounted in an outer
barrel of the washing appliance, and the locking
structure is mounted on an outer barrel bottom; the
locking structure comprises a spring bolt, and a lock- 10
ing motor for driving the spring bolt to stretch out and
draw back in a radial direction, a rotor of the drum
motor is provided with a locking groove matched with
the spring bolt, and the spring bolt is inserted into or
detached from the locking groove under the drive of 15
the locking motor.

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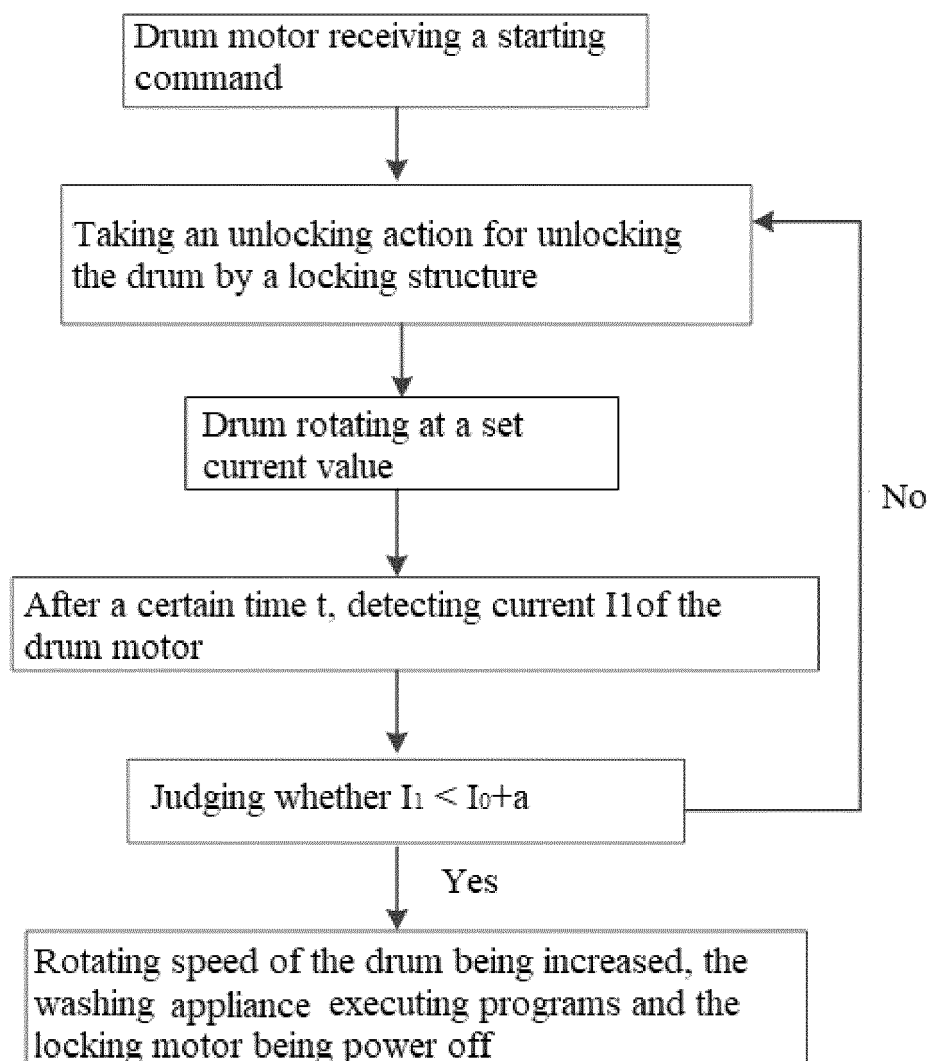


FIG. 1

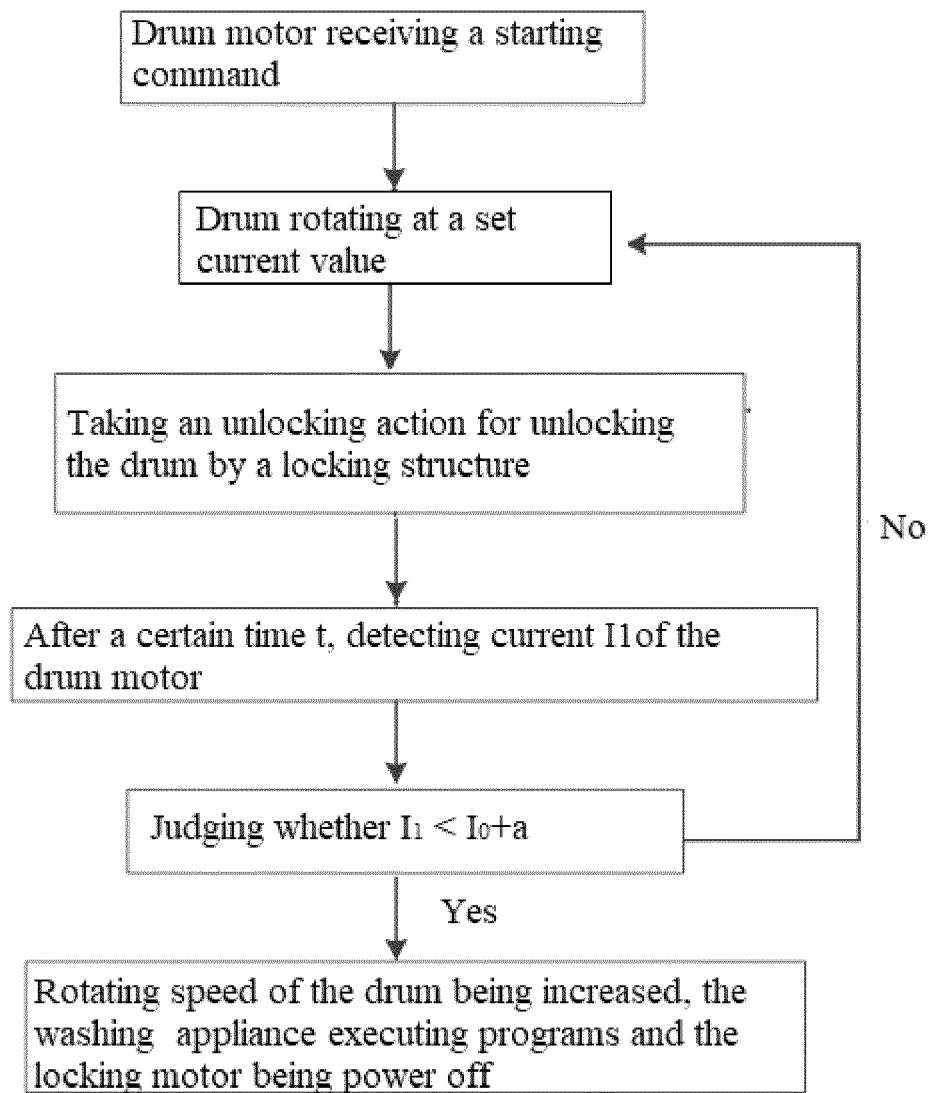


FIG. 2

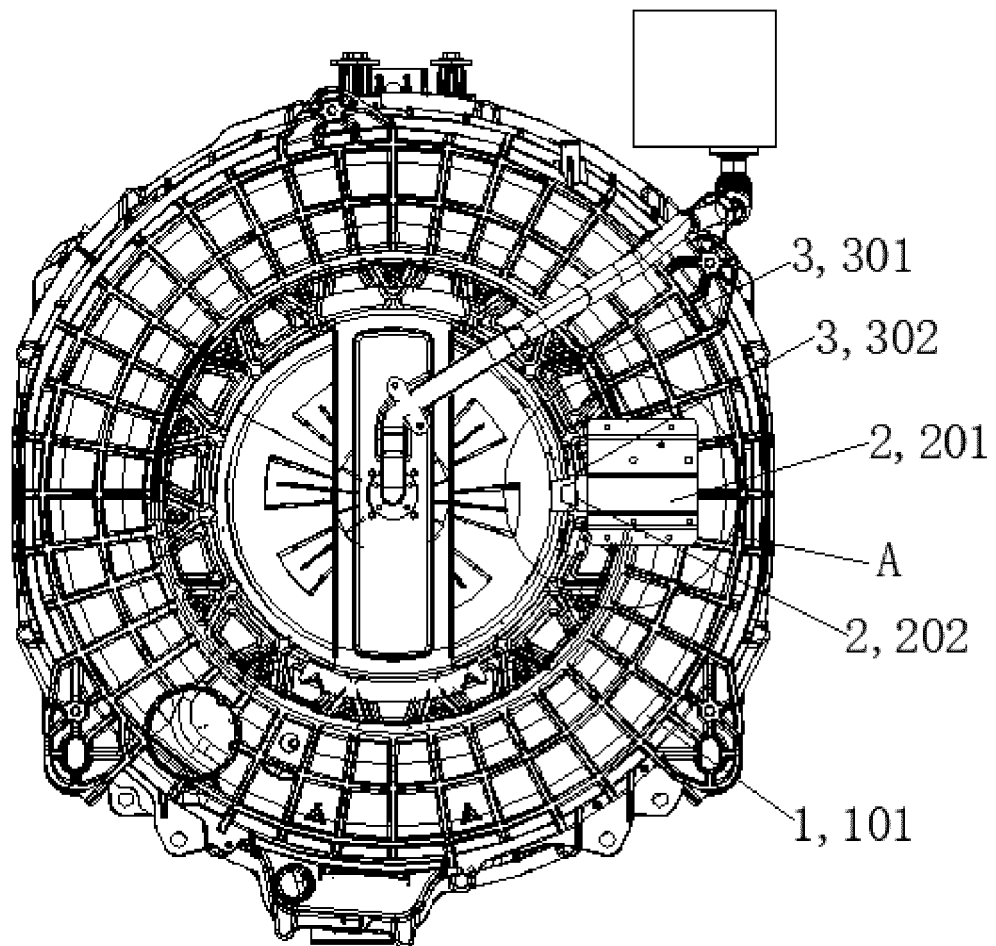


Fig. 3

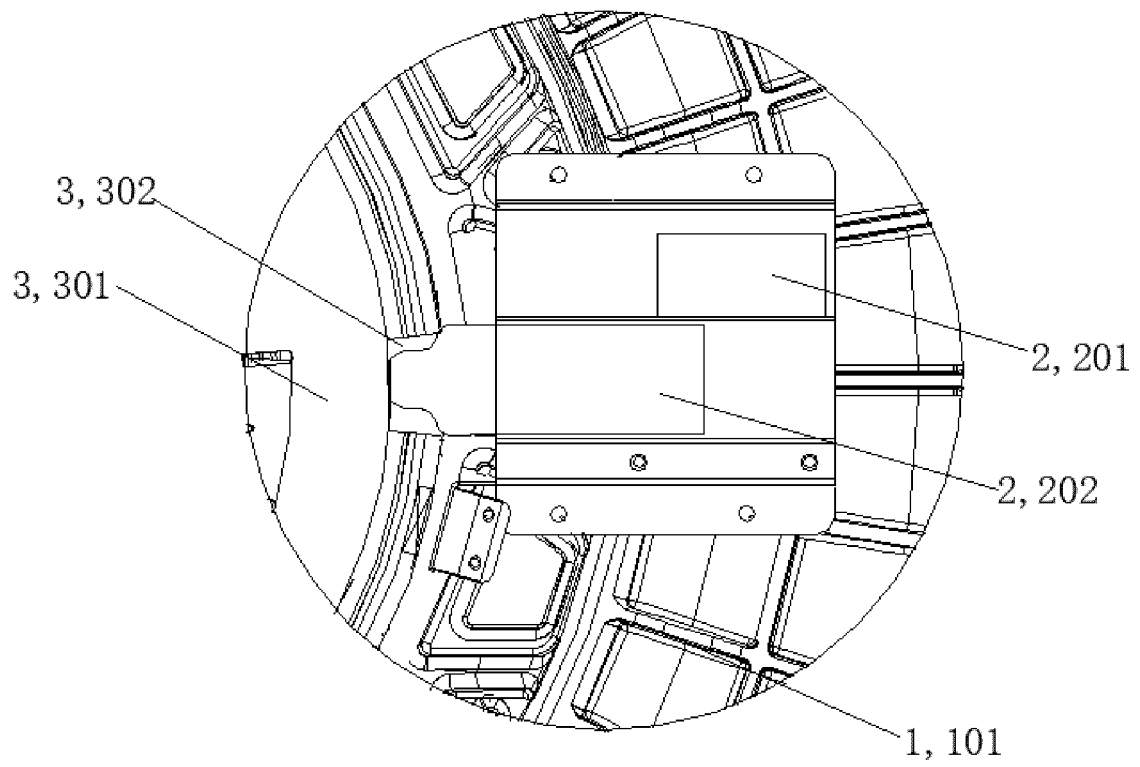


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/109443

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/42(2006.01)i; D06F 33/00(2020.01)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)

EPODOC, WPI, CNPAT, CNKI: 海尔, 海信, 小天鹅, 乐金, 松下, 三洋电机株式会社, LG, 滚筒, 顶开, 上开, 解锁, 解除, 锁定, 锁止, 定位, 电流, 电压, 电机, 电动机, 堵转, 转子, 判定, 判断, 确定, drum?, open+, top, lock+, unlock+, position+, current?, voltage?, motor, rotat+, rotor, determin+, judg+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 110042623 A (WUXI LITTLE SWAN COMPANY LIMITED) 23 July 2019 (2019-07-23) entire document	1-10
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☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

02 November 2020

Date of mailing of the international search report

19 November 2020

Name and mailing address of the ISA/CN

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Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/109443

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Information on patent family members

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