

(19)



(11)

EP 3 156 535 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

06.05.2020 Bulletin 2020/19

(51) Int Cl.:

D06F 37/40 ^(2006.01) *D06F 17/08* ^(2006.01)
D06F 23/02 ^(2006.01) *D06F 23/06* ^(2006.01)
D06F 33/02 ^(2006.01)

(21) Application number: **15806510.2**

(86) International application number:

PCT/CN2015/079426

(22) Date of filing: **21.05.2015**

(87) International publication number:

WO 2015/188683 (17.12.2015 Gazette 2015/50)

(54) **DRUM TYPE WASHING MACHINE**

TROMMELWASCHMASCHINE

MACHINE À LAVER À TAMBOUR

(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**

(72) Inventors:

- **TSUJI, Takahiro**
Tokyo 100-0005 (JP)
- **TANAKA, Hiroyuki**
Tokyo 100-0005 (JP)

(30) Priority: **12.06.2014 JP 2014121778**

(74) Representative: **Zacco Sweden AB**

(43) Date of publication of application:

19.04.2017 Bulletin 2017/16

P.O. Box 5581

114 85 Stockholm (SE)

(73) Proprietors:

- **Haier Asia Co., Ltd**
Tokyo 100-0005 (JP)
- **Qingdao Haier Washing Machine Co., Ltd.**
Laoshan District
Qingdao,
Shandong 266101 (CN)

(56) References cited:

EP-A2- 1 589 864 **CN-A- 1 453 416**
CN-A- 1 517 473 **CN-A- 1 888 193**
CN-A- 1 888 193 **CN-Y- 2 450 240**
KR-A- 20040 036 183

EP 3 156 535 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a drum type washing machine, which can not only continuously operate from washing to drying, but also carry out washing without drying.

BACKGROUND

[0002] Previously, a drum type washing machine stores water in an outer tank at the bottom to enable a transverse-shaft type drum to rotate, washings are lifted up and dropped down by baffles arranged in the drum, and the washings are thrown to the inner circumferential surface of the drum to be washed (with reference to a patent document 1).

[0003] In this way, in a structure of stirring the washings by the baffle, the washings are difficult to twine or rub against each other. Therefore, compared with an automatic washing machine which washes the washings through rotation of a pulsator in a washing and dewatering tank, the drum type washing machine has mechanical force, acting on the washings, is easy to get small, and has detergency easy to lower.

[0004] Therefore, in the drum type washing machine, in order to improve the detergency, a structure that a stirring body is arranged on the rear surface of the drum may be adopted, so that the drum and the stirring body can rotate at different rotation speeds when in washing and rinsing.

Current Technical Literature

Patent Literature

[0005]

Patent Literature 1: Japanese Laid-Open Patent Publication No. 2013-240577

Patent Literature 2: In KR20040036183A, a fully automatic washing machine is disclosed, comprising an outer tub installed in an outer case; a washing tub having plural dehydrating holes; a pulsator formed in the lower center of the washing tub; a dehydrating shaft having an upper dehydrating shaft, a lower dehydrating shaft and a drum connecting the upper dehydrating shaft to the lower dehydrating shaft; a washing shaft having an upper washing shaft, a planetary gear decreasing rpm and transmitting rotational force to the upper washing shaft and a lower washing shaft; a clutch housing surrounding the dehydrating shaft; a stator assembly having a core and a coil part; a rotor surrounding the outer periphery of the stator assembly with rotating; a rotor frame fixing the rotor; and a fan member formed in the upper part of the rotor frame to form

air flow in rotating the rotor frame.

Patent Literature 3: In CN1888193A, an inclined drum washing machine with an agitator is disclosed, including an inclined washing tub, a drum, a hollow drum shaft, a bearing, a bearing cover, a stator, a rotor, an agitator, an agitator shaft, a fixed frame and a constraining device.

SUMMARY

Problems to be solved by the disclosure

[0006] In a drum type washing machine with the above structure, a drum and a stirring body need to integrally rotate at a same rotation speed when in dewatering. Therefore, a clutch mechanism part is arranged at a driving part of the drum and the stirring body, so that a driving form of the driving part can be switched between a first-shaft driving form that enables the drum and the stirring body to integrally rotate at the same rotation speed and a second-shaft driving form that enables the drum and the stirring body to respectively rotate at different rotation speeds.

[0007] Under such condition that the driving form is switched by the clutch mechanism part, if switching is carried out in poor precision, the situation that the drum and the stirring body incorrectly work to lose the expected performance occurs, causing lowered reliability.

[0008] The present disclosure is completed in view of the problems and aims at providing a drum type washing machine as defined in the attached independent claim, which can realize switching of the driving form of the driving part through the clutch mechanism part in good precision. Further improvements are provided in the dependent claims.

Solution for solving the problems

[0009] The drum type washing machine in a main manner of the present disclosure includes: an outer tank, configured in a housing; a drum, configured in the outer tank and is capable of rotating by using a horizontal axis or an inclination axis inclining relative to a horizontal direction as a center; a stirring body, configured at a rear part of the drum and provided, on a surface of the stirring body, with a protruding part in contact with washings; a driving unit, configured to enable the drum and the stirring body to rotate; and a control part, configured to control working of the driving unit. Herein, the driving unit includes: a driving motor; a wing shaft which transmits rotation of the driving motor to the stirring body; a drum shaft which transmits rotation of the driving motor to the drum; and a clutch mechanism part which enables a driving form of the driving unit to be switched between a first-shaft driving form and a second-shaft driving form, wherein the first-shaft driving form is a form that enables the wing shaft and the drum shaft to integrally rotate at a same rotation speed, and the second-shaft driving form

is a form that enables the wing shaft and the drum shaft to respectively rotate at different rotation speeds. In addition, the clutch mechanism part includes a clutch body provided with an engaging flange part, where by moving the clutch body to a first position so as to engage the engaging flange part at the first position with an engaged recess that rotates with rotation of the driving motor, the driving form is switched to the first-shaft driving form. In order to carry out switching from the second-shaft driving form to the first-shaft driving form, the control part executes first-shaft switching treatment, wherein the first-shaft switching treatment is treatment that enables the driving motor to rotate to engage the engaging flange part in unengaged state with the engaged recess after enabling the clutch mechanism part to work to move the clutch body to the first position; wherein a plurality of first concave-convex parts are arranged at an outer circumferential part of the engaging flange part, and a plurality of second concave-convex parts are arranged at an outer circumferential part of the engaged recess; the engaging flange part is in a shape the same as that of the engaged recess; the first concave-convex parts and the second concave-convex parts are engaged with each other when the engaging flange part is inserted into the engaged recess.

[0010] According to the above structure, even if dislocation between the engaging flange part and the engaged recess is generated when the clutch mechanism part is operated to move the clutch body to the first position, the dislocation can be eliminated, so that the engaging flange part is engaged with the engaged recess. Therefore, switching from the second-shaft driving form to the first-shaft driving form can be carried out in good precision.

[0011] In the drum type washing machine in the manner, for the first-shaft switching treatment, the control part may adopt a structure that the driving motor rotates with a driving current lower than a driving current enabling the driving motor to rotate under the first-shaft driving form after the first-shaft switching treatment.

[0012] According to the above structure, for the first-shaft switching treatment, as the driving motor can slowly rotate, the engaging flange part is easily engaged with the engaged recess, thereby improving switching precision.

[0013] The drum type washing machine in the manner may adopt a structure below, namely, the driving part further includes a planetary gear mechanism, wherein the planetary gear mechanism is provided with: a sun gear which rotates along with rotation of the motor; an annular internal gear which surrounds the sun gear; a plurality of planetary gears which are arranged between the sun gear and the internal gear; and a planetary gear carrier which holds the planetary gears in a free manner, wherein either of the planetary gear carrier and the internal gear is fixed on the drum shaft. Under such condition, the drum type washing machine in the manner may adopt a structure below, namely, the clutch body is provided

with an annular rack and is connected with the other one of the planetary gear carrier and the internal gear in a state of limiting rotation relative to the other one of the planetary gear carrier and the internal gear toward a circumferential direction and allowing movement along an axial direction of the drum shaft. Through such structures, the driving part enables the clutch body to move to a second position, the annular rack is engaged with a second engaged part that does not rotate along with rotation of the driving motor at the second position, and the other one of the planetary gear carrier and the internal gear is in a non-rotation state, so that the driving form is switched to the second-shaft driving form. Even if the clutch mechanism part works to enable the clutch body to move to the second position, the other one of the planetary gear carrier and the internal gear can also rotate along with rotation of the driving motor when the annular rack is not engaged with the second engaged part, thereby causing rotation of the clutch body. In order to carry out switching from the second-shaft driving form to the first-shaft driving form, the control part executes second-shaft switching treatment, wherein the second-shaft switching treatment is treatment that enables the driving motor to rotate to engage the unengaged annular rack with the second engaged part after enabling the clutch mechanism part to work to move the clutch body to the second position.

[0014] According to the above structure, even if dislocation between the annular rack and the second engaged part is generated when the clutch mechanism part is operated to move the clutch body to the second position, the dislocation can be eliminated, so that the annular rack is engaged with the second engaged part. Therefore, switching from the first-shaft driving form to the second-shaft driving form can be carried out in good precision.

[0015] Under a situation of adopting the above structure, further, for the second-shaft switching treatment, the control part may adopt a structure that the driving motor rotates with a driving current lower than a driving current enabling the driving motor to rotate under the second-shaft driving form after the second-shaft switching treatment.

[0016] As long as such structure is adopted, for the second-shaft switching treatment, as the driving motor can slowly rotate, the annular rack is easily engaged with the second engaged part, thereby improving switching precision.

[0017] Under a situation of adopting the above structure, the drum type washing machine is further provided with a clutch driving apparatus configured to enable the clutch body to move. Under such condition, the clutch driving apparatus includes: a cam which can be transferred to a first working state enabling the clutch body to move to the first position and a second working state enabling the clutch body to move to the second position; and a state detection part which detects a working state of the cam. For the first-shaft switching treatment, the control part enables the clutch driving apparatus to work according to a detection result of the state detection part

so as to enable the cam to be transferred to the first working state; and for the second-shaft switching treatment, the control part enables the clutch driving apparatus to work according to a detection result of the state detection part so as to enable the cam to be transferred to the second working state

[0018] As long as such structure is adopted, as the position of the clutch body is indirectly detected by detecting the working state of the cam, the driving form of the driving part can be switched with no need of using a sensor and the like configured to directly detect the position of the clutch body.

Effects of the disclosure

[0019] According to the present disclosure, the drum type washing machine can be provided, which can realize switching of the driving form of the driving part through the clutch mechanism part in good precision.

[0020] The effects and the significance of the present disclosure may be further defined through the description of an implementation manner shown below. However, the implementation manner below is only one illustration when the present disclosure is implemented, and the present disclosure is not limited by a technical solution described by the implementation manner below.

BRIEF DESCRIPTION OF DRAWINGS

[0021]

Fig. 1 is a side sectional view illustrating a structure of a drum type washing machine involved in an implementation manner;

Fig. 2 is a sectional view illustrating a structure of a driving unit involved in an implementation manner;

Fig. 3 is a sectional view illustrating a structure of a driving unit involved in an implementation manner;

Fig. 4 is a front view illustrating a rotor and a rotor structure of a driving motor involved in an implementation manner;

Fig. 5 is an enlarged stereoscopic view illustrating a rear part of a bearing unit formed with a rack involved in an implementation manner;

Fig. 6 is a diagram illustrating a structure of a clutch body of a clutch mechanism part involved in an implementation manner;

Fig. 7 is a block diagram illustrating a structure of the drum type washing machine involved in an implementation manner;

Fig. 8 is a diagram illustrating a state that an engaging flange part of the clutch body and an engaged recess of the rotor generate dislocation involved in an implementation manner;

Fig. 9 is a flow chart illustrating first-shaft switching treatment involved in an implementation manner;

Fig. 10 is a flow chart illustrating second-shaft switching treatment involved in an implementation manner;

Fig. 11 is a diagram illustrating a structure of a driving unit involved in a changed example.

DETAILED DESCRIPTION

[0022] A drum type washing machine without a drying function as an implementation manner of a drum type washing machine of the present disclosure is described below with reference to the drawings.

[0023] Fig. 1 is a side sectional view illustrating a structure of a drum type washing machine 1.

[0024] The drum type washing machine 1 is provided with a housing 10 forming an appearance. A front surface 10a of the housing 10 inclines from the central part to the upper part, a throwing opening 11 of washings is formed on the inclined surface, and the throwing opening 11 is covered by a freely opened/closed door 12.

[0025] An outer tank 20 is elastically supported by a plurality of shock absorbers in the housing 10. A drum 22 is configured in the outer tank 20 in a free rotation way. The outer tank 20 and the drum 22 incline in a manner that the rear surface sides become lower relative to a horizontal direction. Therefore, the drum 22 rotates by using an inclined shaft inclining relative to the horizontal direction as the center. The inclination angles of the outer tank 20 and the drum 22 are set as about 10-20 degrees. An opening part 20a of the front surface of the outer tank 20 and an opening part 22a of the front surface of the drum 22 are opposite to the throwing opening 11 and are closed by the door 12 together with the throwing opening 11. A plurality of dewatering holes 22b are formed in the inner circumferential surface of the drum 22. Then, three baffles 23 are arranged on the inner circumferential surface of the drum 22 along a circumferential direction at almost equal intervals.

[0026] A stirring body 24 is configured at the rear part of the drum 22 in a free rotation way and is in an approximate disc shape. A plurality of blades 24a radially extending from the central part are formed on the surface of the stirring body 24. The stirring body 24 and the drum 22 coaxially rotate. The stirring body 24 is equivalent to a rotating body of the present disclosure, and the blades 24 are equivalent to protrusion parts of the present disclosure.

[0027] A driving unit 30 generating a torque for driving the drum 22 and the stirring body 24 is configured to behind the outer tank 20 and is equivalent to a driving part of the present disclosure. The driving unit 30 enables the drum 22 and the stirring body 24 to rotate along the same direction at different rotation speeds in a washing process and a rinsing process. Specifically, the driving unit 30 enables the drum 22 to rotate at a rotation speed with the centrifugal force exerted on the washings in the drum 22 less than the gravity and enables the stirring body 24 to rotate at a rotation speed higher than that of the drum 22. In another aspect, the driving unit 30 enables the drum 22 and the stirring body 24 to integrally rotate at a rotation speed with the centrifugal force ex-

erted on the washings in the drum 22 far more than the gravity in a dewatering process. The detailed structure of the driving unit 30 is described subsequently.

[0028] A water outlet part 20b is formed at the bottom of the outer tank 20. A drainage valve 40 is arranged in the water outlet part 20b and is connected with a drainage hose 41. Water stored in the outer tank 20 is discharged out of the machine through the drainage hose 41 when the drainage valve 40 is opened.

[0029] A detergent box 50 is configured at the front upper part in the housing 10. A detergent container 50a containing a detergent, which can be freely drawn out from the front of the detergent box 50, is contained in the detergent box 50. The detergent box 50 is connected with a water-feeding valve 51 configured to at the rear upper part in the housing 10 through a water-feeding hose 52. In addition, the detergent box 50 is connected with the upper part of the outer tank 20 through a water injection pipe 53. Tap water from a faucet is supplied into the outer tank 20 through the water-feeding hose 52, the detergent box 50 and the water injection pipe 53 when the water-feeding valve 51 is opened. At this moment, the detergent contained in the detergent container 50a is supplied into the outer tank 20 along with a water flow.

[0030] Next, the structure of the driving unit 30 is described in detail.

[0031] Fig. 2 and Fig. 3 are sectional views illustrating the structure of the driving unit 30. Fig. 2 is a sectional view illustrating a state that a driving form of the driving unit 30 is switched to a second-shaft driving form, and Fig. 3 is a sectional view illustrating a state that the driving form of the driving unit 30 is switched to a first-shaft driving form. Fig. 4 is a front view illustrating a structure of a rotor 110 of a driving motor 100. Fig. 5 is an enlarged stereoscopic view illustrating a rear part of a bearing unit 500, on which a rack 514 is formed. Figs. 6(a)-6(c) are diagrams illustrating a structure of a clutch body 610 of a clutch mechanism part 600 and are respectively a front view, a right view and a rear view of the clutch body 610.

[0032] The driving unit 30 includes: the driving motor 100, a wing shaft 200, a drum shaft 300, a planetary gear mechanism 400, the bearing unit 500 and the clutch mechanism part 600. The driving motor 100 generates the torque used for driving the stirring body 24 and the drum 22. The wing shaft 200 rotates through the torque of the driving motor 100 and transmits rotation to the stirring body 24. The wing shaft 200 is equivalent to a first rotation shaft of the present disclosure. The planetary gear mechanism 400 slows down rotation of the wing shaft 200, i.e. rotation of the rotor 110 of the driving motor 100, and transmits rotation to the drum shaft 300. The drum shaft 300 coaxially rotates with the wing shaft 200 at a rotation speed after being slowed down by the planetary gear mechanism 400 and transmits rotation to the drum 22. The drum shaft 300 is equivalent to a second rotation shaft of the present disclosure. The bearing unit 500 supports the wing shaft 200 and the drum shaft 300 in a free rotation way. The clutch mechanism part 600

switches a driving form of the driving motor 100 between the second-shaft driving form and the first-shaft driving form, wherein the second-shaft driving form is a form that enables the stirring body 24, i.e. the wing shaft 200, to rotate at a rotation speed that is equal to that of the driving motor 100 and enables the drum 22, i.e. the drum shaft 300, to rotate at a rotation speed after being slowed down by the planetary gear mechanism 400; and the first-shaft driving form is a form that enables the stirring body 24 and the drum 22, i.e. the wing shaft 200 and the drum shaft 300, and the planetary gear mechanism 400 to integrally rotate at a rotation speed that is equal to that of the driving motor 100.

[0033] The driving motor 100 is an outer rotor type DC (Direct Current) brushless motor and includes the rotor 110 and a stator 120. The rotor 110 is in a cylindrical shape with a bottom, and permanent magnets 111 are arranged on the inner circumferential surface and the whole circumference of the rotor 110. As shown in Fig. 4, a round shaft sleeve part 112 is formed at the central part of the rotor 110. A shaft sleeve hole 113 configured to fix the wing shaft 200 is formed in the shaft sleeve part 112, and an annular engaged recess 114 is formed on the outer circumference of the shaft sleeve hole 113. Concave-convex parts 114a are arranged at the outer circumferential part and the whole circumference of the engaged recess 114. The engaged recess 114 is equivalent to a first engaged part of the present disclosure.

[0034] A coil 121 is arranged at the outer circumferential part of the stator 120. The rotor 110 rotates when an after-mentioned motor driving part supplies driving current to the coil 121 of the stator 120.

[0035] The drum shaft 300 is in a hollow shape, and the wing shaft 200 and the planetary gear mechanism 400 are wrapped inside the drum shaft 300. The central part of the drum shaft 300 is bulged toward the outer side, and the bulging part forms a containing part of the planetary gear mechanism 400.

[0036] The planetary gear mechanism 400 includes: a sun gear 410, an annular internal gear 420 which surrounds the sun gear 410, a plurality of groups of planetary gears 430 which are arranged between the sun gear 410 and the internal gear 420 and a planetary gear carrier 440 which holds the planetary gears 430 in a free rotation manner.

[0037] The sun gear 410 is fixed on the wing shaft 200, and the internal gear 420 is fixed on the drum shaft 300. One group of planetary gears 430 includes a first gear and a second gear which are engaged with each other and rotate in reverse directions. The planetary gear carrier 440 includes a gear carrier shaft 441 extending backward. The gear carrier shaft 441 is coaxial with the drum shaft 300, and a hollow part is formed in the gear carrier shaft 441, so as to insert the wing shaft 200.

[0038] The rear end part of the wing shaft 200 protrudes backward from the gear carrier shaft 441 and is fixed in the shaft sleeve hole 113 on the rotor 110.

[0039] A cylindrical bearing part 510 is arranged at the

central part of the bearing unit 500. In the bearing part 510, a roller 511 and a roller 512 are respectively arranged at the front part and the rear part, and a mechanical sealing element 513 is arranged at the front end part. The outer circumferential surface of the drum shaft 300 is supported by the rollers 511 and 512, and the drum shaft 300 smoothly rotates in the bearing part 510. In addition, the mechanical sealing element 513 prevents water from invading between the bearing part 510 and the drum shaft 300. As shown in Fig. 5, racks 514 are formed on the inner surface and the whole circumference of the rear end part of the bearing part 510. The racks 514 are equivalent to second engaged parts of the present disclosure.

[0040] In the bearing unit 500, a fixed flange part 520 is formed at the circumference of the bearing part 510. A mounting boss 521 is formed at the lower end part of the fixed flange part 520.

[0041] In the fixed flange part 520, the bearing unit 500 is fixed on the rear surface of the outer tank 20 by a fixing method of screw fastening and the like. In a state that the driving unit 30 is installed in the outer tank 20, the wing shaft 200 and the drum shaft 300 are faced with the inner part of the outer tank 20. The drum 22 is fixed on the drum shaft 300, and the stirring body 24 is fixed on the wing shaft 200.

[0042] The clutch mechanism part 600 includes: the clutch body 610, a clutch spring 620, a clutch lever 630, a lever supporting part 640, a clutch driving apparatus 650, a jointing rod 660 and a mounting plate 670.

[0043] As shown in Figs. 6(a)-6(c), the clutch body 610 is in an approximate disc shape. An annular rack 611 is formed on the outer circumferential surface of the front end part of the clutch body 610. The rack 611 is formed in a manner of being engaged with the rack 514 of the bearing unit 500. In addition, on the outer circumferential surface of the clutch body 610, a flange part 612 is formed behind the rack 611. Further, an annular engaging flange part 613 is formed at the rear end part on the clutch body 610. The engaging flange part 613 is in a shape the same as that of the engaged recess 114 of the rotor 110, and concave-convex parts 613a are arranged on the outer circumferential part and the whole circumference of the engaging flange part 613. The concave-convex parts 613a are engaged with each other when the engaging flange part 613 is inserted into the engaged recess 114. The engaging flange part 613 is equivalent to a first engaging part of the present disclosure, and the racks 611 are equivalent to second engaging parts of the present disclosure.

[0044] The gear carrier shaft 441 is inserted into a shaft hole 614 of the clutch body 610. A rack 614a formed on the inner circumferential surface of the shaft hole 614 is engaged with a rack 441a formed on the outer circumferential surface of the gear carrier shaft 441. Therefore, the clutch body 610 becomes a state of allowing movement back and forth and limiting rotation in a circumferential direction relative to the gear carrier shaft 441.

[0045] On the clutch body 610, an annular containing tank 615 is formed on the outer side of the shaft hole 614, and the clutch spring 620 is contained in the containing tank 615. One end of the clutch spring 620 is connected with the rear end part of the bearing part 510, and the other end of the clutch spring 620 is connected with the bottom surface of the containing tank 615.

[0046] A pressing part 631 which is in contact with the rear surface of the flange part 612 of the clutch body 610 and pushes the flange part 612 forward is formed at the upper end part of the clutch lever 630. The clutch lever 630 is supported by a supporting shaft 641 arranged on the lever supporting part 640 in a free rotation way. A mounting shaft 632 is formed at the lower end part of the clutch lever 630.

[0047] The clutch driving apparatus 650 is configured under the clutch lever 630. The clutch driving apparatus 650 includes a torque motor 651 and a disc-shaped cam 652 that rotates around a horizontal axis through a torque of the torque motor 651. A cam shaft 653 is arranged at the outer circumferential part on the cam 652. The rotating center of the cam 652 is the same as the center of the mounting shaft 632 of the clutch lever 630 in the forward-and-backward direction. The cam 652 is equivalent to a working body of the present disclosure.

[0048] The jointing rod 660 extends in the up-and-down direction and is configured to connect the clutch lever 630 and the cam 652. The upper end part of the jointing rod 660 is installed on the mounting shaft 632 of the clutch lever 630, and the lower end part of the jointing rod 660 is installed on the cam shaft 653 of the cam 652. A spring 661 is integrally formed at the middle position of the jointing rod 660 and is an extension spring.

[0049] The lever supporting part 640 and the clutch driving apparatus 650 are fixed on the mounting plate 670 by a fixing method of screw fastening and the like. The mounting plate 670 is fixed on the mounting boss 521 of the bearing unit 500 by screws.

[0050] Under a situation of switching the driving form of the driving unit 30 from the first-shaft driving form to the second-shaft driving form, as shown in Fig. 2, the cam 652 rotates through the torque motor 651 to enable the cam shaft 653 to be located at the lowest position. Along with rotation of the cam 652, the lower end part of the clutch lever 630 is pulled to the lower part by the jointing rod 660. The clutch lever 630 rotates forward by using the supporting shaft 641 as the center, and the pressing part 631 pushes the clutch body 610 forward. The clutch body 610 moves forward against the elasticity of the clutch spring 620, and the rack 611 of the clutch body 610 is engaged with the rack 514 of the bearing unit 500.

[0051] The rack 611 arrives at the position where the rack 611 is engaged with the rack 514 when the cam shaft 653 of the clutch body 610 moves to the assigned central position. At this moment, the spring 661 of the jointing rod 660 is in a natural length state. Since the clutch body 610 does not move to the position more for-

ward than the engaging position, when the cam shaft 653 moves to the lowest position from the specified position, as shown in Fig. 2, the spring 661 extends to the lower part. In this way, since the clutch lever 630 is pulled by the spring 661 in a forward rotation manner, the pressing part 631 exerts pressing force onto the clutch body 610 positioned at the engaging position, so that the rack 611 is tightly engaged with the rack 514.

[0052] In addition, the position of the clutch body 610, at which the rack 611 is engaged with the rack 514, is called a second position below. In addition, the working state of the cam 652 when the cam shaft 653 is positioned at the lowest position is called a second working state below.

[0053] When the rack 611 is engaged with the rack 514, since rotation of the clutch body 610 relative to the bearing unit 500 in a circumferential direction is limited and the clutch body 610 becomes a non-rotation state, the gear carrier shaft 441 of the planetary gear mechanism 400, namely, the planetary gear carrier 440, becomes a state of being fixed in a non-rotation manner. Under such state, when the rotor 110 rotates, the wing shaft 200 rotates at a rotation speed that is equal to that of the rotor 110, and the stirring body 24 connected with the wing shaft 200 also rotates at a rotation speed that is equal to that of the rotor 110. The sun gear 410 in the planetary gear mechanism 400 rotates along with rotation of the wing shaft 200. As described above, since the planetary gear carrier 440 is in the state of being fixed, the first gears and the second gears of the planet gears 430 respectively rotate in the same direction and in the reverse direction with the sun gear 410, and the internal gear 420 and the sun gear 410 rotate in the same direction. Therefore, the drum shaft 300 fixed on the internal gear 420 rotates in the same direction as the wing shaft 200 and at a rotation speed slower than that of the wing shaft 200, and the drum 22 fixed on the drum shaft 300 rotates at a rotation speed slower than that of the stirring body 24 and in the same direction as the stirring body 24. In other words, the stirring body 24 rotates at a rotation speed higher than that of the drum 22 in the same direction as the drum 22.

[0054] In another aspect, under a situation of switching the form of the driving unit 30 from the second-shaft driving form to the first-shaft driving form, as shown in Fig. 3, the cam 652 rotates through the torque motor 651 to enable the cam shaft 653 to be position at the highest part. When the cam 652 rotates, and the cam shaft 653 moves upward, firstly, the spring 661 is contracted. After the spring 661 restores to the natural length, the jointing rod 660 moves upward along with movement of the cam shaft 653, and the lower end part of the clutch lever 630 is pushed by the jointing rod 660 to move upward. The clutch lever 630 rotates backward by using the supporting shaft 641 as the center, and the pressing part 631 is separated from the flange part 612 of the clutch body 610. The clutch body 610 moves backward through the elasticity of the clutch spring 620, and the engaging

flange part 613 of the clutch body 610 is engaged with the engaged recess 114 of the rotor 110.

[0055] In addition, the position of the clutch body 610, at which the engaging flange part 613 is engaged with the engaged recess 114, is called a first position below. In addition, the working state of the cam 652 when the cam shaft 653 is positioned at the highest part is called a first working state below.

[0056] When the engaging flange part 613 is engaged with the engaged recess 114, rotation relative to the rotor 110 toward a circumferential direction of the clutch body 610 is limited, and the clutch body 610 and the rotor 110 become a rotatable state. Under such state, the wing shaft 200 and the clutch body 610 rotate at a rotate speed that is equal to that of the rotor 110 when the rotor 110 rotates. At this moment, the sun gear 410 and the planetary gear carrier 440 rotate at a rotation speed that is equal to that of the rotor 110 in the planetary gear mechanism 400. Therefore, the internal gear 420 rotates at a rotation speed that is equal to that of the sun gear 410 and the planetary gear carrier 440, and the drum shaft 300 fixed on the internal gear 420 rotates at a rotation speed that is equal to that of the rotor 110. Namely, the wing shaft 200, the planetary gear mechanism 400 and the drum shaft 300 integrally rotate in the driving unit 30, so that the drum 22 and the stirring body 24 integrally rotate.

[0057] Fig. 7 is a block diagram illustrating the structure of the drum type washing machine 1.

[0058] In addition to the above structure, the drum type washing machine 1 is further provided with: a control part 701, a storage part 702, an operation part 703, a water level sensor 704, the motor driving part 705, a water-feeding driving part 706, a drainage driving part 707, a clutch driving part 708 and a door locking apparatus 709.

[0059] The operation part 703 includes: a power button 703a, a start button 703b and a program selection button 703c. The power button 703a is a button configured to switch on and off a power supply of the drum type washing machine 1. The start button 703b is a button configured to start rotation. The mode selection button 703c is a button configured to select any running program from a plurality of running programs related to washing running. The operation part 703 outputs an input signal corresponding to the button operated by a user to the control part 701.

[0060] The water level sensor 704 detects a water level in the outer tank 20 and outputs a water level detection signal corresponding to the detected water level to the control part 701.

[0061] The motor driving part 705 supplies the driving current to the driving motor 100 according to a control signal from the control part 701. The motor driving part 705 is provided with a speed sensor for detecting rotation speed of the driving motor 100, an inverter circuit and the like, and adjusts the driving current to enable the driving motor 100 to rotate at a rotation speed set by the control part 701.

[0062] The water-feeding driving part 706 supplies the driving current to the water-feeding valve 51 according to the control signal from the control part 701. The drainage driving part 707 supplies the driving current to the drainage valve 40 according to the control signal from the control part 701.

[0063] The clutch driving apparatus 650 includes a first detection sensor 654 and a second detection sensor 655. The first detection sensor 654 and the second detection sensor 655 form a state detection part of the present disclosure. The first detection sensor 654 detects that the cam 652 becomes a first working state and outputs a detection signal to the control part 701. The second detection sensor 655 detects that the cam 652 becomes second working state and outputs a detection signal to the control part 701. The clutch driving part 708 supplies the driving current to the torque motor 651 according to the detection signals from the first detection sensor 654 and the second detection sensor 655 as well as the control signal output by the control part 701.

[0064] The door locking apparatus 709 locks and unlocks the door 12 according to the control signal from the control part 701.

[0065] The storage part 702 includes an EEPROM (Electrically Erasable Programmable Read-Only Memory), an RAM (Random Access Memory) and the like. A program used for executing the washing running in a variety of washing running programs is stored in the storage part 702. In addition, a variety of parameters and a variety of control marks used for executing the programs are stored in the storage part 702.

[0066] The control part 701 controls the motor driving part 705, the water-feeding driving part 706, the drainage driving part 707, the clutch driving part 708, the door locking apparatus 709 and the like according to the programs stored in the storage part 702 and based on various signals from the operation part 703, the water level sensor 704 and the like.

[0067] The drum type washing machine 1 carries out the washing running in the variety of washing running programs according to a selection operation of the user carried out by the program selection button 703c. A washing process, a middle dewatering process, a rinsing process and a final dewatering process are sequentially carried out in the washing running. In addition, sometimes, the middle dewatering process and the rinsing process can be carried out for more than two times according to the running program.

[0068] The driving form of the driving unit 30 is switched to the second-shaft driving form in the washing process and the rinsing process. Water is stored in the outer tank 20 at the specified water level lower than the lower edge of the throwing opening 11 to enable the washings in the drum 22 to be immersed into the water, and under such state, the driving motor 100 alternatively rotates in the forward direction and in the reverse direction. Therefore, the drum 22 and the stirring body 24 alternatively rotate in the forward direction and in the reverse direction in a

state that rotation speed of the stirring body 24 is higher than that of the drum 22. At this moment, the drum 22 rotates at a rotation speed with the centrifugal force acted on the washings less than the gravity.

[0069] The washings in the drum 22 are lifted up and dropped down by the baffles and are thrown to the inner circumferential surface of the drum 22. Besides, at the rear part of the drum 22, the washings are in contact with the blades 24a of the rotating stirring body 24, and rubbed and stirred by the blades 24a. Therefore, the washings are washed or rinsed.

[0070] In the middle dewatering process and the final dewatering process, the driving form of the driving unit 30 is switched to the first-shaft driving form. The driving motor 100, namely, the drum 22 and the stirring body 24, rotates at a rotation speed with the centrifugal force acted on the washings in the drum 22 far more than the gravity. The washings are pressed on the inner circumferential surface through the action of the centrifugal force and are dewatered.

[0071] So, when switching is carried out from the second-shaft driving form to the first-shaft driving form, and the clutch body 610 is moved to the first position through the elasticity of the clutch spring 620, as shown in Fig. 8, sometimes, the concave-convex parts 613a and 114a are dislocated from each other toward rotation direction of the rotor 110, i.e. the driving motor 100. In addition, in Fig. 8, the clutch body 610 is expressed by a dot-and-dash line for the purpose of convenience.

[0072] Under a situation that the concave-convex parts 613a and 114a are dislocated from each other, the clutch body 610 does not move to the first position, and the engaging flange part 613 is not engaged with the engaged recess 114. Under such state, since rotation of the driving motor 100 is accelerated more quickly under the situation that the driving motor 100 formally rotates for dewatering, a hidden danger exists that rotation of the driving motor 100 is still accelerated to a rotation speed used for dewatering under a state that the engaging flange part 613 cannot be engaged with the engaged recess 114. In this way, since rotation of the driving motor 100 is incorrectly transmitted to the drum shaft 300, a hidden danger of incorrect dewatering of the washings exists as the drum 22 incorrectly rotates.

[0073] Additionally, when switching is carried out from the first-shaft driving form to the second-shaft driving form, and the clutch body 610 is pushed by the clutch lever 630 to move to the second position, all teeth of the rack 611 and all teeth of the rack 514 are sometimes dislocated toward a circumferential direction of the clutch body 610. Under such situation, the clutch body 610 does not move to the second position, and the racks 611 and 514 cannot be engaged with each other. Therefore, in washing and rinsing, when the driving motor 100 formally rotates in a state that the racks 611 and 514 are not engaged with each other, a hidden danger of incorrect washing and rinsing of the washings exists as the drum 22 incorrectly rotates.

[0074] Therefore, in the implementation manner, the control part 701 executes first-shaft switching treatment used for carrying out switching from the second-shaft driving form to the first-shaft driving form in good precision and executes second-shaft switching treatment used for carrying out switching from the first-shaft driving form to the second-shaft driving form in good precision. The first-shaft switching treatment and the second-shaft switching treatment are described in detail below.

[0075] Fig. 9 is a flow chart illustrating the first-shaft switching treatment.

[0076] Before the first-shaft switching treatment is started, the driving form of the driving unit 30 is the second-shaft driving form, and the cam 652 of the clutch driving apparatus 650 is in the second working state.

[0077] The control part 701 enables the torque motor 651 to rotate (S101) when the first-shaft switching treatment is started. The control part 701 judges whether the detection signal is output by the first detection sensor 654 (S102). The control part 701 enables the torque motor 651 to stop (S103) when the detection signal is output by the first detection sensor 654 (S102: YES) in a way that the cam 652 rotates until the cam shaft 653 is positioned at the highest position. As described above, the clutch body 610 arrives at the first position under a situation that the concave-convex parts 613a and 114a are not dislocated from each other and the engaging flange part 613 is engaged with the engaged recess 114. In another aspect, the clutch body 610 does not arrive at the first position under a situation that the concave-convex parts 613a and 114a are dislocated from each other and the engaging flange part 613 is not engaged with the engaged recess 114.

[0078] When the torque motor 651 is stopped, the control part 701 sets rotation speed of the driving motor 100 as a specified pre-rotation speed and supplies driving current corresponding to the pre-rotation speed to the driving motor 100 to enable the driving motor 100 to pre-rotate (S104). The pre-rotation speed is set as rotation speed slower than that when the driving motor 100 is enabled to formally rotate under the first-shaft driving form, for example, rotation speed is about 20rpm-30rpm. Therefore, the driving current supplied to the driving motor 100 when in pre-rotation is less than that of the driving motor 100 when in formal rotation.

[0079] The rotor 110 of the driving motor 100 slowly rotates. Under a situation that the concave-convex parts 613a and 114a are dislocated from each other, when the engaged recess 114 rotates along with rotation of the rotor 110 until the concave-convex parts 613a and 114a are at the consistent position, the engaging flange part 613 is engaged with the engaged recess 114. The clutch body 610 arrives at the first position.

[0080] The control part 701 stops the driving motor 100 (S106) after the specified pre-rotation time (S105). The pre-rotation time is set as time that enables the rotor 110 of the driving motor 100 to rotate for many times from a half time through rotation at the pre-rotation speed. Since

rotation angle of the rotor 110 of the driving motor 100 is larger than an angle R corresponding to an interval of the concave-convex part 114a of the engaged recess 114 shown in Fig. 8, even if dislocation of almost an interval is generated between the concave-convex part 613a of the engaging flange part 613 and the concave-convex part 114a of the engaged recess 114, the engaging flange part 613 is also engaged with the engaged recess 114.

[0081] So, the first-shaft switching treatment is ended. Then, the control part 701 enables the driving motor 100 to formally rotate. For example, under the situation of performing the dewatering process under the first-shaft driving form, the control part 701 supplies driving current corresponding to a rotation speed used for dewatering to the driving motor 100, so as to enable the driving motor 100 to rotate.

[0082] Fig. 10 is a flow chart illustrating the second-shaft switching treatment.

[0083] Before the second-shaft switching treatment is started, the driving form of the driving unit 30 is the first-shaft driving form, and the cam 652 of the clutch driving apparatus 650 is in the first working state.

[0084] The control part 701 enables the torque motor 651 to rotate (S201) when the second-shaft switching treatment is started. The control part 701 judges whether the detection signal is output by the second detection sensor 655 (S202). The control part 701 enables the torque motor 651 to stop (S203) when the detection signal is output by the second detection sensor 655 (S202: YES) in a way that the cam 652 rotates until the cam shaft 653 is positioned at the lowest position. As described above, the clutch body 610 arrives at the second position under a situation that the racks 611 and 514 are engaged with each other. In another aspect, the clutch body 610 does not arrive at the second position under a situation that the racks 611 and 514 are dislocated from each other and are not engaged with each other.

[0085] When the torque motor 651 is stopped, the control part 701 sets rotation speed of the driving motor 100 as a specified pre-rotation speed and supplies driving current corresponding to the pre-rotation speed to the driving motor 100 to enable the driving motor 100 to pre-rotate (S204). The pre-rotation speed is set as rotation speed slower than that when the driving motor 100 is enabled to formally rotate according to the second-shaft driving form. Therefore, the driving current supplied to the driving motor 100 when in pre-rotation is less than that of the driving motor 100 when in formal rotation. The pre-rotation speed set according to the second-shaft switching treatment can not only be equal to that set according to the first-shaft switching treatment, but also be different from that set according to the first-shaft switching treatment.

[0086] The rotor 110 of the driving motor 100 slowly rotates. The wing shaft 200 rotates along with rotation of the rotor 110. Therefore, the planetary gears 430 rotate when the sun gear 410 rotates. Under a situation that the

racks 611 and 514 are not engaged with each other, both the internal gear 420 and the planetary gear carrier 440 are in a rotation state; but since the internal gear 420 is connected with the drum 22 and the planetary gear carrier 440 is connected with the clutch body 610, a torque required by rotation is smaller, namely, the planetary gear carrier 440 rotates along with rotation of the planetary gears 430. The dislocated racks 611 and 514 are engaged with each other when the clutch body 610 rotates along with rotation of the planetary gear carrier 440. The clutch body 610 arrives at the first position.

[0087] The control part 701 stops the driving motor 100 (S206) after the specified pre-rotation time (S205). The pre-rotation time is set as time that enables the rotor 110 of the driving motor 100 to rotate for many times from a half time through rotation at the pre-rotation speed. The pre-rotation time of the second-shaft switching treatment can not only be equal to that of the first-shaft switching treatment, but also be different from that of the first-shaft switching treatment.

[0088] So, the second-shaft switching treatment is ended. Then, the control part 701 enables the driving motor 100 to formally rotate. For example, under the situation of performing the washing process according to the second-shaft driving form, the control part 701 supplies driving current corresponding to a rotation speed used for washing to the driving motor 100, so as to enable the driving motor 100 to rotate. Or, for example, under the situation of performing the rinsing process according to the second-shaft driving form, the control part 701 supplies driving current corresponding to a rotation speed used for rinsing to the driving motor 100, so as to enable the driving motor 100 to rotate.

<Effects of the implementation manner>

[0089] As described above, according to the described implementation manner, in order to realize switching from the second-shaft driving form to the first-shaft driving form, the first-shaft switching treatment is executed after the clutch mechanism part 600 is operated to move the clutch body 610 to the first position, and the first-shaft treatment enables the driving motor 100 to rotate to engage the unengaged engaging flange part 613 with the engaged recess 114. Therefore, when the clutch mechanism part 600 is operated to move the clutch body 610 to the first position, even if the dislocation between the engaging flange part 613 and the engaged recess 114 is generated, the dislocation can be eliminated, so that the engaging flange part 613 is engaged with the engaged recess 114. Therefore, since switching from the second-shaft driving form to the first-shaft driving form can be carried out in good precision, rotation of the drum 22 and the stirring body 24 is correctly carried out under the first-shaft driving form, so as to carry out correct de-watering.

[0090] Further, according to the implementation manner, since the machine is designed into the first-shaft

switching treatment, the driving motor 100 is enabled to rotate through the driving current lower than that when the driving motor 100 rotates under the first-shaft driving form after the first-shaft switching treatment, thereby enabling the driving motor 100 to slowly rotate. Therefore, the engaging flange part 613 is easily engaged with the engaged recess 114, so as to improve switching precision.

[0091] Further, according to the implementation manner, in order to realize switching from the first-shaft driving form to the second-shaft driving form, the second-shaft switching treatment is executed after the clutch mechanism part 600 is operated to move the clutch body 610 to the second position, and the second-shaft switching treatment enables the driving motor 100 to rotate to engage the unengaged racks 611 and 514. Therefore, when the clutch mechanism part 600 is operated to move the clutch body 610 to the second position, even if the dislocation between the racks 611 and 514 is generated, the dislocation can be eliminated, so that the racks 611 and 514 are engaged with each other. Therefore, since switching from the first-shaft driving form to the second-shaft driving form can be carried out in good precision, rotation of the drum 22 and the stirring body 24 is correctly carried according to the second-shaft driving form, so as to carry out correct washing or rinsing.

[0092] Further, according to the implementation manner, since the machine is designed into the second-shaft switching treatment, the driving motor 100 rotates through the driving current lower than that when the driving motor 100 rotates according to the second-shaft driving form after the second-shaft switching treatment, thereby enabling the driving motor 100 to slowly rotate. Therefore, the racks 611 and 514 are easily engaged with each other, so as to improve switching precision.

[0093] Further, according to the implementation manner, since the machine is designed to detect the working state of the cam 652 by the first detection sensor 654 and the second detection sensor 655, the position of the clutch body 610 is indirectly detected. Therefore, the driving form of the driving unit 30 can be switched with no need of the sensors for directly detecting the position of the clutch body 610 and the like.

<Change example>

[0094] Although the implementation manner of the present invention is described above, the present disclosure is not limited by the above implementation manner. In addition, various changes can also be made to the implementation manner of the present invention in addition to the above description.

[0095] For example, in the above implementation manner, the engaging flange part 613 is formed on the clutch body 610 and is taken as the first engaging part, and the engaged recess 114 is formed on the rotor 110 of the driving motor 100 and is taken as the first engaged part. But, as long as the clutch body 610 and the rotor 110 are

engaged with each other, the clutch body 610 and the rotor 110 can be fixed in a circumferential direction, regardless of the structures of the first engaging part and the first engaged part. In addition, in the above implementation manner, the rack 611 is formed on the clutch body 610 and is taken as the second engaging part, and the rack 514 is formed on the bearing part 510 of the bearing unit 500 and is taken as the second engaged part. However, as long as the clutch body 610 and the bearing part 510 are engaged with each other, the clutch body 610 and the rotor 110 can be fixed in a circumferential direction through engagement, regardless of the structures of the second engaging part and the second engaged part.

[0096] Further, in the above implementation manner, for the first-shaft switching treatment and the second-shaft switching treatment, the driving motor 100 is stopped after the pre-rotation time. But, the pre-rotation may also be transferred to rotation used for dewatering and washing without stopping the driving motor 100 after the pre-rotation time.

[0097] Further, in the above implementation manner, the drum shaft 300 is fixed on the internal gear 420, and the planetary carrier shaft 441, i.e. the planetary gear carrier 440, is connected with the clutch body 610. Therefore, in the second-shaft driving form, when the wing shaft 200 rotates under a state that the planetary gear carrier 440 is fixed by the clutch body 610, the planetary gears 430 rotate around the own axis along with rotation of the sun gear 410, and the internal gear 420 rotates at a rotation speed slower than that of the sun gear 410. But, as shown in Fig. 11, a structure that the drum shaft 300 is fixed on the planetary gear carrier 440 may also be adopted. Under such situation, a shaft part 425, which protrudes backward from the drum shaft 300, of a top end part 425a is arranged on the internal gear 420. Moreover, the clutch body 610 is connected with the shaft part 425. Namely, the clutch body 610 is connected with the internal gear 420 through the shaft part 425. Further, the planetary gears 430 are changed to only be provided with the first gear. In the second-shaft driving form, when the wing shaft 200 rotates under a state that the internal gear 420 is fixed by the clutch body 610, the planetary gears 430 rotate around the own axis and revolve along with rotation of the sun gear 410, and the planetary gear carrier 440 rotates at a rotation speed slower than that of the sun gear 410. Therefore, the drum shaft 300 fixed on the planetary gear carrier 440 rotates.

[0098] Further, since the space between the teeth of the racks 611 and 514 is small, compared with the situation of switching from the second-shaft driving form to the first-shaft driving form, the situation that the racks 611 and 514 are not engaged with each other is difficult to generate. Therefore, as long as the precision of engagement of the racks 611 and 514 is high, for the second-shaft switching treatment, the treatment from the step S204 to the step S206 used for enabling the driving motor 100 to pre-rotate may also be omitted.

[0099] Further, in the above implementation manner, the drum 22 rotates by using the inclination axis inclining relative to the horizontal direction as the center. But, the drum type washing machine 1 may also adopt a structure that the drum 22 rotates by using the horizontal axis as the center.

[0100] Further, although the drum type washing machine 1 of the above implementation manner does not have the drying function, the present disclosure can also be used for a drum type washing machine with the drying function, i.e. a drum type washing and drying machine.

[0101] Additionally, various changes can be appropriately made to the implementation manner of the present invention within the scope of the technological idea expressed within the scope of the claims.

Reference signs:

[0102] 10: housing; 20: outer tank; 22: drum; 24: stirring body (rotating body); 24a: blade (protruding part); 30: driving unit (driving part); 100: driving motor; 110: rotor; 114: engaged recess (first engaged part); 200: wing shaft (first rotation shaft); 300: drum shaft (second rotation shaft); 400: planetary gear mechanism; 410: sun gear; 420: internal gear; 430: planetary gear; 440: planetary gear carrier; 500: bearing unit; 510: bearing part; 514: rack (second engaged part); 600: clutch mechanism part; 610: clutch body; 611: rack (second engaging part); 613: engaging flange part (first engaging part); 650: clutch driving apparatus; 652: cam (working body); 654: first detection sensor (state detection part); 655: second detection sensor (state detection part); 701: control part.

Claims

1. A drum type washing machine, provided with:

an outer tank (20), configured in a housing (10);
a drum (22), configured in the outer tank (20) and is capable of rotating by using a horizontal axis or an inclination axis inclining relative to a horizontal direction as a center;
a stirring body (24), configured at a rear part of the drum (22) and provided, on a surface of the stirring body (24), with a protruding part in contact with washings;
a driving unit (30), configured to enable the drum (22) and the stirring body (24) to rotate; and
a control part (701), configured to control working of the driving unit (30);
characterized in that,
the driving unit (30) comprises:

a driving motor (100);
a wing shaft (200), configured to transmit rotation of the driving motor (100) to the stirring body (24);

a drum shaft (300), configured to transmit rotation of the driving motor (100) to the drum (22); and

a clutch mechanism part (600), configured to switch a driving form of the driving unit (30) between a first-shaft driving form and a second-shaft driving form, wherein the first-shaft driving form is a form that enables the wing shaft (200) and the drum shaft (300) to integrally rotate at a same rotation speed, and the second-shaft driving form is a form that enables the wing shaft (200) and the drum shaft (300) to respectively rotate at different rotation speeds, wherein

the clutch mechanism part (600) comprises: a clutch body (610) provided with an engaging flange part (613), wherein

by moving the clutch body (610) to a first position so as to engage the engaging flange part (613) at the first position with an engaged recess (114) that rotates with rotation of the driving motor (100), the driving form is switched to the first-shaft driving form;

the control part (701) executes first-shaft switching treatment to carry out switching from the second-shaft driving form to the first-shaft driving form, wherein the first-shaft switching treatment is treatment that enables the clutch mechanism part (600) to work to move the clutch body (610) to the first position and then enables the driving motor (100) to rotate to engage the engaging flange part (613) in unengaged state and the engaged recess (114);

a plurality of first concave-convex parts (613a) are arranged at an outer circumferential part and the whole circumference of the engaging flange part (613), and a plurality of second concave-convex parts (114a) are arranged at an outer circumferential part and the whole circumference of the engaged recess (114); the engaging flange part (613) is in a shape the same as that of the engaged recess (114); the first concave-convex parts (613a) and the second concave-convex parts (114a) are engaged with each other when the engaging flange part (613) is inserted into the engaged recess (114).

2. The drum type washing machine according to claim 1, wherein
for the first-shaft switching treatment, the control part (701) enables the driving motor (100) to rotate with a driving current lower than a driving current enabling the driving motor (100) to rotate under the first-shaft driving form after the first-shaft switching treatment.
3. The drum type washing machine according to claim 1 or 2, wherein

the driving unit (30) further comprises a planetary gear mechanism (400), wherein the planetary gear mechanism (400) is provided with: a sun gear (410) which rotates along with rotation of the motor (100); an annular internal gear (420) which surrounds the sun gear (410); a plurality of planetary gears (430) which are arranged between the sun gear (410) and the internal gear (420); and a planetary gear carrier (440) which holds the planetary gears (430) in a free rotation manner, wherein one of the planetary gear carrier (440) and the internal gear (420) is fixed on the drum shaft (300);

the clutch body (610) is provided with an annular rack (611) and is connected with the other one of the planetary gear carrier (440) and the internal gear (420) in a state of limiting rotation relative to the other one of the planetary gear carrier (440) and the internal gear (420) toward a circumferential direction and allowing movement along an axial direction of the drum shaft (300);

by moving the clutch body (610) to a second position so as to engage the annular rack (611) at the second position with a second engaged part (514) that does not rotate along with rotation of the driving motor (100) and become a non-rotation state for the other one of the planetary gear carrier (440) and the internal gear (420), the driving form is switched to the second-shaft driving form;

even if the clutch mechanism part (600) works to enable the clutch body (610) to move to the second position, the annular rack (611) is not engaged with the second engaged part (514), and at this moment, the other one of the planetary gear carrier (440) and the internal gear (420) rotates along with rotation of the driving motor (100), so that the clutch body (610) rotates; and

the control part (701) executes second-shaft switching treatment to carry out switching from the second-shaft driving form to the first-shaft driving form, wherein the second-shaft switching treatment is treatment that enables the clutch mechanism part (600) to work to move the clutch body (610) to the second position and then enables the driving motor (100) to rotate to engage the unengaged annular rack (611) with the second engaged part (514).

4. The drum type washing machine according to claim 3, wherein
for the second-shaft switching treatment, the control part (701) enables the driving motor (100) to rotate with a driving current lower than a driving current enabling the driving motor (100) to rotate under the second-shaft driving form after the second-shaft switching treatment.
5. The drum type washing machine according to claim 3 or 4, further comprising a clutch driving apparatus (650) configured to enable the clutch body (610) to

move, wherein
the clutch driving apparatus (650) comprises:

a cam (652), capable of being transferred to a first working state enabling the clutch body (610) to move to the first position and a second working state enabling the clutch body (610) to move to the second position; and
a state detection part, configured to detect a working state of the cam (652), wherein
for the first-shaft switching treatment, the control part (701) enables the clutch driving apparatus (650) to work according to a detection result of the state detection part so as to enable the cam (652) to be transferred to the first working state; and
for the second-shaft switching treatment, the control part (701) enables the clutch driving apparatus (650) to work according to a detection result of the state detection part so as to enable the cam (652) to be transferred to the second working state.

Patentansprüche

1. Trommelwaschmaschine, die mit Folgendem versehen ist:

einen äußeren Behälter (20), ausgelegt in einem Gehäuse (10);
eine Trommel (22), die im äußeren Behälter (20) ausgelegt und dazu im Stande ist, durch Anwendung einer horizontalen Achse oder einer Neigungsachse, die im Verhältnis zu einer horizontalen Richtung als Zentrum geneigt ist, zu drehen;
einen Rührkörper (24), ausgelegt an einem hinteren Teil der Trommel (22) und auf einer Oberfläche des Rührkörpers (24) mit einem vorspringenden Teil versehen, der mit Wäschen in Kontakt ist;
eine Antriebseinheit (30), die dafür ausgelegt ist, eine Drehung der Trommel (22) und des Rührkörpers (24) zu ermöglichen; und
einen Steuerteil (701), der dafür ausgelegt ist, die Arbeit der Antriebseinheit (30) zu steuern, **dadurch gekennzeichnet, dass**
die Antriebseinheit (30) Folgendes umfasst:

einen Antriebsmotor (100);
eine Flügelwelle (200), die dafür ausgelegt ist, eine Drehung des Antriebsmotors (100) an den Rührkörper (24) zu übertragen;
eine Trommelwelle (300), die dafür ausgelegt ist, eine Drehung des Antriebsmotors (100) an die Trommel (22) zu übertragen; und

einen Kupplungsmechanismusteil (600), der dafür ausgelegt ist, eine Antriebsform der Antriebseinheit (30) zwischen einer erste-Welle-Antriebsform und einer zweite-Welle-Antriebsform zu schalten, wobei die erste-Welle-Antriebsform eine Form ist, die eine integrale Drehung der Flügelwelle (200) und der Trommelwelle (300) bei derselben Geschwindigkeit ermöglicht, und die zweite-Welle-Antriebsform eine Form ist, die es ermöglicht, dass die Flügelwelle (200) bzw. die Trommelwelle (300) bei unterschiedlichen Drehgeschwindigkeiten drehen, wobei

der Kupplungsmechanismusteil (600) Folgendes umfasst: einen Kupplungskörper (610), der mit einem eingreifenden Flanschteil (613) versehen ist, wobei die Antriebseinheit in eine erste-Welle-Antriebsform geschaltet wird durch Bewegen des Kupplungskörpers (610) zu einer ersten Position, damit der eingreifende Flanschteil (613) in der ersten Position mit einer eingreifenden Ausnehmung (114), die mit der Drehung des Antriebsmotors (100) dreht, in Eingriff geht; der Steuerteil (701) erste-Welle-Schaltbehandlung ausübt, um ein Schalten von der zweite-Welle-Antriebsform in eine erste-Welle-Antriebsform auszuführen, wobei die erste-Welle-Schaltbehandlung eine Behandlung ist, die es dem Kupplungsmechanismusteil (600) ermöglicht, zu arbeiten, um den Kupplungskörper (610) zu der ersten Position zu bewegen, und es dann dem Antriebsmotor (100) ermöglicht, zu drehen, damit der eingreifende Flanschteil (613) in gelöstem Zustand und die eingreifende Ausnehmung (114) in Eingriff gehen; eine Mehrheit von ersten konkav-konvexen Teilen (613a) an einem äußeren Umfangsteil und an dem ganzen Umfang des eingreifenden Flanschteils (613) angeordnet sind, und eine Mehrheit von zweiten konkav-konvexen Teilen (114a) an einem äußeren Umfangsteil und an dem ganzen Umfang der eingreifenden Ausnehmung (114) angeordnet sind; wobei der eingreifende Flanschteil (613) in Form das gleiche wie die eingreifende Ausnehmung (114) ist; die ersten konkav-konvexen Teile (613a) und die zweiten konkav-konvexen Teile (114a) ineinander eingreifen, wenn der eingreifende Flanschteil (613) in die eingreifende Ausnehmung (114) eingeführt wird.

2. Trommelwaschmaschine nach Anspruch 1, wobei der Steuerteil (701) für die erste-Welle-Schaltbehandlung es dem Antriebsmotor (100) ermöglicht, mit einem Antriebsstrom zu drehen, der niedriger als ein Antriebsstrom ist, der es dem Antriebsmotor

(100) ermöglicht, unter der erste-Welle-Antriebsform nach der erste-Welle-Schaltbehandlung zu drehen.

3. Trommelwaschmaschine nach Anspruch 1 oder 2, wobei die Antriebseinheit (30) weiter einen Planetengetriebemechanismus (400) umfasst, wobei der Planetengetriebemechanismus (400) mit Folgendem versehen ist: einem Sonnenrad (410), das zusammen mit der Drehung des Motors (100) dreht; einem ringförmigen Innenrad (420), das das Sonnenrad (410) umgibt; einer Mehrheit von Planetengetrieben (430), die zwischen dem Sonnenrad (410) und dem Innenrad (420) angeordnet sind; und einem Planetengetriebeträger (440), der die Planetengetrieben (430) frei drehbar hält, wobei der Planetengetriebeträger (440) oder das Innenrad (420) an der Trommelwelle (300) befestigt ist; der Kupplungskörper (610) mit einem ringförmigen Gestell (611) versehen ist und mit dem anderen von dem Planetengetriebeträger (440) und dem Innenrad (420) verbunden ist in einem Zustand begrenzter Drehung im Verhältnis zu dem anderen von dem Planetengetriebeträger (440) und dem Innenrad (420) gegen eine Umfangsrichtung und eine Bewegung entlang einer axialen Richtung der Trommelwelle (300) erlaubt; die Antriebsform in eine zweite-Welle-Antriebsform geschaltet wird durch Bewegen des Kupplungskörpers (610) zur einer zweiten Position, damit das ringförmige Gestell (611) in der zweiten Position mit einem zweiten eingreifenden Teil (514) in Eingriff geht, der nicht zusammen mit der Drehung des Antriebsmotors (100) dreht, und ein Zustand ohne Drehung für den anderen von dem Planetengetriebeträger (440) und dem Innenrad (420) wird; selbst wenn der Kupplungsmechanismusteil (600) dafür arbeitet, es zu ermöglichen, den Kupplungskörper (610) in die zweite Position zu bewegen, ist das ringförmige Gestell (611) nicht mit dem zweiten eingreifenden Teil (514) in Eingriff, und zu diesem Zeitpunkt dreht der andere von dem Planetengetriebeträger (440) und dem Innenrad (420) zusammen mit der Drehung des Antriebsmotors (100), so dass der Kupplungskörper (610) dreht; und der Steuerteil (701) zweite-Welle-Schaltbehandlung ausübt, um ein Schalten von der zweite-Welle-Antriebsform in eine zweite-Welle-Antriebsform auszuführen, wobei die zweite-Welle-Schaltbehandlung eine Behandlung ist, die es dem Kupplungsmechanismusteil (600) ermöglicht, zu arbeiten, um den Kupplungskörper (610) zu einer ersten Position zu bewegen, und es dann dem Antriebsmotor (100) ermöglicht, zu drehen, damit das gelöste ringförmige Gestell (611) mit dem zweiten eingreifenden Teil (514) in Eingriff geht.

4. Trommelwaschmaschine nach Anspruch 3, wobei der Steuerteil (701) für die zweite-Welle-Schaltbehandlung es dem Antriebsmotor (100) ermöglicht, mit einem Antriebsstrom zu drehen, der niedriger als ein Antriebsstrom ist, der es dem Antriebsmotor (100) ermöglicht, unter der zweite-Welle-Antriebsform nach der zweite-Welle-Schaltbehandlung zu drehen.

5. Trommelwaschmaschine nach Anspruch 3 oder 4, weiter umfassend eine Kupplungsantriebseinrichtung (650), die dafür ausgelegt ist, es zu ermöglichen, den Kupplungskörper (610) zu bewegen, wobei die Kupplungsantriebseinrichtung (650) Folgendes umfasst:

einen Nocken (652), der in einen ersten Arbeitszustand, der es ermöglicht, den Kupplungskörper (610) in die erste Position zu bewegen, und in einen zweiten Arbeitszustand, der es ermöglicht, den Kupplungskörper (610) in die zweite Position zu bewegen, überführt werden kann; und einen Zustandserfassungsteil, der dafür ausgelegt ist, einen Arbeitszustand des Nockens (652) zu erfassen, wobei der Steuerteil (701) für die erste-Welle-Schaltbehandlung es der Kupplungsantriebseinrichtung (650) ermöglicht, gemäß einem Erfassungsergebnis des Zustandserfassungsteils zu arbeiten, damit der Nocken (652) in den ersten Arbeitszustand überführt werden kann; und der Steuerteil (701) für die zweite-Welle-Schaltbehandlung es der Kupplungsantriebseinrichtung (650) ermöglicht, gemäß einem Erfassungsergebnis des Zustandserfassungsteils zu arbeiten, damit der Nocken (652) in den zweiten Arbeitszustand überführt werden kann.

Revendications

1. Machine à laver de type tambour, pourvue :

d'un réservoir extérieur (20), configuré dans un boîtier (10) ;
d'un tambour (22), qui est configuré dans le réservoir extérieur (20) et capable de tourner en utilisant un arbre horizontal ou un arbre d'inclinaison s'inclinant par rapport à une direction horizontale en tant que centre ;
d'un corps rotatif (24), configuré au niveau d'une partie arrière du tambour (22) et pourvu, sur une surface du corps rotatif (24), d'une partie saillante en contact avec des lavages ;
d'une unité d'entraînement (30), configurée pour permettre au tambour (22) et au corps ro-

tatif (24) de tourner ; et
d'une partie de commande (701), configurée
pour commander le fonctionnement de l'unité
d'entraînement (30) ;

caractérisée en ce que

l'unité d'entraînement (30) comprend :

un moteur d'entraînement (100) ;
un arbre de rotation (200), configuré pour
transmettre la rotation du moteur d'entraî-
nement (100) au corps rotatif (24) ;
un arbre de tambour (300), configuré pour
transmettre la rotation du moteur d'entraî-
nement (100) au tambour (22) ; et
une partie de mécanisme d'embrayage
(600), configurée pour commuter une forme
d'entraînement de l'unité d'entraînement
(30) entre une forme d'entraînement du pre-
mier arbre et une forme d'entraînement du
deuxième arbre, la forme d'entraînement du
premier arbre étant une forme qui permet à
l'arbre de rotation (200) et à l'arbre de tam-
bour (300) de tourner intégralement à une
même vitesse de rotation, et la forme d'en-
traînement du deuxième arbre étant une
forme qui permet à l'arbre de rotation (200)
et à l'arbre de tambour (300) de tourner res-
pectivement à différentes vitesses de rota-
tion, dans laquelle la partie de mécanisme
d'embrayage (600) comprend : un corps
d'embrayage (610) muni d'une partie de bri-
de d'engagement (613), dans laquelle

en déplaçant le corps d'embrayage (610) dans
une première position de manière à engager la
première partie de bride d'engagement (613) à
la première position avec un évidement engagé
(114) qui tourne avec la rotation du moteur d'en-
traînement (100), la forme d'entraînement est
commutée à la forme d'entraînement du premier
arbre ;

la partie de commande (701) exécute un traite-
ment de commutation du premier arbre pour ef-
fectuer la commutation de la forme d'entraîne-
ment du deuxième arbre à la forme d'entraîne-
ment du premier arbre, le traitement de commu-
tation du premier arbre étant un traitement qui
permet à la partie de mécanisme d'embrayage
(600) de fonctionner pour déplacer le corps
d'embrayage (610) dans la première position et
puis permet au moteur d'entraînement (100) de
tourner pour engager la partie de bride d'enga-
gement (613) dans une condition non engagée
et l'évidement engagé (114) ;

une pluralité de premières parties concaves-
convexes (613a) sont arrangées au niveau
d'une partie extérieure circonférentielle et de
toute la circonférence de la partie de bride d'en-

gagement (613), et une pluralité de deuxièmes
parties concaves-convexes (114a) sont arran-
gées au niveau d'une partie extérieure circon-
férentielle et de toute la circonférence de l'évi-
dement engagé (114) ; la partie de bride d'en-
gagement (613) est dans la même forme que
celle de l'évidement engagé (114) ; les premiè-
res parties concaves-convexes (613a) et les
deuxièmes parties concaves-convexes (114a)
sont en prise les unes avec les autres lorsque
la partie de bride d'engagement (613) est insé-
rée dans l'évidement engagé (114).

2. Machine à laver de type tambour selon la revendi-
cation 1, dans laquelle pour le traitement de com-
mutation du premier arbre, la partie de commande
(701) permet au moteur d'entraînement (100) de
tourner avec un courant d'entraînement inférieur à
un courant d'entraînement permettant au moteur
d'entraînement (100) de tourner sous la forme d'en-
traînement du premier arbre après le traitement de
commutation du premier arbre.

3. Machine à laver de type tambour selon la revendi-
cation 1 ou 2, dans laquelle l'unité d'entraînement
(30) comprend en outre un mécanisme d'engrenage
planétaire (400), le mécanisme d'engrenage plané-
taire (400) étant pourvu : d'un engrenage solaire
(410) qui tourne en même temps que la rotation du
moteur (100) ; d'un engrenage interne annulaire
(420) qui entoure l'engrenage solaire (410) ; d'une
pluralité d'engrenages planétaires (430) qui sont dis-
posés entre l'engrenage solaire (410) et l'engrenage
interne (420) ; et un support d'engrenage planétaire
(440) qui maintient les engrenages planétaires (430)
d'une manière à rotation libre, l'un parmi le support
d'engrenage planétaire (440) et l'engrenage interne
(420) étant fixé sur l'arbre de tambour (300) ;
le corps d'embrayage (610) est pourvu d'une cré-
maillère annulaire (611) et est connecté à l'autre du
support d'engrenage planétaire (440) et de l'engre-
nage interne (420) dans un état de rotation limitante
par rapport à l'autre du support d'engrenage plané-
taire (440) et de l'engrenage interne (420) vers une
direction circonférentielle et permettant un mouve-
ment le long d'une direction axiale de l'arbre de tam-
bour (300) ;

en déplaçant le corps d'embrayage (610) à une
deuxième position de façon à engager la crémaillère
annulaire (611) à la deuxième position avec une
deuxième partie engagée (514) qui ne tourne pas
avec la rotation du moteur d'entraînement (100) et
devient un état de non-rotation pour l'autre du sup-
port d'engrenage planétaire (440) et de l'engrenage
interne (420), la forme d'entraînement étant commu-
tée vers la forme d'entraînement du deuxième
arbre ; même si la partie de mécanisme d'embraya-
ge (600) fonctionne pour permettre au corps d'em-

brayage (610) de se déplacer vers la deuxième position, la crémaillère annulaire (611) n'est pas engagée avec la deuxième partie engagée (514), et à ce moment, l'autre du support d'engrenage planétaire (440) et de l'engrenage interne (420) tourne en même temps que la rotation du moteur d'entraînement (100), si bien que le corps d'embrayage (610) tourne ; et

la partie de commande (701) exécute un traitement de commutation du deuxième arbre pour effectuer la commutation de la forme d'entraînement du deuxième arbre à la forme d'entraînement du premier arbre, le traitement de commutation du deuxième arbre étant un traitement qui permet à la partie de mécanisme d'embrayage (600) de fonctionner pour déplacer le corps d'embrayage (610) dans la deuxième position et permet ensuite au moteur d'entraînement (100) de tourner pour engager la crémaillère annulaire non engagée (611) avec la deuxième partie engagée (514).

4. Machine à laver de type tambour selon la revendication 3, dans lequel pour le traitement de commutation du deuxième arbre, la partie de commande (701) permet au moteur d'entraînement (100) de tourner avec un courant d'entraînement inférieur à un courant d'entraînement permettant au moteur d'entraînement (100) de tourner sous la forme d'entraînement du deuxième arbre après le traitement de commutation du deuxième arbre.
5. Machine à laver de type tambour selon la revendication 3 ou 4, comprenant en outre un dispositif d'entraînement d'embrayage (650) configuré pour permettre au corps d'embrayage (610) de se déplacer, dans laquelle le dispositif d'entraînement d'embrayage (650) comprend :

une came (652), pouvant être transférée dans un premier état de travail permettant au corps d'embrayage (610) pour se déplacer à la première position et un deuxième état de travail permettant au corps d'embrayage (610) de se déplacer à la deuxième position ; et

une partie de détection d'état, configurée pour détecter un état de fonctionnement de la came (652), où

pour le traitement de commutation du premier arbre, la partie de commande (701) permet au dispositif d'entraînement d'embrayage (650) de fonctionner selon un résultat de détection de la partie de détection d'état afin de permettre à la came (652) d'être transférée dans le premier état de travail ; et

pour le traitement de commutation du deuxième arbre, la partie de commande (701) permet au dispositif d'entraînement d'embrayage (650) de fonctionner selon un résultat de détection de la

partie de détection d'état afin de de permettre à la came (652) d'être transférée dans le deuxième état de travail.

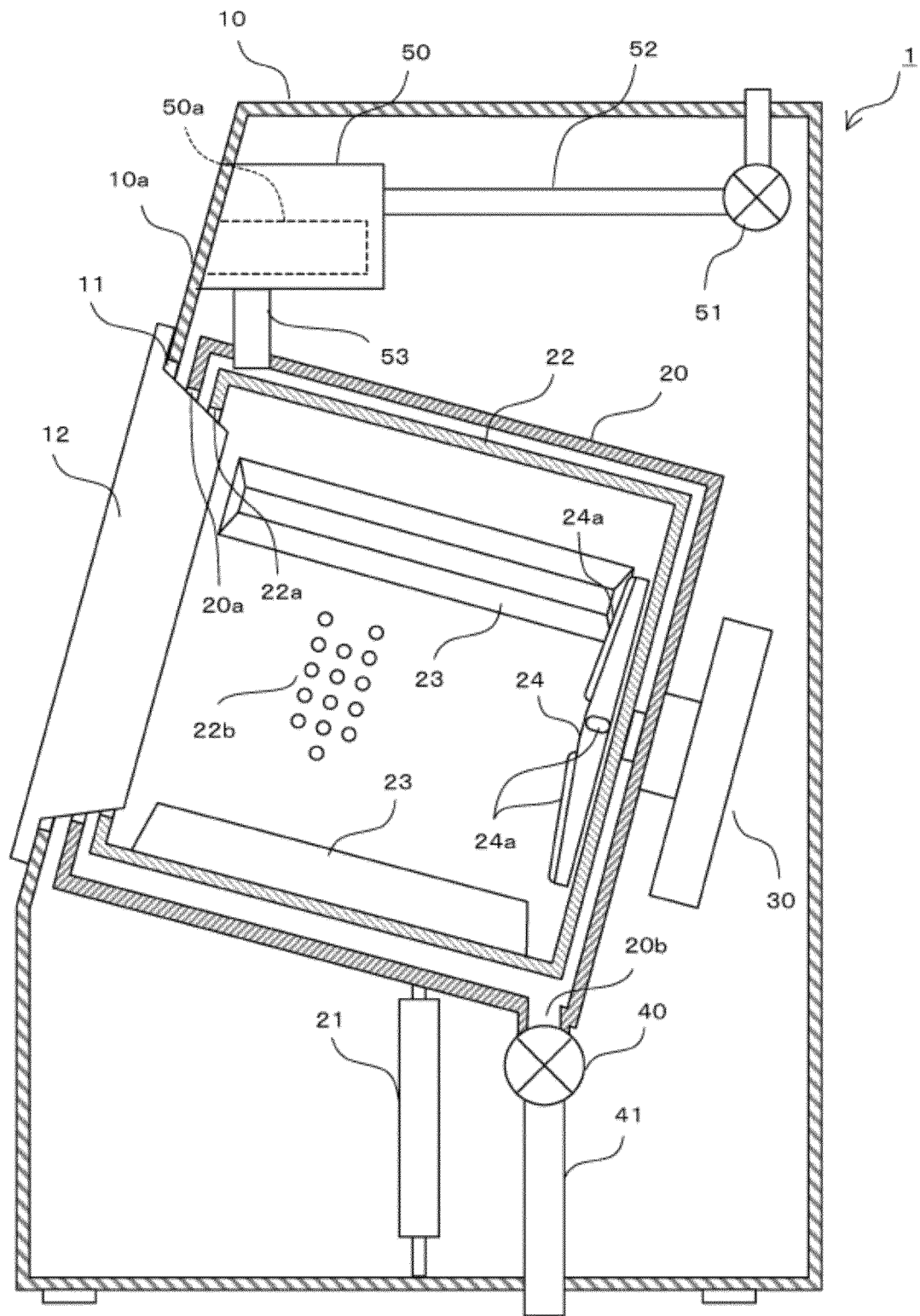


FIG.1

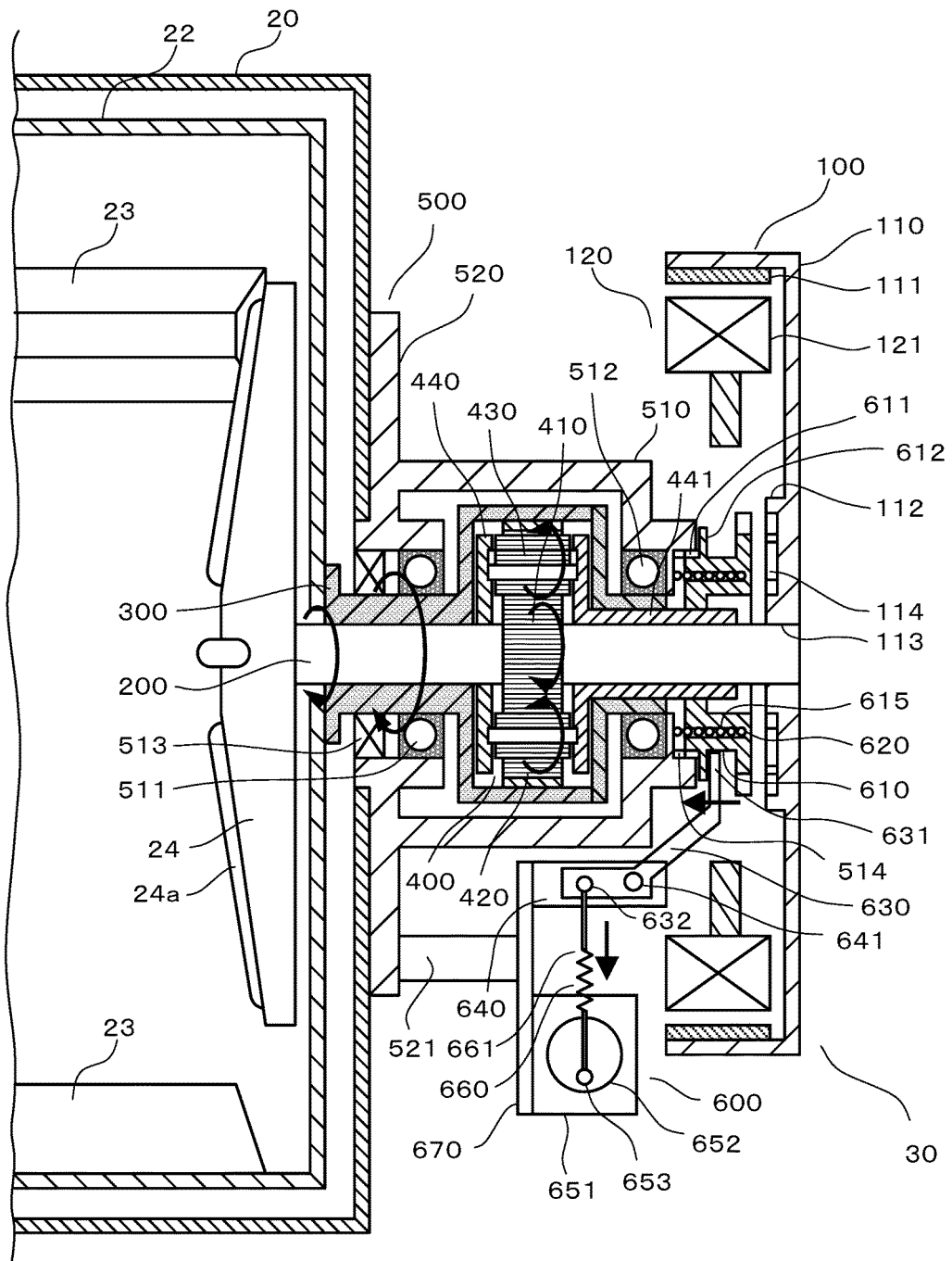


FIG. 2

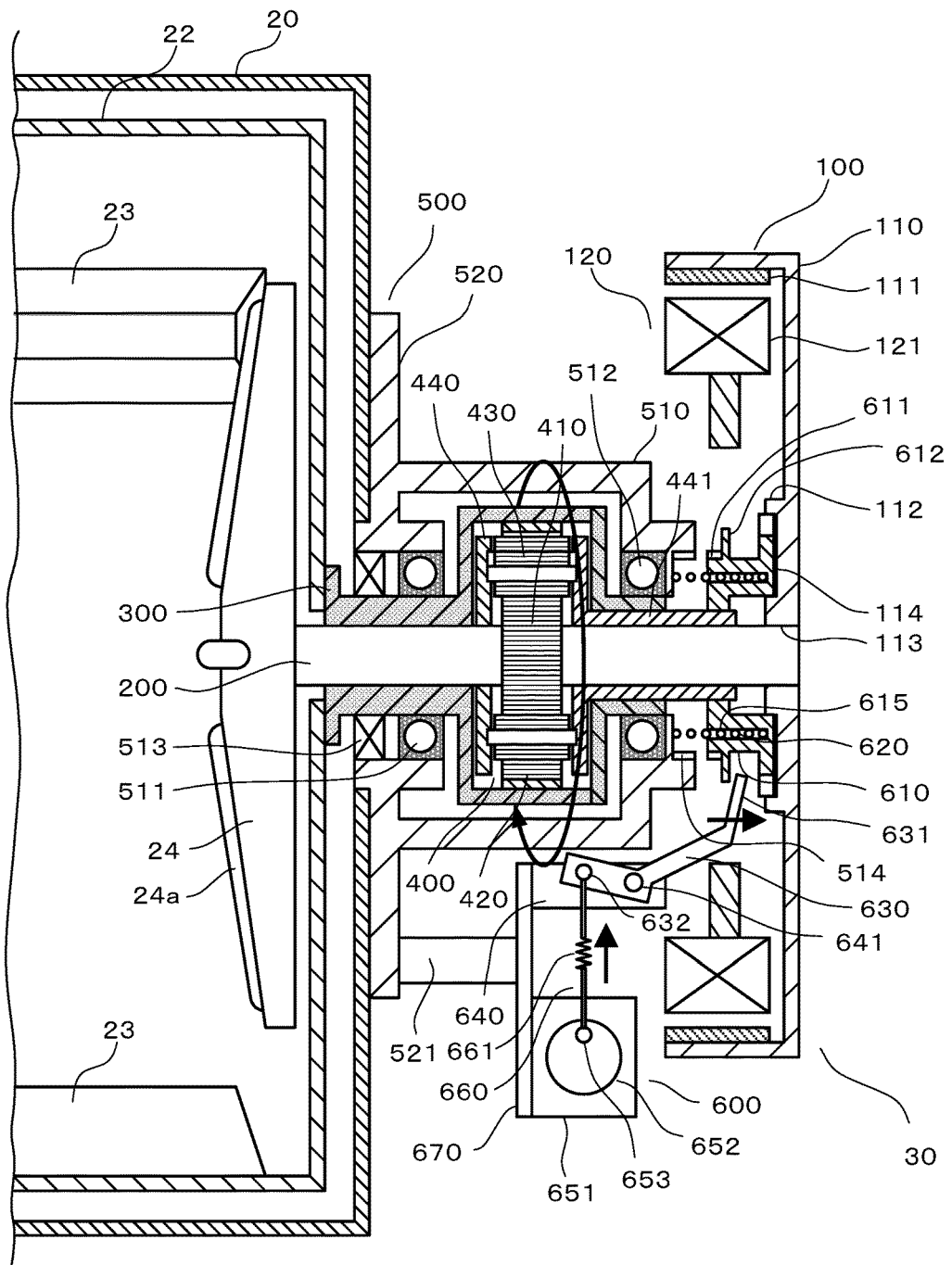


FIG.3

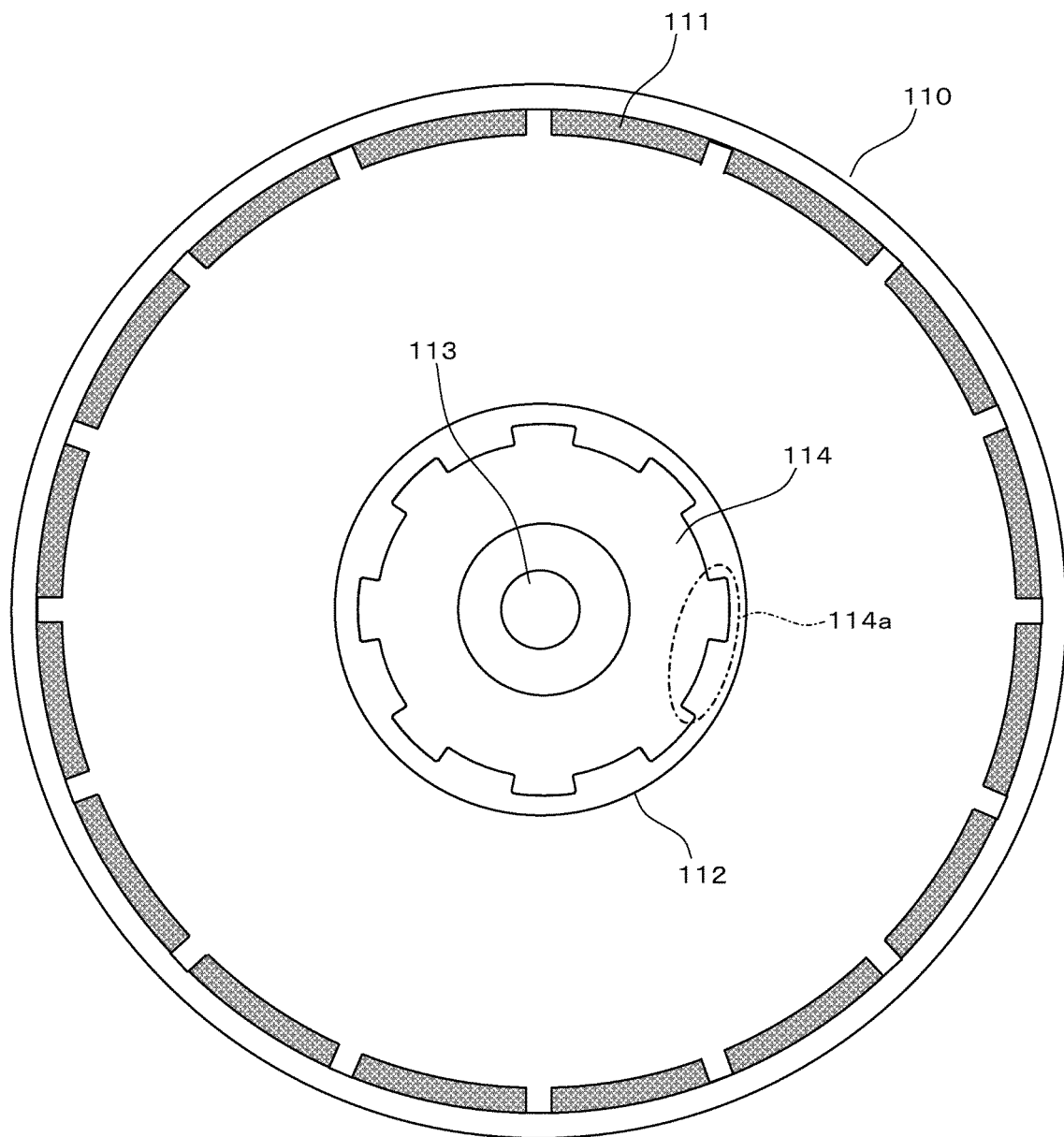


FIG.4

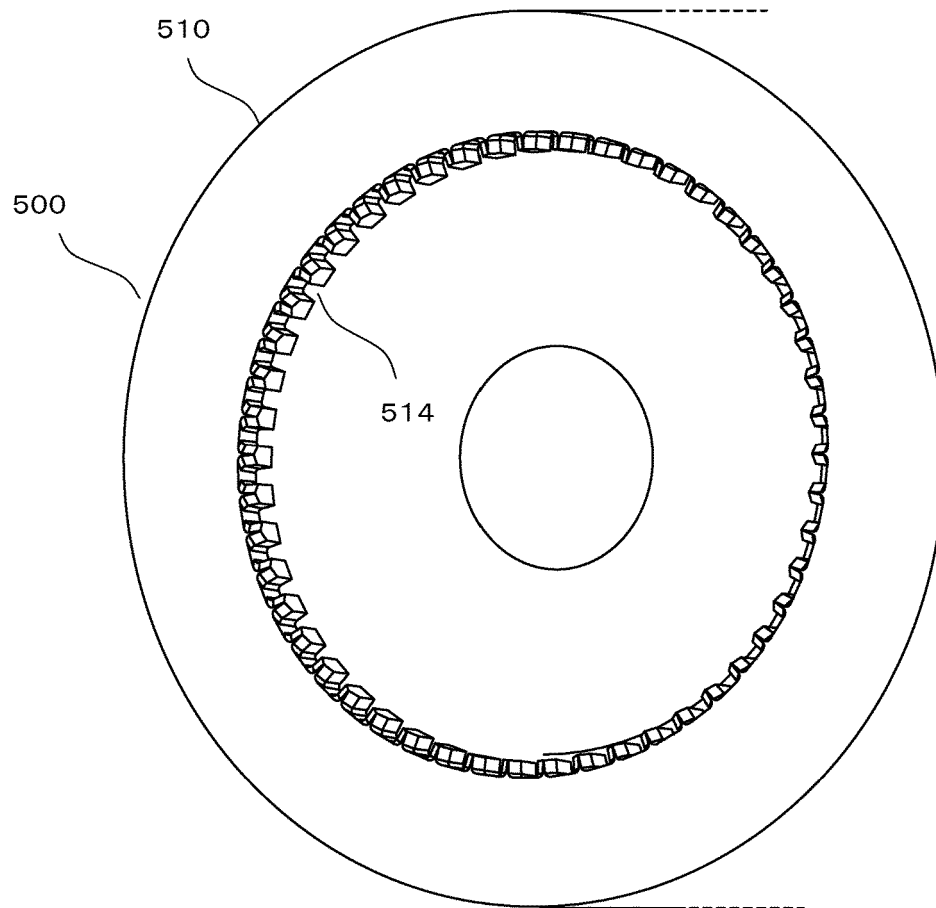


FIG.5

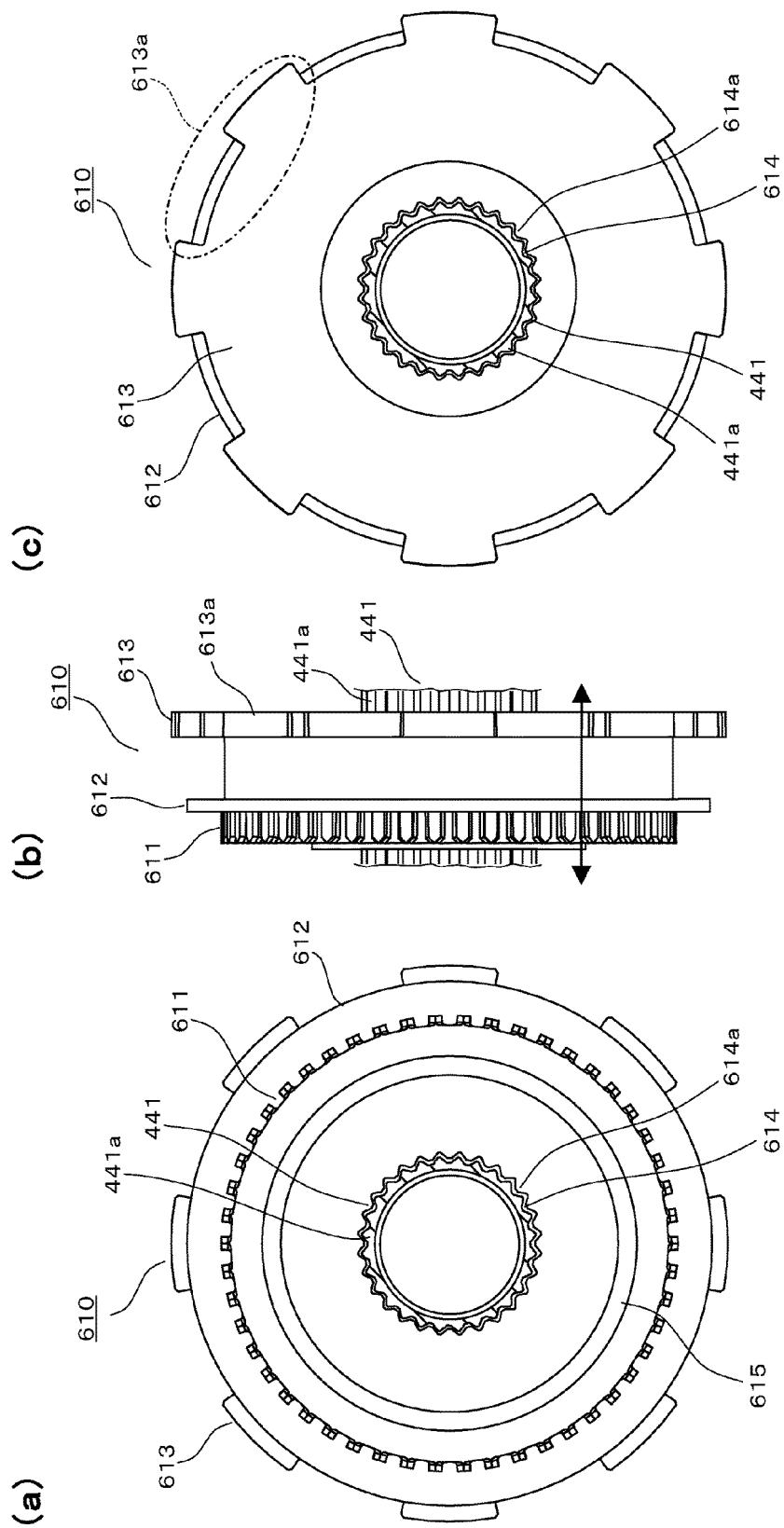


FIG.6

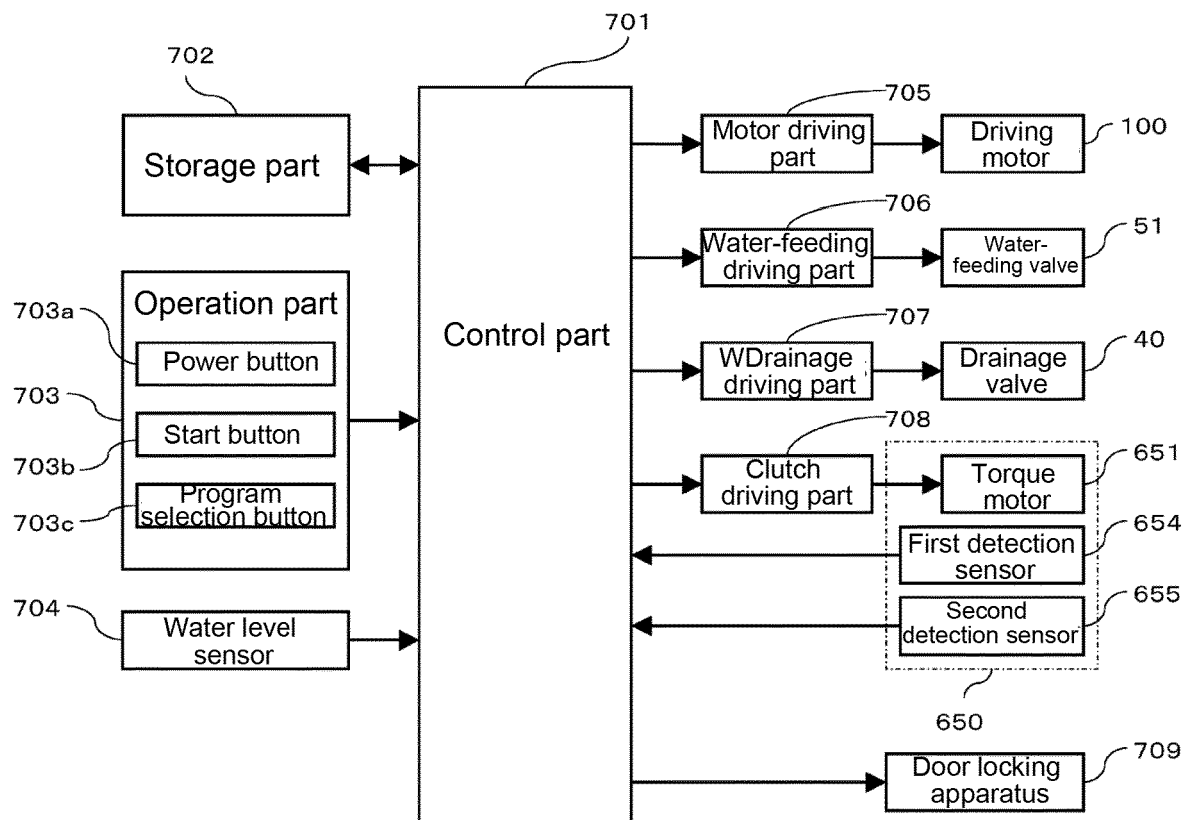


FIG.7

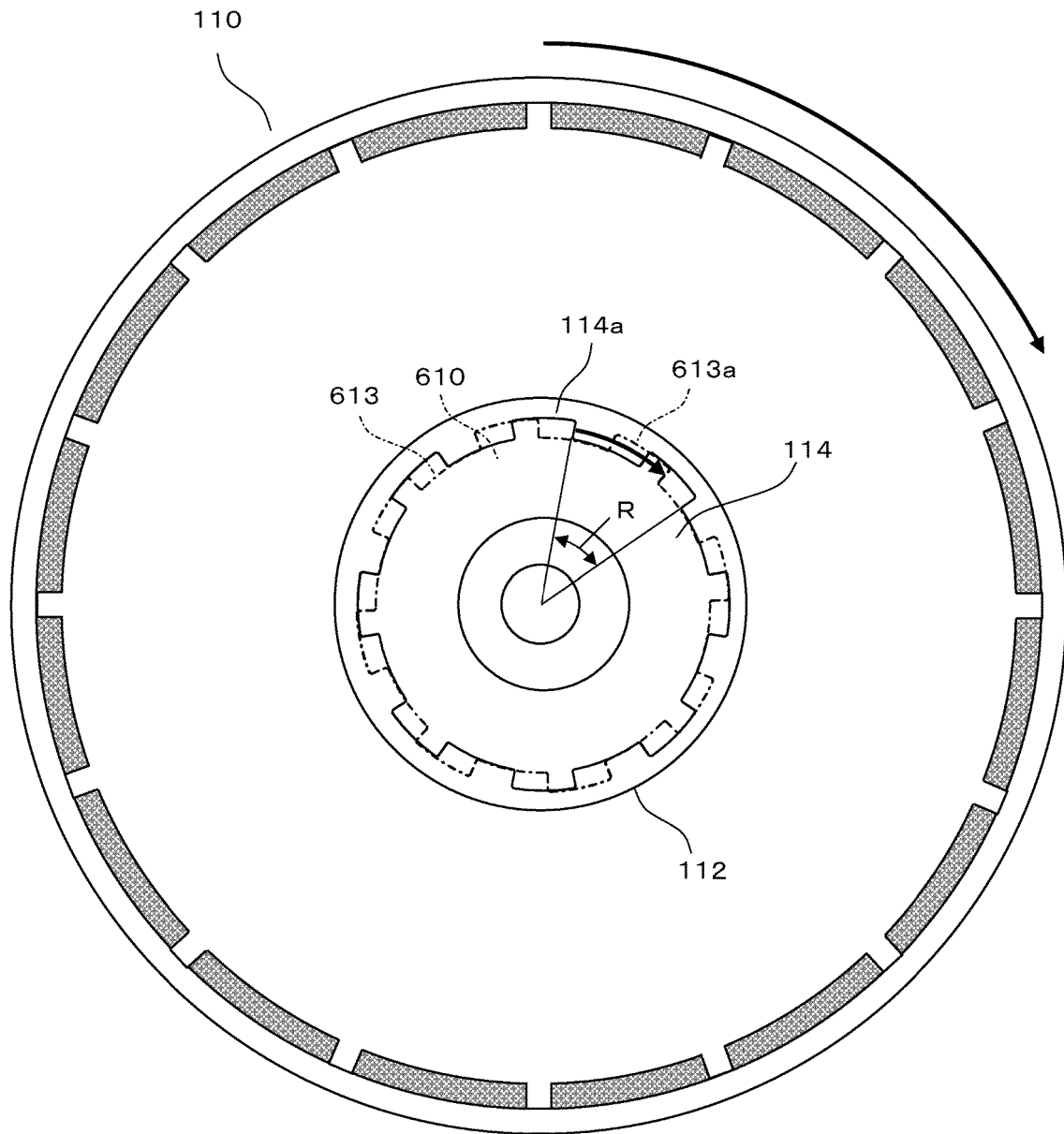
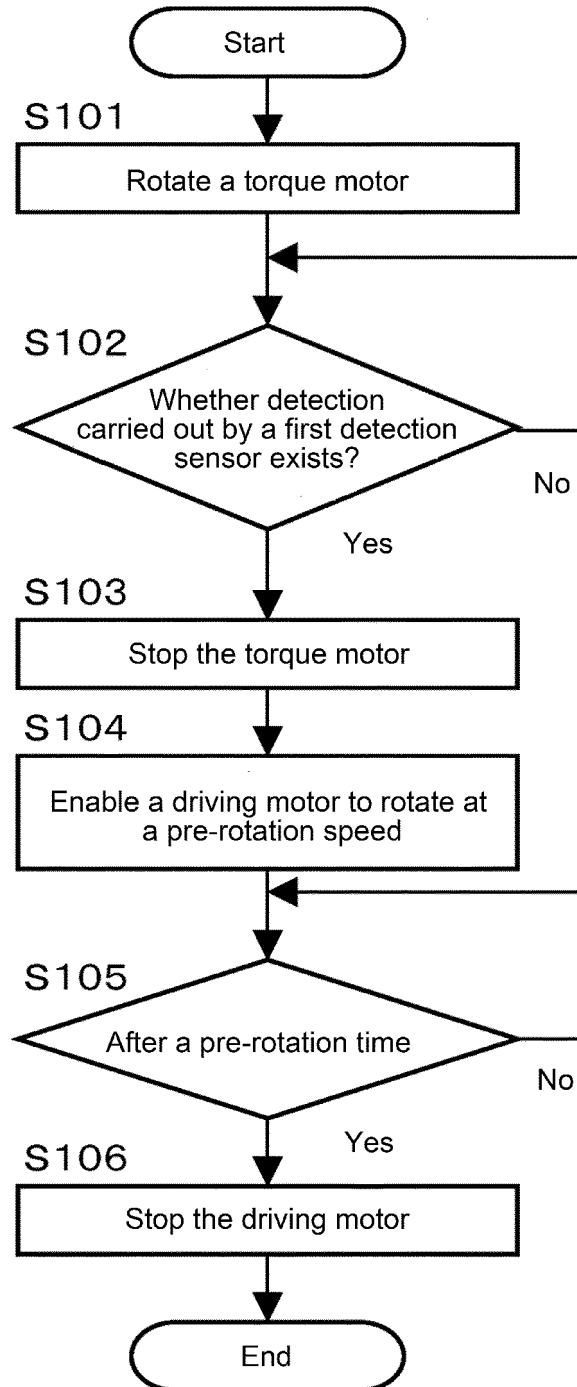
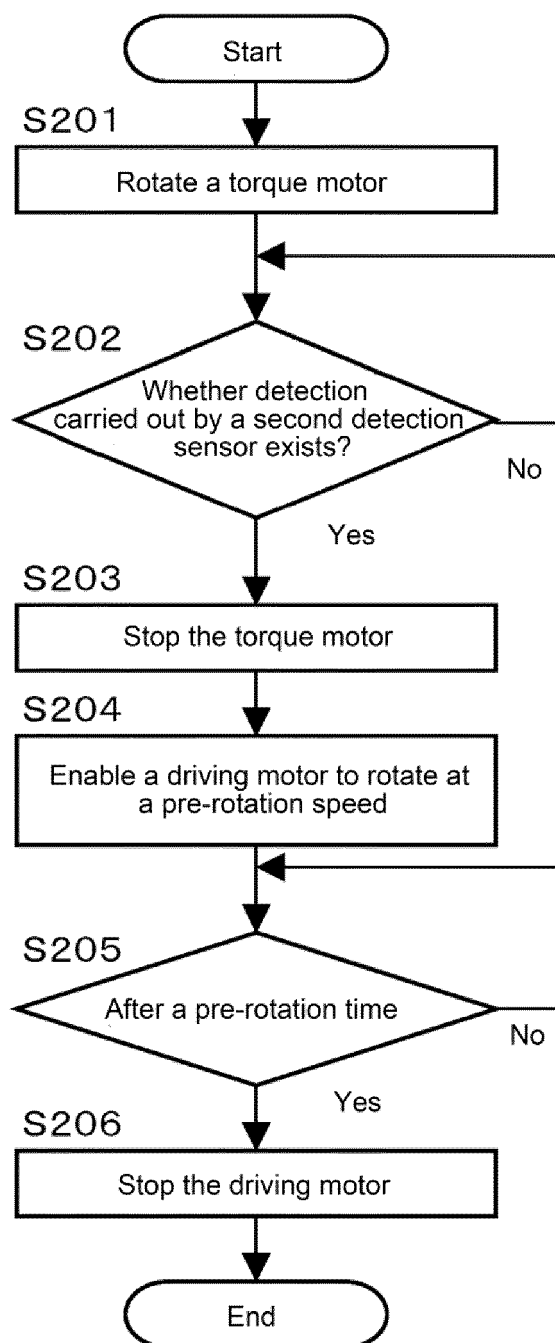


FIG.8

First-shaft switching treatment**FIG.9**

Second-shaft switching treatment**FIG.10**

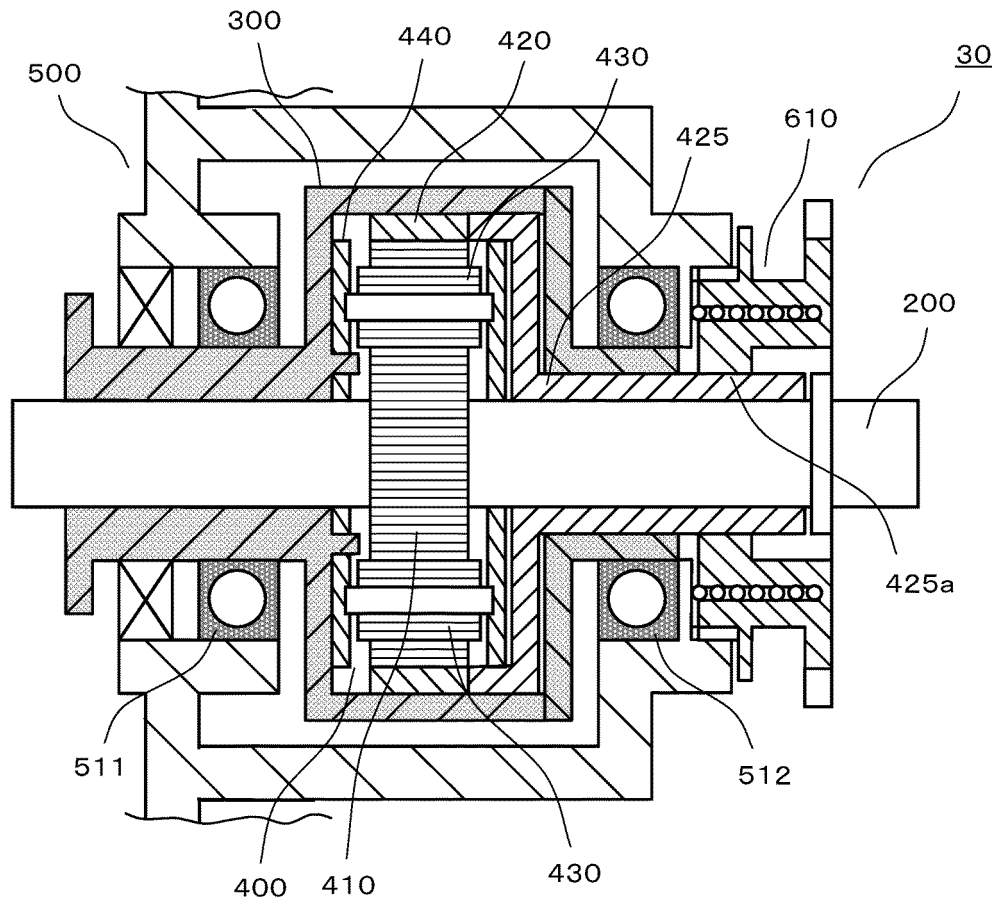


FIG.11

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2013240577 A [0005]
- KR 20040036183 A [0005]
- CN 1888193 A [0005]