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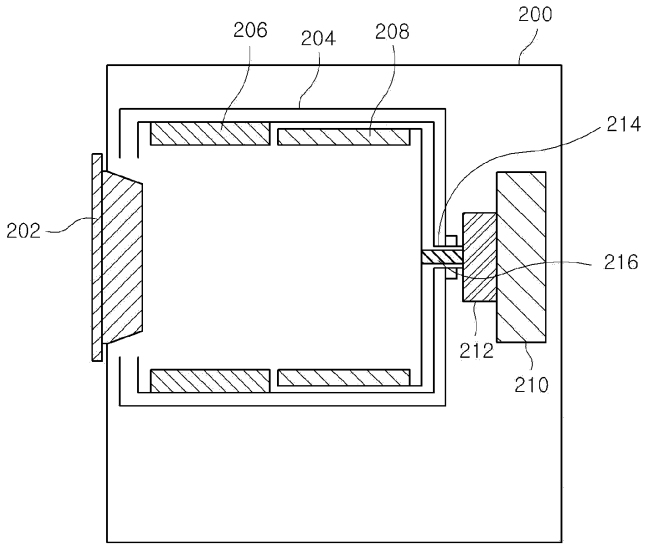
(54) DRUM WASHING MACHINE AND WASHING METHOD THEREOF

(57) A washing machine includes an outer tank (204) installed inside a main body (200); a first inner tank (206) located inside the outer tank; a second inner tank (208) located inside the outer tank; a first shaft (214) connected to the first inner tank; a second shaft (216) connected to the second inner tank; a motor (210) configured to supply rotational force, connected to the first and second shafts; and a clutch configured to supply the rotational force from the motor to the first and second shafts independently, the clutch (212) connected between the first shaft, the second shaft, and the motor.

FIG. 2



EP 2 966 209 A1

Description

Cross-Reference to Related Application

[0001] This application is based on and claims priority to Korean Patent Application No. 2014-0086171, filed on July 9, 2014, the disclosure of which is incorporated herein in its entirety by reference.

Field

[0002] Embodiments according to the present disclosure relate to washing machines, and more particularly, to drum washing machines and methods of washing laundry using such machines. In an embodiment, a washing machine includes a type of dual drum that includes an internal drum, which makes it possible to realize a greater variety of washing patterns or programs by using a clutch to independently control the direction of each drum's rotation and the rotational speed of each of the drums, and which improves cleaning by generating a frictional force between laundry items using the motive power produced by the drums.

Background

[0003] In general, a washing machine is an item of equipment that cleans laundry such as clothes by rotating water and detergent in a tub. Washing machines can be categorized as either vertical washing machines or drum washing machines based on the orientation of the tub in which the laundry is placed. A drum washing machine has a drum whose axis of rotation is horizontal. Laundry is placed inside the drum, is moved vertically (up and down) by the rotation of the drum, and is cleaned while moving.

[0004] As noted, in general, the drum of a drum washing machine has a horizontal axis of rotation; however, it is possible for the drum to rotate at some different angle. A drum washing machine with a horizontal or nearly horizontal axis of rotation makes laundry rotate inside the drum in the circumferential direction.

[0005] Accordingly, the laundry moves inside the drum due to centrifugal force caused by the drum's rotation and due to friction between the items of laundry and between the laundry and the inside wall of the drum. Depending on the rotational speed of the drum, the laundry moves circularly along the inside wall of the drum or it falls from the upper part of the drum to the lower part of the drum due to gravity.

[0006] The movement of the laundry inside the drum has a significant impact on washing effectiveness. That is, the movement of the laundry cleans the laundry evenly by changing the amount of contact between the laundry and the drum wall. Also, increasing the centrifugal and/or frictional forces applied to the laundry improves washing effectiveness.

[0007] FIG. 1 is a cross sectional view of a conventional drum washing machine.

[0008] Referring to FIG. 1, the drum washing machine includes a cabinet 100 which has an opening at the front side, a tub 102 which is installed inside the cabinet to contain washing water, and a rotatable drum 104 which is installed inside the tub 102 to contain the laundry and detergent.

[0009] The drum 104 has a front opening as in the cabinet 100 and the tub 102, and a motor fixed to the back of the tub is installed outside the drum and causes the drum to rotate around a horizontal axis. Accordingly, when the motor operates, the drum 104 produces a washing action by rotating around the horizontal axis.

[0010] Further, many lifters 106 protruding toward the center of the drum are installed on the inside wall of the drum 104 and help improve washing effectiveness by lifting the laundry while the drum 104 rotates to increase movement of the laundry.

[0011] However, conventional drum washing machines are equipped with a single drum and the laundry moves only along the inside wall of the drum in the circumferential direction. Therefore, conventional drum washing machines cannot induce more complex movement of the laundry such as movement in the axial direction and/or rotational movement. Also, conventional washing machines with one drum cannot apply extra power to generate more complex movement of the laundry. Consequently, washing effectiveness is limited because of the limited movement of the laundry. This can be a problem because, as a result, washing time and electricity consumption increase to compensate for the limited washing effectiveness.

Summary

[0012] In view of the above, embodiments according to the present invention provide a drum washing machine that includes a type of dual drum that includes an internal (second) drum inside a first drum, which makes it possible to realize a greater variety of washing programs through independent control of each drum's direction of rotation and through control of each drum's speed of rotation using a clutch, and which improves washing effectiveness by generating a frictional force between items of laundry through relative motive power between the first drum and the second drum.

[0013] In an embodiment according to the invention, a washing machine includes: an outer tank installed inside a main body; a first inner tank located inside the outer tank; a second inner tank located inside the outer tank, and which can operate independently from the first inner tank; a first shaft connected to the first inner tank; a second shaft connected to the second inner tank; a motor configured to supply rotational force, connected to the first and second shafts; and a clutch configured to supply the rotational force from the motor to the first and second shafts independently, the clutch connected between the first shaft, the second shaft, and the motor.

[0014] Further, the clutch can control rotation speed and rotation direction of the first and second shafts independently through the independent supply of the rotational force.

[0015] Further, in an embodiment, the second inner tank is inside the first inner tank.

[0016] Further, in an embodiment, the depth of the second inner tank may be less than or equal to the depth of the first inner tank.

[0017] Further, in an embodiment, a lifter of the first inner tank and a lifter of the second inner tank may be located the same distance from the axes of rotation of the first inner tank and the second inner tank.

[0018] In another embodiment according to the present invention, a washing control method in a washing machine with a first inner tank and a second inner tank inside an outer tank includes: generating, with a motor, a rotational force required for the rotation of the first and second inner tanks; supplying the rotational force independently to a first shaft connected with the first inner tank and to a second shaft connected with the second inner tank through a clutch connected to the motor; and controlling the first and second inner tanks independently according to a pattern or program selected from a number of predetermined patterns or programs through independent supply of the rotational force.

[0019] Further, the predetermined patterns may include: a first pattern where the first inner tank is stationary and the second inner tank rotates in the normal (forward) or reverse direction, a second pattern where both the first and second inner tanks rotate in the normal (forward) direction, a third pattern where the first inner tank rotates in the reverse direction and the second inner tank rotates in the normal (forward) direction, a fourth pattern where the second inner tank stops and the first inner tank rotates in the normal (forward) or reverse direction, a fifth pattern where both the first and second inner tanks rotate in the reverse direction, and a sixth pattern where the first inner tank rotates in the normal (forward) direction, and the second inner tank rotates in the reverse direction.

[0020] In another embodiment according to the present invention, a washing control method includes selecting a pattern or program from a number of washing patterns or programs in a washing machine that includes a first inner tank and a second inner tank, where the patterns/programs may include: a first pattern where the first inner tank is stationary, and the second inner tank rotates in the normal (forward) or reverse direction, a second pattern where both the first and second inner tanks rotate in the normal (forward) direction, a third pattern where the first inner tank rotates in the reverse direction and the second inner tank rotates in the normal (forward) direction, a fourth pattern where the second inner tank is stationary and the first inner tank rotates in the normal (forward) or reverse direction, a fifth pattern where both the first and second inner tanks rotate in the reverse direction, and a sixth pattern where the first inner tank rotates in the normal (forward)direction, and the second inner tank rotates in the reverse direction.

[0021] In embodiments according to the present invention, washing effectiveness is improved using a dual drum structure including an internal drum, thereby realizing a greater variety of washing programs through individual control of the direction of rotation of each drum and through individual control of the rotation speed of the drums, using a clutch. Also, washing effectiveness is further improved by generating a frictional force between items of laundry through the relative motive power between the first drum and the second drum.

Brief Description of the Drawings

[0022]

FIG. 1 is a cross-sectional view of a conventional drum washing machine.

FIG. 2 is a diagram of an example of a dual drum washing machine in embodiments according to the present disclosure.

FIGs. 3A, 3B, and 3C are diagrams illustrating how rotation is controlled in a dual drum washing machine in embodiments according to the present disclosure.

FIG. 4 is a flowchart of an example of a washing control method in an embodiment according to the present disclosure.

Detailed Description

[0023] Hereinafter, embodiments according to the present invention will be described in detail with reference to the accompanying drawings.

[0024] In the following description, well-known functions or components will not be described in detail to avoid unnecessarily obscuring aspects of the present invention.

[0025] FIG. 2 illustrates an example of a structure of a washing machine equipped with a dual drum in embodiments according to the present disclosure.

[0026] Hereinafter, each component in a washing machine of the present disclosure is described in more detail with reference to FIG. 2.

[0027] The washing machine is equipped with a cabinet 200 corresponding to a main body, which is the exterior of the machine. At the front side of the cabinet 200, an opening 202 is built to allow laundry (e.g., clothes) to be placed into the cabinet 200.

[0028] The opening 202 may be opened and closed by a door, which is attached to the cabinet 200. On the top part of the cabinet 200, there is a control panel (not shown) which has different buttons to control operation of the washing machine. The control panel may have a detergent supply device (not shown) where detergent may be stored.

[0029] Also, a round-shaped outer tank which holds water (e.g., during washing) is built inside the cabinet 200, e.g., a round-shaped tub 204 and a rotatable first

inner tank 206, e.g., a rotatable first drum, and a rotatable second inner tank 208, e.g., a rotatable second drum where the laundry is placed, is installed inside the tub 204.

[0030] The second drum 208 is an internal drum installed in addition to the first drum 206 in embodiments according to the present disclosure, and it may be located inside the first drum 206 as shown in FIG. 2. In terms of rotation control (control of speed and direction), it can be controlled independently from the first drum 206.

[0031] Also, the depth of the second drum 208 may be less than or equal to the depth of the first drum 206, and lifters (not shown) may be located in the first drum 206 and in the second drum 208. In an embodiment, the lifters in the first drum 206 and the lifters in the second drum 208 are located the same distance from the axes of rotation of the two drums.

[0032] A drive motor 210 is installed at the back side of the tub 204 to drive the first drum 206 and the second drum 208.

[0033] The first drum 206 is a rotatable round-shaped component inside of the tub 204, and the second drum 208 is a rotatable round-shaped component inside of the first drum 206. The second drum 208 is installed to allow rotation relative to the first drum 206. In other words, in embodiments according to the present disclosure, the first drum 206 and the second drum 208 have a structure that allows them to operate independently from each other; therefore, it is possible for them to rotate at different speeds and/or in different directions relative to one another.

[0034] The drive motor 210 is, in general, a device that generates power to drive the first drum 206 and the second drum 208, and is installed at the back side of the tub 204.

[0035] A clutch 212 is connected between a first shaft 214 and a second shaft 216. The first shaft 214 is connected to the drive motor 210 and to the first drum 206, and the second shaft 216 is connected to the second drum 208. The clutch 212 separately provides the rotational force supplied from the drive motor 210 to the first shaft 214 and to the second shaft 216.

[0036] More specifically, the clutch 212 is located between the drive motor 210 and the first drum 206 and the second drum 208, and is individually connected to the first shaft 214, thereby controlling the rotation of the first drum 206, and to the second shaft 216, thereby controlling the rotation of the second drum 208. Therefore, the clutch 212 can provide independent control of the first drum 206 and of the second drum 208 by delivering a rotational force generated by the drive motor 210 to the first shaft 214 and/or to the second shaft 216.

[0037] For example, the clutch 212 can respond to a rotation control input from the control panel and selectively deliver the rotational force from the drive motor 210 to either or both of the first shaft 214 and the second shaft 216. That is, the rotational force from the drive motor can be delivered to either the first shaft 214 or the second shaft 216, or it can be delivered to both shafts at the same time. Also, the clutch 212 can independently control the direction of rotation of each shaft. That is, one shaft can rotate in one direction while the other shaft rotates in the other direction, or both shafts can rotate in the same direction. Furthermore, one shaft can rotate while the other shaft remains stationary. As a result, the clutch 212 controls the rotational force and also the rotational direction of the first drum 206 and the second drum 208 according to the rotation control input.

[0038] FIGs. 3A to 3C illustrate individual rotation control in a dual drum washing machine in embodiments according to the present disclosure. Hereinafter, embodiments according to the present disclosure are explained in more detail with reference to FIG. 2 and FIGs. 3A to 3C.

[0039] First, as illustrated in FIG. 2, the structure of a dual drum washing machine in the present disclosure includes a second internal drum 208 in addition to the first drum 206. In such a dual drum structure, the clutch 212 is coupled to each drum to provide rotation control; therefore, the rotation speed and direction of the first drum 206 and the second drum 208 may be controlled independently of each other.

[0040] That is, with regard to controlling the rotation of the dual drum in the present disclosure, it may be controlled in different patterns: the first drum 206 is stopped and the second drum 208 rotates normally as shown in FIG. 3A; both the first drum 206 and the second drum 208 rotate normally as shown in FIG. 3B; and the first drum 206 rotates in reverse (opposite its normal direction of rotation) and the second drum 208 rotates normally as shown in FIG. 3C. A total of at least six different drum rotation patterns can be realized.

[0041] The six different rotation patterns will be explained in more detail. In a first pattern, the first drum is stopped and the second drum rotates either in the normal (forward) direction or in the reverse direction. In a second pattern, both the first and the second drums rotate in the normal (forward) direction.

[0042] In a third pattern, the first drum rotates in the reverse direction and the second drum rotates in the normal (forward) direction. In a fourth pattern, the second drum is stopped and the first drum rotates either in the normal (forward) direction or in the reverse direction.

[0043] In a fifth pattern, both the first and the second drums rotate in the reverse direction. In a sixth pattern, the first drum rotates in the normal (forward) direction and the second drum rotates in the reverse direction.

[0044] By using different rotation patterns such as those mentioned above, rotation control of the dual drum according to the present disclosure improves washing effectiveness since it makes a method of washing such as scrubbing possible, in addition to a method of washing that simply uses a difference in height as in a washing machine with only one drum.

[0045] That is, in a conventional single drum washing machine, only normal rotation or reverse rotation is possible, and a washing program is applied and the laundry

is washed only according to the drum's direction of rotation.

[0046] However, a dual drum washing machine in the present disclosure not only has normal and reverse rotations, but it can also realize a greater variety of washing programs through independent control of the direction of rotation in the first drum 206 and in the second drum 208 and through the difference in rotational speed between the drums. Also, washing is improved through friction between the laundry, which is generated by the relative motive power between the first drum 206 and the second drum 208.

[0047] FIG. 4 is a flowchart 400 of an example of a washing control method in an embodiment according to the present disclosure.

[0048] In block 402, a rotational force is generated with a motor.

[0049] In block 404, the rotational force is independently supplied to a first shaft connected with a first inner tank of the washing machine and to a second shaft connected with a second inner tank of the washing machine through a clutch connected to the motor.

[0050] In block 406, the first and second inner tanks are independently controlled according to a pattern selected from a number of predetermined patterns, through the independent supply of the rotational force. In an embodiment, the patterns include the six patterns described above.

[0051] According to the present disclosure, as mentioned already, washing effectiveness is improved using a dual drum structure with an internal drum and a clutch, providing a greater variety of washing programs through individual control of the direction of rotation of each drum and through individual control of the speed of rotation of the drums. Also, washing is improved by generating more frictional force between the items of laundry through the relative motive power between the first drum and the second drum.

[0052] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as may be suited to the particular use contemplated.

[0053] Embodiments according to the invention are thus described. While the present disclosure has been described in particular embodiments, it should be appreciated that the invention should not be construed as limited by such embodiments, but rather construed according to the below claims.

Claims

1. A washing machine, comprising:

   an outer tank installed inside a main body;
   a first inner tank located inside the outer tank;
   a second inner tank located inside the outer tank, and that can operate independently from the first inner tank;
   a first shaft connected to the first inner tank;
   a second shaft connected to the second inner tank;
   a motor configured to supply rotational force, connected to the first and second shafts; and
   a clutch configured to supply the rotational force from the motor to the first and second shafts independently, the clutch connected between the first shaft, the second shaft, and the motor.

2. The washing machine of claim 1, wherein the clutch controls a rotation speed and rotation direction of the first and second shafts independently through the independent supply of the rotational force.

3. The washing machine of claim 1, wherein the second inner tank is inside the first inner tank.

4. The washing machine of claim 3, wherein the depth of the second inner tank is less than or equal to the depth of the first inner tank.

5. The washing machine of claim 3, wherein the first inner tank includes a lifter and the second inner tank includes a lifter.

6. A washing control method in a washing machine comprising a first inner tank and a second inner tank inside an outer tank, the washing control method comprising:

   generating a rotational force with a motor;
   supplying the rotational force independently to a first shaft connected with the first inner tank and to a second shaft connected with the second inner tank through a clutch connected to the motor; and
   controlling the first and second inner tanks independently according to a pattern selected from a plurality of predetermined patterns through the independent supply of the rotational force.

7. The washing control method of claim 6, wherein the predetermined patterns comprise:

   a first pattern where the first inner tank is stationary and the second inner tank rotates,
   a second pattern where both the first and second

inner tanks rotate in the forward direction,
a third pattern where the first inner tank rotates in the reverse direction and the second inner tank rotates in the forward direction,
a fourth pattern where the second inner tank is stationary and the first inner tank rotates,
a fifth pattern where both the first and second inner tanks rotate in the reverse direction, and
a sixth pattern where the first inner tank rotates in the forward direction, and the second inner tank rotates in the reverse direction.

8. The washing control method of claim 6, wherein the second inner tank is inside the first inner tank.

9. A method for controlling washing according to patterns in a washing machine comprising a first inner tank and a second inner tank, the method comprising:

selecting a pattern from a plurality of washing patterns comprising:

a first pattern where the first inner tank is stationary, and the second inner tank rotates,
a second pattern where both the first and second inner tanks rotate in the forward direction,
a third pattern where the first inner tank rotates in the reverse direction and the second inner tank rotates in the forward direction,
a fourth pattern where the second inner tank is stationary and the first inner tank rotates,
a fifth pattern where both the first and second inner tanks rotate in the reverse direction, and
a sixth pattern where the first inner tank rotates in the forward direction, and the second inner tank rotates in the reverse direction.

FIG. 1

(PRIOR ART)

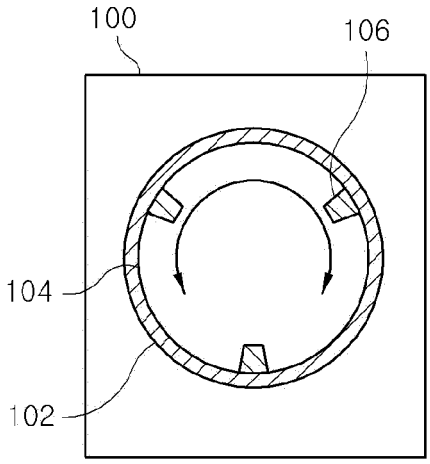


FIG.2

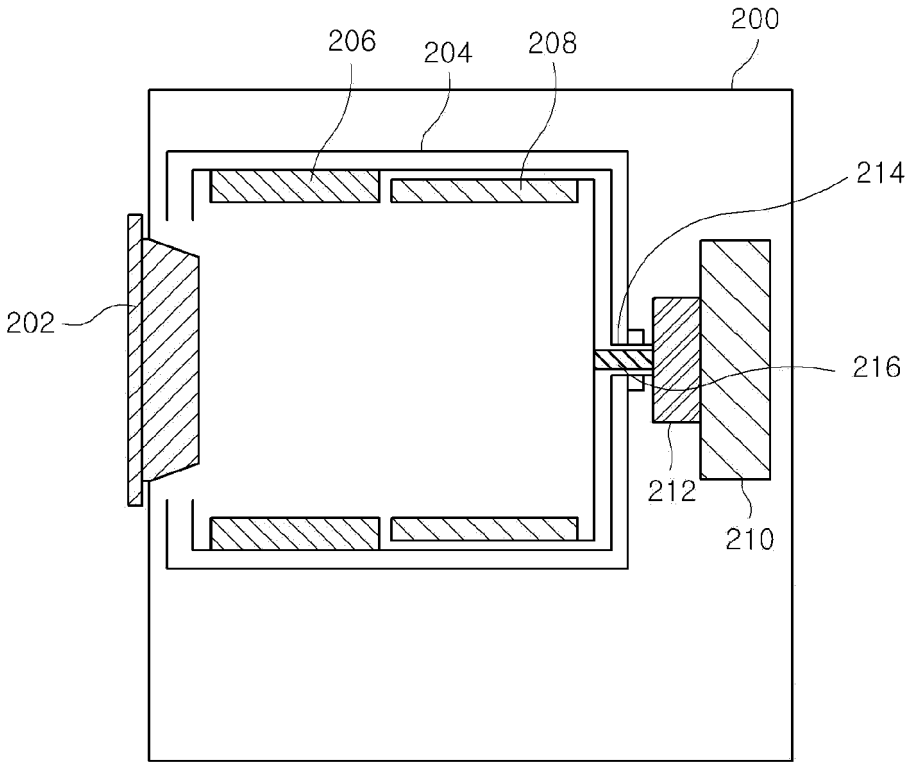


FIG.3A

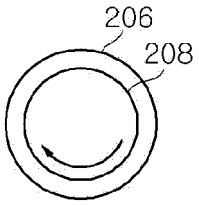


FIG.3B

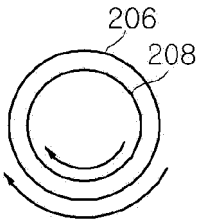


FIG.3C

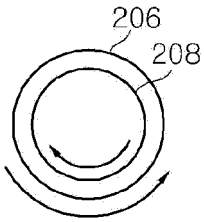
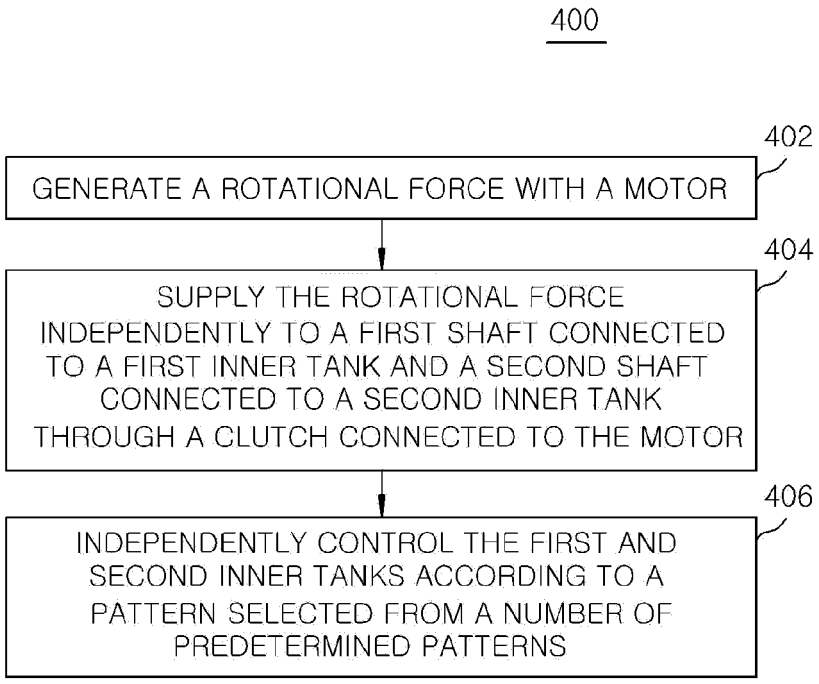


FIG. 4


400
402
GENERATE A ROTATIONAL FORCE WITH A MOTOR
404
SUPPLY THE ROTATIONAL FORCE INDEPENDENTLY TO A FIRST SHAFT CONNECTED TO A FIRST INNER TANK AND A SECOND SHAFT CONNECTED TO A SECOND INNER TANK THROUGH A CLUTCH CONNECTED TO THE MOTOR
406
INDEPENDENTLY CONTROL THE FIRST AND SECOND INNER TANKS ACCORDING TO A PATTERN SELECTED FROM A NUMBER OF PREDETERMINED PATTERNS

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EUROPEAN SEARCH REPORT

Application Number
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D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 August 2015	Stroppa, Giovanni

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