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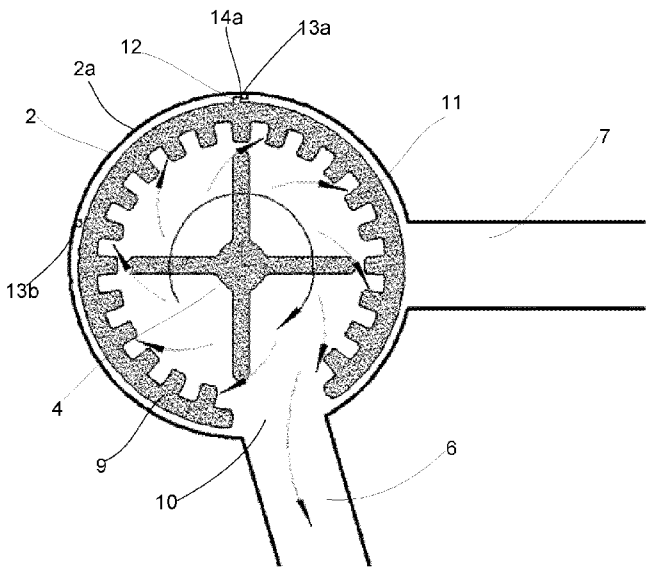

FIG. 4

(57) Abstract: The present invention discloses a pump (1) and a laundry care machine with the pump (1). The pump (1) includes a pump chamber (2), an impeller (4) disposed in the pump chamber (2) and driven by a motor (3), and a water inlet channel (5), a water circulation channel (6), and a water drainage channel (7) that are in fluid communication with the pump chamber (2). A valve (9) is disposed in the pump chamber (2). The valve (9) is provided with an opening (10).The valve (9) can move between a first position and a second position, where at the first position, the opening (10) is fitted into the water circulation channel6, so that the water circulation channel (6) is in fluid communication with the pump chamber (2) and the water inlet channel (5), and the water drainage channel (7) and the pump chamber (2) are separated by the valve (9);and at the second position, the opening (10) is fitted into the water drainage channel (7),so that the water drainage channel (7) is in fluid communication with the pump chamber (2) and the water inlet channel (5), and the water circulation channel (6) and the pump chamber (2) are separated by the valve (9). With the present invention, problems of space occupation and high costs of a circulation and drainage pump in the prior art are resolved. By using the pump (1) of the present invention, space as well as material costs is saved, and a manufacturing process is simplified.

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PUMP AND LAUNDRY CARE MACHINE WITH THE PUMP

The present invention relates to a pump and a laundry care machine with such pump, and in particular, to a washing machine.

Currently, a washing machine is generally provided with a pump used to drive the drainage of water from or circulation of water in the washing machine. One type of pump is the single drainage pump that only has a water drainage function. A water utilization rate of this type of pump is not high. Another type of pump is circulation and drainage pump, which is implemented by adding another motor to the drainage pump. However, this type of pump needs two motors that separately extend towards two sides of the pump, and therefore, the pump occupies space in a washing machine and the cost of the pump is relatively high.

Currently, effective solutions for problems of space occupation and high costs of a circulation and drainage pump in the prior art are not yet provided.

The present invention provides a pump and a laundry care machine with the pump, so as to at least resolve problems of space occupation and high costs of a circulation and drainage pump in the prior art.

To achieve the objective, according to a first aspect of the present invention, a pump is provided as follows.

The pump according to the invention includes a pump chamber, an impeller disposed in the pump chamber and driven by a motor, and a water inlet channel, a water circulation channel, and a water drainage channel that are in fluid communication with the pump chamber, wherein a valve is disposed in the pump chamber, the valve is provided with an opening, and the valve can move between a first position and a second position, where at the first position, the opening is fitted into the water circulation channel, so that the water circulation channel is in fluid communication with the pump chamber and the water inlet channel, and the water drainage channel and the pump chamber are separated by the

valve; and at the second position, the opening is fitted into the water drainage channel, so that the water drainage channel is in fluid communication with the pump chamber and the water inlet channel, and the water circulation channel and the pump chamber are separated by the valve.

With the foregoing structure, when a washing machine is operated, water enters the pump chamber from the water inlet channel. When the washing machine needs to perform an internal water circulation operation, the valve is at the first position, the opening is fitted into the water circulation channel, and water is discharged to the water circulation channel from the pump chamber. When the washing machine needs to perform a water drainage operation, the valve is at the second position, the opening is fitted into the water drainage channel, and water is discharged to the water drainage channel from the pump chamber. By means of different positions of the valve, the pump implements two functions including water circulation and water drainage.

Preferably, the valve has a circumference surrounding the impeller, and is rotatably installed in a manner of being coaxial with the impeller. The valve surrounds the impeller. A shaft penetrates through the valve and the impeller, and supports the valve. The valve rotates around the shaft to the first position or the second position in the foregoing solution.

Preferably, an inner side surface, facing the impeller, of the valve is provided with at least one protruded portion that can be pushed by water to drive the valve to rotate. By arranging several protruded portions on the inner side surface of the valve, when the impeller rotates to drive water to rotate, the water keeps lashing the protruded portions, and the protruded portions are subjected to power and therefore drive the valve to rotate to the first position or the second position.

Preferably, the impeller is driven by the motor, so as to switch between rotating along a first direction and rotating along a second direction. When the impeller rotates along the first direction, the valve rotates to the first position, and at this time, water is discharged to the water circulation channel from the pump chamber. When the impeller rotates along the second direction, the valve rotates to the second position, and water is discharged to the water drainage channel from the pump chamber.

Preferably, a limit apparatus for blocking the valve at the first position and the second position is disposed between the pump chamber and the valve. Only when the valve is at the first position and the second position, the opening is aligned with the water circulation channel 6 and the water drainage channel 7, and water circulation or water drainage can be implemented. Therefore, a limit apparatus is needed for blocking the valve at the first position and the second position.

Preferably, the limit apparatus includes a protrusion disposed on one of the pump chamber and the valve, and a blocking surface disposed on the other of the pump chamber and the valve. The limit apparatus may be arranged as a protrusion disposed on an inner wall of the pump chamber, and a blocking surface disposed on an outer wall of the valve. When the protrusion is in contact with the blocking surface, the valve is limited at this position, and this position may be the first position or the second position in the foregoing solution. At this time, a water circulation or water drainage operation may be implemented.

Preferably, the limit apparatus includes protrusions disposed on an inner wall of the pump chamber and an outer wall of the valve separately. When the protrusion on the inner wall of the pump chamber is in contact with the protrusion on the outer wall of the valve, the valve is limited at this position, and this position may be the first position or the second position in the foregoing solution. At this time, a water circulation or water drainage operation may be implemented.

Preferably, two protrusions are disposed on the inner wall of the pump chamber, where one protrusion is used to limit the valve at the first position, and the other protrusion is used to limit the valve at the second position.

Preferably, the limit apparatus includes a protrusion disposed on an inner wall of the pump chamber, and a groove matching with the protrusion that is disposed on an outer wall of the valve, where the groove extends along a circumference and has two blocking surfaces located at end portions. When the protrusion is in contact with a blocking surface, the valve is limited at this position, and this position may be the first position or the second

position in the foregoing solution. At this time, a water circulation or water drainage operation may be implemented. Another alternative solution that would be easily conceived of is arranging, on a pump chamber, a groove with a blocking surface, and arranging a protrusion on an outer wall of a valve, which also limits the position of the valve.

Preferably, the pump chamber has a cylindrical side wall and an end wall located at one end of the cylindrical side wall; the water drainage channel and the water circulation channel are connected to the cylindrical side wall; and the water inlet channel is connected to the end wall of the pump chamber. With this design, the space of the pump is more compact, and the efficiency of implementing a water circulation or water drainage operation is higher.

Preferably, the valve has a water inlet that is in communication with the water inlet channel, and the water inlet is used to introduce water into the valve.

Preferably, in the foregoing solution, the motor is a three-phase brushless direct current motor, and this motor is used as a drive source. With high efficiency, a controllable rotation speed, and a controllable rotation direction, one motor implements two functions including circulation and water drainage. When a washing machine needs to circulate water or drain water, the function may be implemented as long as the motor is controlled to perform forward rotation and reverse rotation, that is, clockwise rotation and counterclockwise rotation.

According to another aspect of the present invention, a laundry care machine is further provided, and the washing machine includes a machine body, a tub in the machine body, and the pump of the foregoing solution.

With the present invention, problems of space occupation and high costs of a circulation and drainage pump in the prior art are resolved. On one hand, by using one motor, functions of circulation and water drainage are implemented, so that energy is saved and water drainage is reduced. On the other hand, as compared with a traditional unidirectional circulation and drainage pump, one motor is saved, so that space as well as material costs is saved, and a manufacturing process is simplified.

The disclosure will become more fully understood from the detailed description given hereinbelow for illustration only, and thus not limitative of the disclosure.

The Figures of the accompanying drawing described hereinafter are intended to provide further understanding of the present invention, and constitute a part of the present application. Exemplary embodiments and descriptions of the present invention and included therein are intended to explain the present invention, but not intended to unduly limit the present invention. In the accompanying drawing:

FIG. 1 is a three-dimensional schematic diagram of a pump;
FIG. 2 is a schematic sectional diagram of the pump;
FIG. 3 is a schematic diagram of a valve of the pump;
FIG. 4 is an operation schematic diagram (1) of the valve of the pump in a pump chamber; and
FIG. 5 is an operation schematic diagram (2) of the valve of the pump in the pump chamber.

It should be noted that the embodiments and features of the embodiments in the present application may be combined in a case of not conflicting with each other.

FIG. 1 is a three-dimensional schematic diagram of a pump, FIG. 2 is a schematic sectional diagram of the pump, and FIG. 3 is a schematic diagram of a valve of the pump according to the present invention. As shown in FIG. 1, FIG. 2, and FIG. 3:

A pump 1 includes a pump chamber 2, an impeller 4 disposed in the pump chamber 2 and driven by a motor 3, and a water inlet channel 5, a water circulation channel 6, and a water drainage channel 7 that are in fluid communication with the pump chamber 2, where the motor is provided with a rotation shaft 8 for driving the impeller 4; fluid such as water enters the pump chamber 2 through the water inlet channel 5; and the water circulation channel 6 and the water drainage channel 7 are in communication with the pump chamber 2.

A valve 9 is disposed in the pump chamber 2; the valve 9 is provided with an opening 10; and the valve 9 can move between a first position and a second position.

FIG. 4 is an operation schematic diagram of the valve of the pump 1 in a pump chamber 2. As shown in FIG. 4, at the first position, the opening 10 is fitted into the water circulation channel 6, so that the water circulation channel 6 is in fluid communication with the pump chamber 2 and the water inlet channel 5, and the water drainage channel 7 and the pump chamber 2 are separated by the valve 9.

FIG. 5 is an operation schematic diagram of the valve of the pump 1 in the pump chamber 2. As shown in FIG. 5, at the second position, the opening 10 is fitted into the water drainage channel 7, so that the water drainage channel 7 is in fluid communication with the pump chamber 2 and the water inlet channel 5, and the water circulation channel 6 and the pump chamber 2 are separated by the valve 9.

With the foregoing structure, when a washing machine is operated, water enters the pump chamber 2 from the water inlet channel 5. When the washing machine needs to perform an internal water circulation operation, the valve 9 is at the first position, the opening 10 is fitted into the water circulation channel 6, and water is discharged to the water circulation channel 6 from the pump chamber 2. When the washing machine needs to perform a water drainage operation, the valve 9 is at the second position, the opening 10 is fitted into the water drainage channel 7, and water is discharged to the water drainage channel 7 from the pump chamber 2. By means of different positions of the valve, the pump 1 implements two functions including water circulation and water drainage.

Preferably, the valve 9 has a circumference surrounding the impeller 4, and is rotatably installed in a manner of being coaxial with the impeller 4. The valve 9 surrounds the impeller 4. A shaft 8 penetrates through the valve 9 and the impeller 4, and supports the valve 9. The valve 9 rotates around the shaft 8 to the first position or the second position in the foregoing solution.

Preferably, as shown in FIG. 3, an inner side surface 9a, facing the impeller, of the valve 9 is provided with at least one protruded portion 11 that can be pushed by water to drive the valve to rotate. By arranging several protruded portions 11 on the inner side surface 9a of

the valve 9, when the impeller rotates to drive water to rotate, the water keeps lashing the protruded portions 11, and the protruded portions 11 are subjected to power and therefore drive the valve 9 to rotate to the first position or the second position.

Preferably, in the foregoing solution, the impeller 4 is driven by the motor 3, so as to switch between rotating along a first direction and rotating along a second direction. When the impeller 4 rotates along the first direction, for example, along a clockwise direction, the valve 9 is subjected to power and therefore rotates to the first position, and at this time, water is discharged to the water circulation channel 6 from the pump chamber 2. When the impeller 4 rotates along a second direction, for example, along a counterclockwise direction, the valve 9 is subjected to power and therefore rotates to the second direction, and water is discharged to the water drainage channel 7 from the pump chamber 2.

Preferably, a limit apparatus for blocking the valve 9 at the first position and the second position is disposed between the pump chamber 2 and the valve 9. The valve 9 moves in the pump chamber 2. Therefore, only when the valve 9 is at the first position or the second position, the opening is aligned with the water circulation channel 6 or the water drainage channel 7, and a water circulation or water drainage operation can be implemented. Therefore, a limit apparatus is needed for blocking the valve 9 at the first position and the second position.

Preferably, the limit apparatus includes a protrusion disposed on one of the pump chamber and the valve, and a blocking surface disposed on the other of the pump chamber and the valve. The limit apparatus may be arranged as a protrusion disposed on an inner wall of the pump chamber, and a blocking surface disposed on an outer wall of the valve. When the protrusion is in contact with the blocking surface, the valve is limited to this position, and this position may be the first position or the second position in the foregoing solution. At this time, a water circulation or water drainage operation may be implemented.

Preferably, in a preferred embodiment, as shown in FIG. 4 and FIG. 5, the limit apparatus includes protrusions 13a and 12 that are respectively disposed on an inner wall 2a of the pump chamber 2 and an outer wall 9b of the valve 9. When the protrusion 13a on the inner wall 2a of the pump chamber is in contact with a blocking surface 14a at one side of

the protrusion 12 on the outer wall 9b of the valve, the valve 9 is limited at this position, and this position may be the first position or the second position in the foregoing solution. At this time, a water circulation or water drainage operation may be implemented.

Preferably, the inner wall of the pump chamber 2 is provided with two protrusions 13a and 13b. As stated in the foregoing solution, one protrusion 13a is used to limit the valve 9 at the first position, and the other protrusion 13b is used to limit the valve 9 at the second position. At this time, the protrusion 13b is in contact with the blocking surface 14b at one side of the protrusion 12 on the outer wall 9b of the valve.

Preferably, in other embodiments that are not shown in the accompany drawings, a limit apparatus may include a protrusion disposed on an inner wall of a pump chamber, and a groove matching with the protrusion that is disposed on an outer wall of a valve, where the groove extends along a circumference and has two blocking surfaces located at end portions. When the protrusion is in contact with a blocking surface, the valve is limited at this position, and this position may be first position or the second position in the foregoing solution. At this time, a water circulation or water drainage operation may be implemented. Another alternative solution that would be easily conceived of is arranging, on a pump chamber, a groove with a blocking surface, and arranging a protrusion on an outer wall of a valve, which also limits the position of the valve.

Preferably, the pump chamber 2 has a cylindrical side wall 21, and an end wall 22 located at one end of the cylindrical side wall; the water drainage channel 6 and the water circulation channel 7 are connected to the cylindrical side wall 21; and the water inlet channel 5 is connected to the end wall 22 of the pump chamber. With this design, the space of the pump is more compact, and the efficiency of implementing a water circulation or water drainage operation is higher.

Preferably, in the foregoing solution, the valve 9 has a water inlet 15 that is in communication with the water inlet channel 5, and the water inlet 15 is used to introduce water into the valve.

Preferably, in the foregoing solution, the motor is a three-phase brushless direct current motor, and this motor is used as a drive source. With high efficiency, a controllable rotation speed, and a controllable rotation direction, one motor implements two functions including circulation and water drainage. When a washing machine needs to circulate water or drain water, the function may be implemented as long as the motor is controlled to perform forward rotation and reverse rotation, that is, clockwise rotation and counter-clockwise rotation.

According to another aspect of the present invention, a laundry care machine is further provided, and the laundry care machine includes a machine body, a tub in the machine body, and the pump according to the foregoing solution. Details are not described herein again.

With the present invention, problems of space occupation and high costs of a circulation and drainage pump in the prior art are resolved. On one hand, by using one motor, functions of circulation and water drainage are implemented, so that energy is saved and water drainage is reduced. On the other hand, as compared with a traditional unidirectional circulation and drainage pump, one motor is saved, so that space as well as material costs is saved, and a manufacturing process is simplified.

Specific implementation manners described in the foregoing and shown in the accompany drawings are merely used to illustrate the present invention, but are not all of the present invention. Any variation to the present invention made by a person of ordinary skill in the art within the scope of the basic technical thought of the present invention falls within the protection scope of the present invention.

REFERENCE NUMERALS

1	Pump
2	Pump chamber
2a	Inner wall of pump chamber
3	Motor
4	Impeller
5	Water inlet channel
6	Water circulation channel
7	Water drainage channel
8	Rotation shaft
9	Valve
9a	Inner side surface of valve
9b	Outer wall of valve
10	Opening
11	Protruded portion
12	Protrusion
13a	Protrusion
13b	Protrusion
14a	Blocking surface
14b	Blocking surface
15	Water inlet
21	Cylindrical side wall
22	End wall

CLAIMS

1. A pump (1), comprising: a pump chamber (2), an impeller (4) disposed in the pump chamber (2) and driven by a motor (3), and a water inlet channel (5), a water circulation channel (6), and a water drainage channel (7) that are in fluid communication with the pump chamber (2), **characterized in that**
a valve (9) is disposed in the pump chamber (2); the valve (9) is provided with an opening (10); the valve (9) can move between a first position and a second position, wherein
at the first position, the opening (10) is fitted into the water circulation channel (6), so that the water circulation channel (6) is in fluid communication with the pump chamber (2) and the water inlet channel (5), and the water drainage channel (7) and the pump chamber (2) are separated by the valve (9); and
at the second position, the opening (10) is fitted into the water drainage channel (7), so that the water drainage channel (7) is in fluid communication with the pump chamber (2) and the water inlet channel (5), and the water circulation channel (6) and the pump chamber (2) are separated by the valve (9).

2. The pump (1) according to claim 1, characterized in that:
the valve (9) has a circumference surrounding the impeller (4), and is rotatably installed in a manner of being coaxial with the impeller (4).

3. The pump (1) according to claim 2, characterized in that:
an inner side surface (9a), facing the impeller (4), of the valve (9) is provided with at least one protruded portion (11) that can be pushed by water to drive the valve (9) to rotate.

4. The pump (1) according to any preceding claim, characterized in that:
the impeller (4) is driven by the motor (3), so as to switch between rotating along a first direction and rotating along a second direction.

5. The pump (1) according to any preceding claim, characterized in that:
a limit apparatus (12, 13a, 13b, 14a, 14b) for blocking the valve (9) at the first position and the second position is disposed between the pump chamber (2) and the valve (9).

6. The pump (1) according to claim 5, characterized in that:
the limit apparatus (12, 13a, 13b, 14a, 14b) comprises a protrusion (12, 13a, 13b) disposed on one of the pump chamber (2) and the valve (9), and a blocking surface (14a, 14b) disposed on the other of the pump chamber (2) and the valve (9).

7. The pump (1) according to claim 5, characterized in that:
the limit apparatus (12, 13a, 13b, 14a, 14b) comprises protrusions (12, 13a, 13b) disposed on an inner wall (2a) of the pump chamber (2) and an outer wall (9b) of the valve (9) separately.

8. The pump (1) according to claim 7, characterized in that:
the inner wall (2a) of the pump chamber (2) is provided with two protrusions (12, 13a, 13b).

9. The pump (1) according to claim 6, characterized in that:
the limit apparatus (12, 13a, 13b, 14a, 14b) comprises a protrusion (12, 13a, 13b) disposed on an inner wall (2a) of the pump chamber (2), and a groove matching with the protrusion (11, 12, 13a, 13b) disposed on an outer wall (9b) of the valve (9), wherein the groove extends along a circumference and has two blocking surfaces (14a, 14b) located at end portions.

10. The pump (1) according to any preceding claim, characterized in that:
the pump chamber (2) has a cylindrical side wall (21) and an end wall (22) located at one end of the cylindrical side wall (21); the water drainage channel (7) and the water circulation channel (6) are connected to the cylindrical side wall (21); and the water inlet channel (5) is connected to the end wall (22) of the pump chamber (2).

11. The pump (1) according to claim 10, characterized in that:
the valve (9) has a water inlet (15) that is in communication with the water inlet channel (5).

12. The pump (1) according to any preceding claim, characterized in that: the motor (3) is a three-phase brushless direct current motor.

13. A laundry care machine, comprising: a machine body and a tub in the machine body, characterized in that: the laundry care machine comprises the pump according to any of claims 1 to 12.

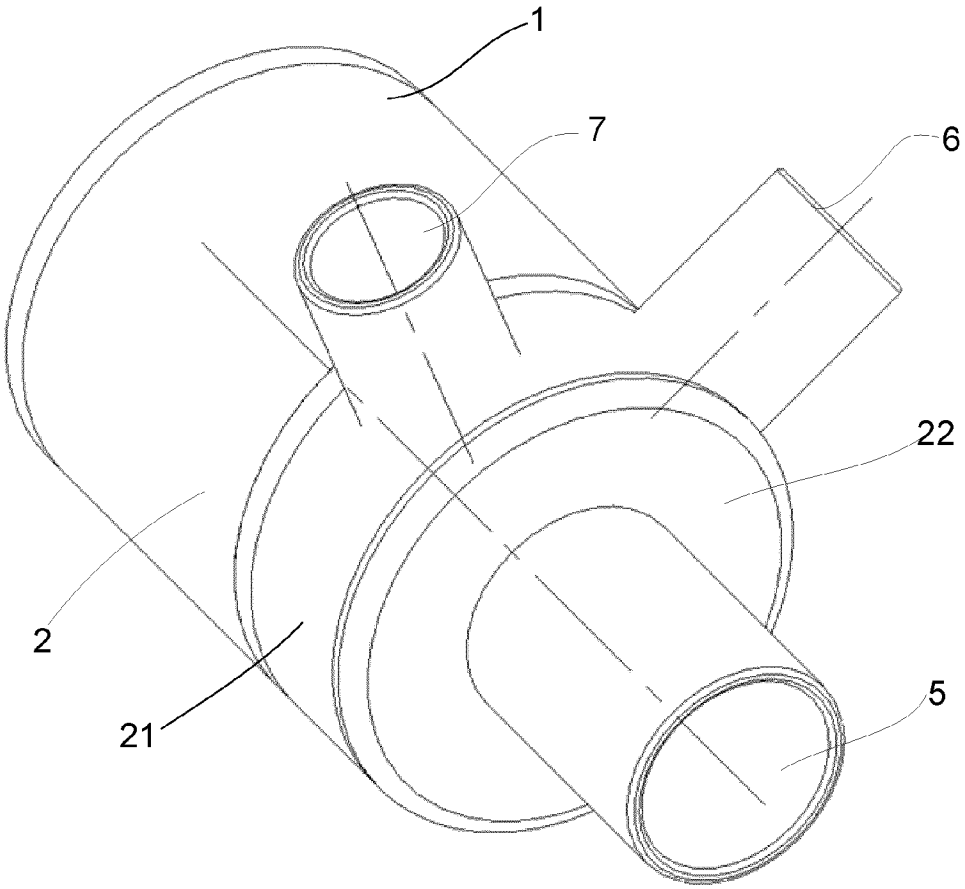

FIG. 1

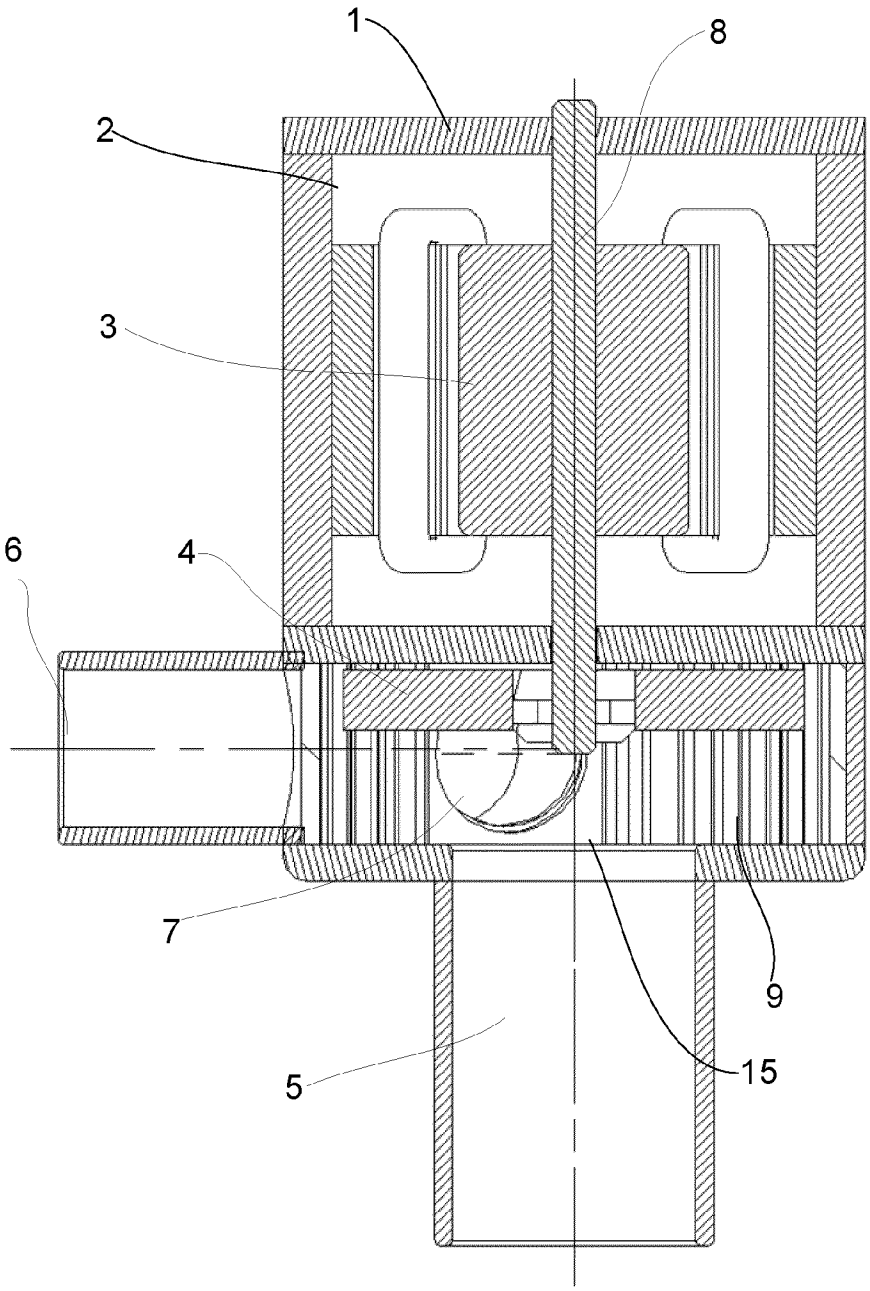

FIG. 2

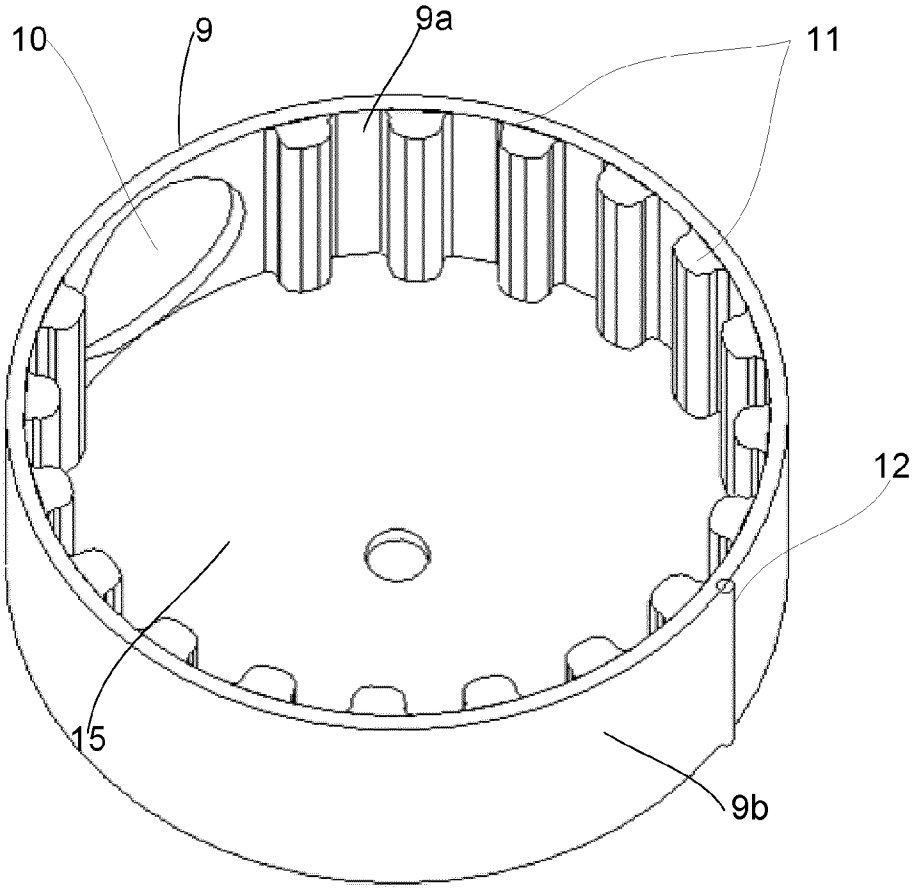

FIG. 3

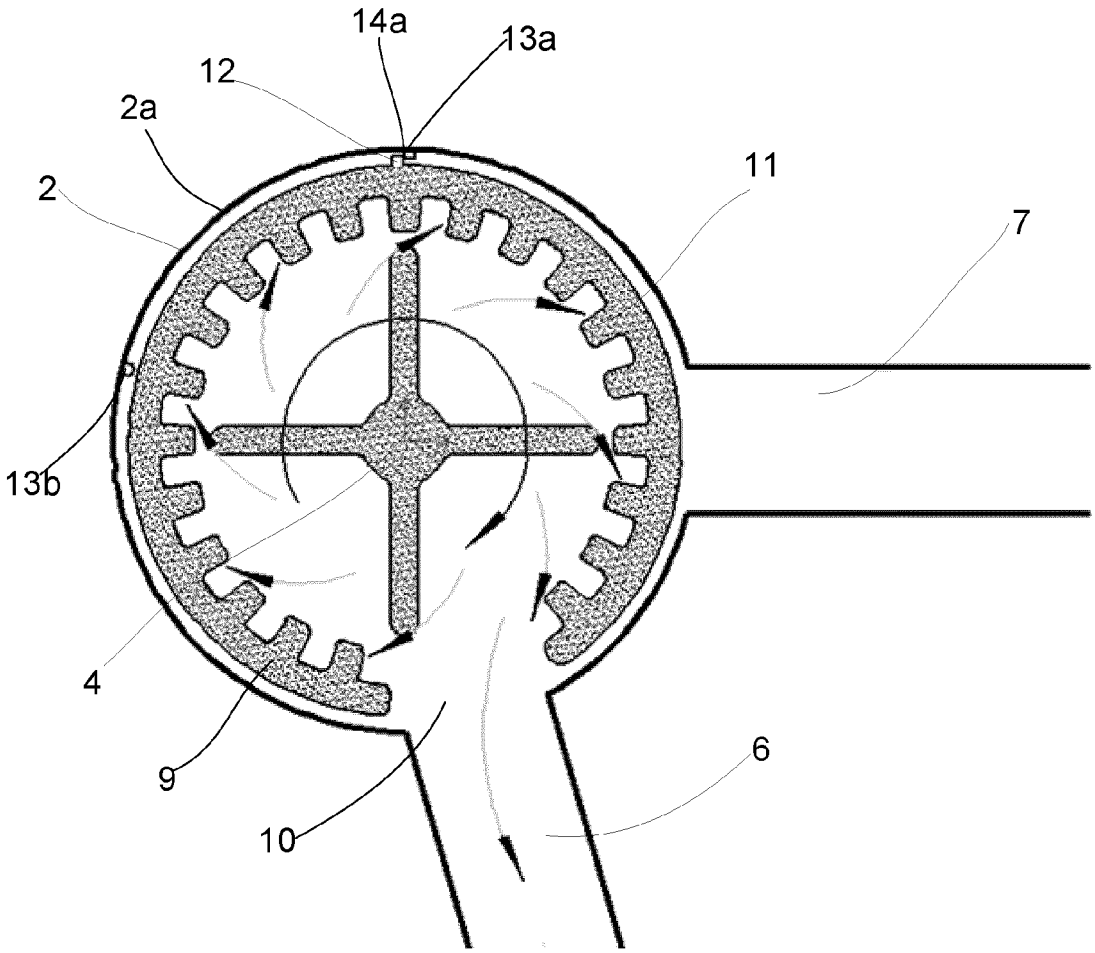

FIG. 4

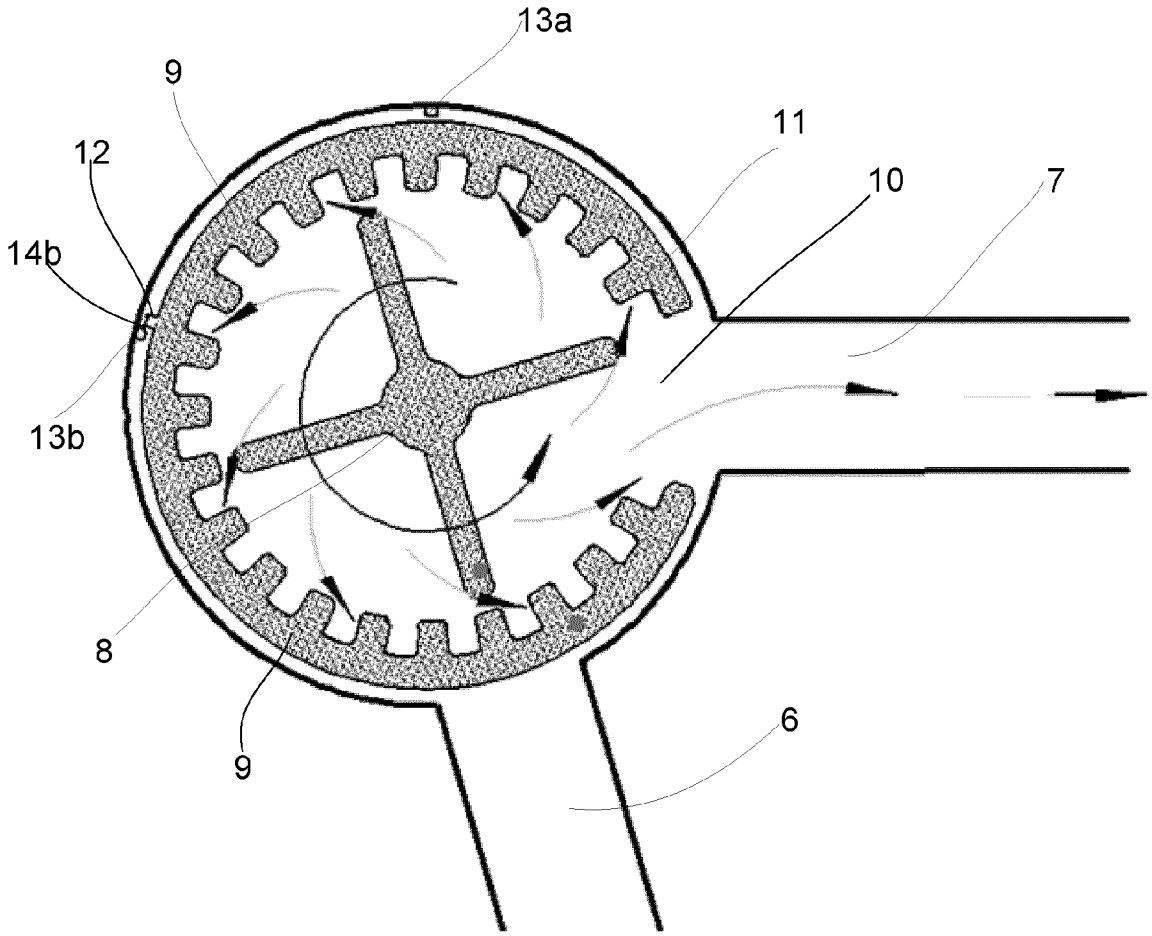

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/063456

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F39/08 F04D29/48
ADD. A47L15/42

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06F A47L F04D

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 411 250 A1 (FAGOR S COOP [ES]) 21 April 2004 (2004-04-21) paragraphs [0001] - [0003] paragraphs [0008] - [0009] paragraphs [0012] - [0016] figures 1-4	1-6,9-13
X	US 2012/114473 A1 (BADAFEM AWADE [CN] ET AL) 10 May 2012 (2012-05-10) paragraphs [0003] - [0004] paragraphs [0041] - [0042] paragraphs [0045] - [0052] figures 1-3, 5-9	1,4,5, 10,12,13
X	US 4 869 076 A (SAKAI TADASHI [JP] ET AL) 26 September 1989 (1989-09-26) column 6, lines 10-57 figures 4-9	1-12

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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21 July 2016	01/08/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Weidner, Maximilian

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