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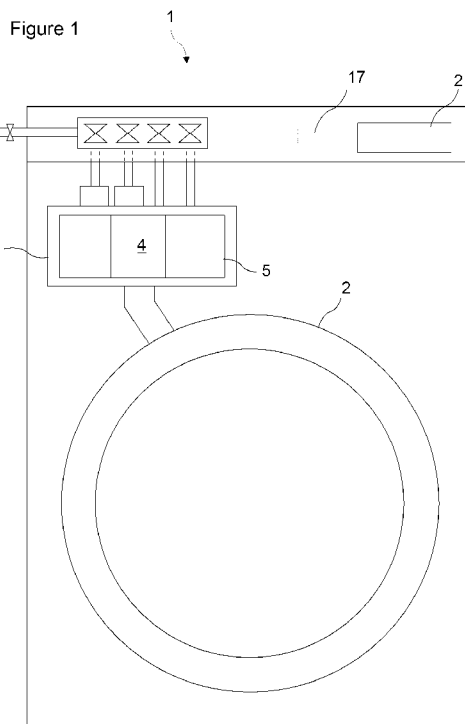
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(54) Title: A WASHING MACHINE COMPRISING A DETERGENT DOSING UNIT



(57) Abstract: The present invention relates to a washing machine (1) comprising a tub (2) wherein the washing process is performed; a dispenser (5) which has at least one compartment (4) wherein liquid detergent is stored; and a housing (3) which opens into the tub and wherein the dispenser (5) is placed. The dispenser (5) further comprises a dosing unit (15) having a water chamber (8) comprising a water inlet (6) and an impeller (10) with a plurality of wing (9) which is rotated by means of water coming from the water inlet (6), and detergent chamber (11) comprising a detergent outlet (12) and a gear (14) connected to the impeller (10) so as to rotate together, said gear (14) having a plurality of teeth (13) pushing the detergent toward the outlet (12); the dispenser (5) further comprises a sensor (16) which measures the number of revolutions of the impeller (10) on the gear (14) and a control unit (17) configured to calculate the amount of water and detergent delivered into the tub (2) by using the data received from the sensor (16).

Description**A WASHING MACHINE COMPRISING A DETERGENT DOSING UNIT**

- [0001] The present invention relates to a washing machine wherein the amount of liquid to be delivered to the tub is measured in a precise manner.
- [0002] In washing machines, the amount of liquids such as water, liquid detergent, softener, etc. taken into the tub to be used in the washing process is critical in terms of efficient washing of the laundry. In case the water and cleaning agents are delivered into the tub in an insufficient amount, the laundry cannot be properly cleaned, and in case of delivery in an excessive amount, cleaning agent and energy consumption increases, and the laundry may wear down due to contact with excessive amount of chemicals. In the state of the art one of the most used embodiments for measuring the amount of liquid delivered into the tub is based on determining the water level in a channel wherein the water taken into the tub fills in. Another state of the art solution is to measure the weight of the tub by means of a weight sensor after taking water into the tub to determine the change in the weight of the tub. However, these methods are disadvantageous in that the type of the liquid delivered into the tub cannot be identified. Another disadvantage of these methods is that the amount of liquid measured may change depending on the characteristics of the tub and on the type of the laundry loaded into the tub. In another state of the art embodiment, a flow meter is disposed on the line which carries the water taken from the mains. However, in washing machines comprising an automatic detergent dosing unit wherein the liquid detergent is stored to be automatically dosed, the placement of a flow meter causes structural and systemic difficulties due to the space limit. Moreover, the flow meter mounted onto the water intake system increases the production costs and prolongs the assembly time.
- [0003] In the state of the Patent Document No. EP2428607, a water-conducting household appliance is disclosed. The appliance comprises a housing, an operating chamber, and an automatic dosing system that is arranged within the housing. The automatic dosing system comprises a chamber wherein liquid detergent is loaded and a delivery pump arranged in the

chamber.

- [0004] The aim of the present invention is the realization of a washing machine wherein the amount of liquid delivered into the tub is determined in a simple and accurate manner.
- [0005] The washing machine realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a dosing unit having an impeller which is disposed in a water chamber with a water inlet through which the mains water is taken, and which is rotated by means of the water flowing from the water inlet, and which has a plurality of wings, the dosing unit further having a detergent chamber which has a detergent outlet opening into the housing and which is in connection with the compartment such that some of the detergent stored in the compartment fills therein, and a gear which is disposed in the detergent chamber, which is connected to the impeller so as to be driven and rotated by the impeller around an axis of rotation and which has a plurality of teeth pushing the detergent in the detergent chamber towards the detergent outlet when rotated, the washing machine further comprising a sensor which is disposed on the dosing unit and which measures the number of revolutions of the impeller or the gear, and a control unit which is configured to calculate the amount of detergent delivered into the tub by using the data received from the sensor. Thus, the amount of detergent delivered into the tub is measured in an accurate manner without the need for an element such as pump, flow meter, etc. which causes difficulties in terms of placement, and the ideal amount of detergent is enabled to be delivered to the tub.
- [0006] In an embodiment of the present invention, a water outlet is provided on the water chamber, which enables the water taken from the water inlet to be sent to the housing to be used in the washing process. Thus, both the amount of detergent delivered into the tub and the amount of water sent into the tub can be measured by means of the same mechanic system in a precise manner.
- [0007] In an embodiment of the present invention, the sensor which is a magnetic sensor has a magnetic detector detecting the change in the magnetic field

and a magnetic element placed onto the impeller, the gear or the shaft which moves while the detergent is dosed. The position of the magnetic element disposed on the movable components changes with respect to the magnetic detector while the detergent is dosed, and the magnetic detector detects the change in the magnetic field. Thus, the total number of revolutions of the impeller and the gear can be determined in a simple manner.

- [0008] In an embodiment of the present invention, the sensor which is an optical sensor comprises a light source emitting light onto the wings while the impeller is rotated and an optical detector detecting the light emitted by the light source. When one of the wings of the impeller comes between the optical detector and the light source while the impeller is rotated, the light cannot reach the optical detector, thus the sensor detects the presence of the wing. Consequently, the sensor counts the number of wings passing in front thereof while the detergent is dosed and determines the number of revolutions of the impeller.
- [0009] By means of the present invention, the amount of liquid delivered into the tub is enabled to be measured in a precise manner by using a simple and compact mechanism.
- [0010] The washing machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:
- [0011] Figure 1 - is the schematic view of the washing machine related to an embodiment of the present invention.
- [0012] Figure 2 - is the schematic view of the dispenser and the dosing unit related to an embodiment of the present invention.
- [0013] Figure 3 - is the view of the dosing unit related to an embodiment of the present invention.
- [0014] Figure 4 - is the cross-sectional view of the dosing unit taken along the line E-E in Figure 3.
- [0015] Figure 5 - is the view of the dosing unit related to another embodiment of the present invention.
- [0016] Figure 6 - is the cross-sectional view of the dosing unit taken along the line A-A in Figure 5.

[0017] The elements illustrated in the figures are numbered as follows:

1. Washing Machine
2. Tub
3. Housing
4. Compartment
5. Dispenser
6. Water Inlet
7. Water Outlet
8. Water Chamber
9. Wing
10. Impeller
11. Detergent Chamber
12. Detergent Outlet
13. Tooth
14. Gear
15. Dosing Unit
16. Sensor
17. Control Unit
18. Shaft
19. Magnetic Element
20. Magnetic Detector
21. Light Source
22. Optical Detector

[0018] The washing machine (1) comprises a tub (2) wherein the washing process is performed; a dispenser (5) which has at least one compartment (4) wherein liquid detergent is stored; and a housing (3) which opens into the tub and wherein the dispenser (5) is placed.

[0019] The washing machine (1) comprises a dosing unit (15) having an impeller (10) which is disposed in a water chamber (8) with a water inlet (6), which has a plurality of wings (9) and which is rotated by means of the water, which comes from the water inlet (6), hitting the wings (9), the dosing unit (15) further having a gear (14) which is disposed in a detergent chamber (11), which is connected to the impeller (10) so as to be rotated together

with the impeller (10) and which has a plurality of teeth (13) pushing the detergent in the detergent chamber (11) towards a detergent outlet (12) opening into the housing (3) when rotated, the washing machine (1) further comprising a sensor (16) which is disposed on the dosing unit (15) and which measures the number of revolutions of the impeller (10) or the gear (14), and a control unit (17) which is configured to calculate the amount of detergent delivered into the tub (2) by using the data received from the sensor (16). Water is taken into the water chamber (8) through the water inlet (6) in order to rotate the gear (14) providing the dosing of the detergent, and by enabling the water coming from the water inlet (6) to hit the wings (9) of the impeller (10), the impeller (10) and the gear (14) are rotated at the same time. The number of revolutions of the impeller is directly proportional to the amount of water entering the water chamber (8), and the same amount of water is passed through the water chamber (8) at every revolution of the impeller (10). The water chamber (8) further has a water outlet (7) which provides the discharge of the water in the water chamber (8). The water outlet (7) enables the water in the water chamber (8) to be sent, as per preference, to the dispenser (5), the housing (3) or to a tank to be stored. The detergent chamber (11) is in fluid connection to the compartment (4), and the detergent filling into the detergent chamber (11) from the compartment (4) goes in between the teeth of the rotating gear (14) to be sent towards the detergent outlet (12). By taking the detergent in between the teeth (13) and pushing the same, the same amount of detergent is dosed into the housing (3) at every revolution of the gear (14). The sensor (16) is configured to determine the total number of revolutions of the components rotated by means of the hydraulic pressure of the water, namely of the impeller (10) or the gear (14), and the control unit (17) measures the total amount of water passed through the water chamber (8), in other words discharged from the water outlet (7) as well as the total amount of detergent supplied to the housing (3) in a quick and precise manner depending on the number of revolutions detected by the sensor (16). Thus, the control unit (17) adjusts the parameters relevant to the washing process according to the amount of

water and detergent used, increasing the efficiency of the washing process.

- [0020] In an embodiment of the present invention, a water outlet (7) is provided on the water chamber (8), which enables the water taken from the water inlet (6) to be sent to the housing (3) to be supplied into the tub (2). The water inlet (6) is preferably connected to a mains line wherein the water taken from the mains to be used in the washing process is carried. The water outlet (7) is in the form of a channel with one end opening into the water chamber (8) and the other end into the housing (3). The water taken into the water chamber (8) is carried towards the water outlet (7) from the water inlet (6) by means of the impeller (10) and then delivered to the housing (3) to be sent to the tub (2). Thus, the impeller (10) functions as a flow meter, and the amount of detergent delivered into the tub (2) as well as the amount of water taken into the tub (2) to be used in the washing process are measured in a precise manner without using an additional component.
- [0021] In another embodiment of the present invention, the washing machine (1) comprises a shaft (18) whereon the impeller (10) is connected and which rotates together with the impeller (10); the gear (14) which is connected onto the shaft (18) so as to be rotated by the shaft (18), and the sensor (16) which measures the number of revolutions of the shaft (18). The shaft (18) provides the connection of the gear (14) with the impeller (10) and enables the rotational movement of the impeller (10) to be transferred to the gear (14). This embodiment is advantageous in that the sensor (16) can be mounted independently of the impeller (10) and the gear (14). Thus, ease of placement is provided.
- [0022] In an embodiment of the present invention, the sensor (16) is of magnetic type, and has a magnetic element (19) disposed on a movable component such as the shaft (18), the impeller (10) and the gear (14), and a magnetic detector (20) which detects the presence of the magnetic element (19) in a certain distance. Thus, the number of revolutions of rotating components can be measured by the magnetic detector (20) at a distance, and the sensor (16) is prevented from blocking the movement of the rotating

components.

- [0023] In another embodiment of the present invention, the sensor (16) has a magnetic element (19) disposed on the shaft (18), and a magnetic detector (20) which is configured to detect the change in the magnetic field generated by the magnetic element (19) while the shaft (18) is rotated.
- [0024] In another embodiment of the present invention, the sensor (16) has a magnetic element (19) disposed on at least one tooth (13), and a magnetic detector (20) which is configured to detect the change in the magnetic field generated by the magnetic element (19) while the gear (14) is rotated.
- [0025] In another embodiment of the present invention, the sensor (16) has a magnetic element (19) disposed on at least one wing (9), and a magnetic detector (20) which is configured to detect the change in the magnetic field generated by the magnetic element (19) while the impeller (10) is rotated.
- [0026] In another embodiment of the present invention, the sensor (16) has a light source (21) and an optical detector (22) which is suitable for detecting the light emitted by the light source (21), and detects the presence of the wing (9) passing in front of the light source (21) depending on whether the light reaches the optical detector (22), thus providing the measurement of the number of revolutions of the impeller (10). This embodiment is advantageous in that the need for placing any component of the sensor (16) onto the rotating components such as the shaft (18), the impeller (10), the gear (14), etc. is eliminated. Thus, the sensor (16) is prevented from occupying space on the gear (14) and the impeller (10), and from causing erroneous measurements by creating additional weight.
- [0027] By means of the present invention, the amount of the liquids supplied by the dosing unit (15), namely of the water and the detergent can be determined in a quick and precise manner, and by performing the measurement by means of the simple and compact detergent dosing unit (15), ease of production is provided.

Claims

1. A washing machine (1) **comprising** a tub (2) wherein the washing process is performed; a dispenser (5) which has at least one compartment (4) wherein liquid detergent is stored; and a housing (3) which opens into the tub and wherein the dispenser (5) is placed, **characterized by**
 - a dosing unit (15) having an impeller (10) which is disposed in a water chamber (8) with a water inlet (6), which has a plurality of wings (9) and which is rotated by means of the water, which comes from the water inlet (6), hitting the wings (9), the dosing unit (15) further having a gear (14) which is disposed in a detergent chamber (11), which is connected to the impeller (10) so as to be rotated together with the impeller (10) and which has a plurality of teeth (13) pushing the detergent in the detergent chamber (11) towards a detergent outlet (12) opening into the housing (3) when rotated,
 - a sensor (16) which is disposed on the dosing unit (15) and which measures the number of revolutions of the impeller (10) or the gear (14), and
 - a control unit (17) which is configured to calculate the amount of liquid delivered into the tub (2) by using the data received from the sensor (16).
2. A washing machine (1) as in Claim 1, **characterized by** a water outlet (7) is provided on the water chamber (8), which enables the water taken from the water inlet (6) to be sent to the housing (3) to be supplied into the tub (2).
3. A washing machine (1) as in Claim 1 or Claim 2, **characterized by** a shaft (18) whereon the impeller (10) is connected and which rotates together with the impeller (10); the gear (14) which is connected onto the shaft (18) so as to be rotated by the shaft (18), and the sensor (16) which measures the number of revolutions of the shaft (18).
4. A washing machine (1) as in Claim 3, **characterized by** the sensor (16) having a magnetic element (19) disposed on the shaft (18), and a magnetic detector (20) which is configured to detect the change in the magnetic field generated by the magnetic element (19) while the shaft (18) is rotated.
5. A washing machine (1) as in Claim 1 or Claim 2, **characterized by** the sensor (16) having a magnetic element (19) disposed on at least one tooth (13), and a magnetic detector (20) which is configured to detect the change in the magnetic field generated by the magnetic element (19) while the gear (14) is

rotated.

6. A washing machine (1) as in Claim 1 or Claim 2, **characterized by** the sensor (16) having a magnetic element (19) disposed on at least one wing (9), and a magnetic detector (20) which is configured to detect the change in the magnetic field generated by the magnetic element (19) while the impeller (10) is rotated.
7. A washing machine (1) as in Claim 1 or Claim 2, **characterized by** the sensor (16) which has a light source (21) and an optical detector (22) suitable for detecting the light emitted by the light source (21), and which detects the presence of the wing (9) passing in front of the light source (21) depending on whether the light reaches the optical detector (22), thus providing the measurement of the number of revolutions of the impeller (10).

Figure 1

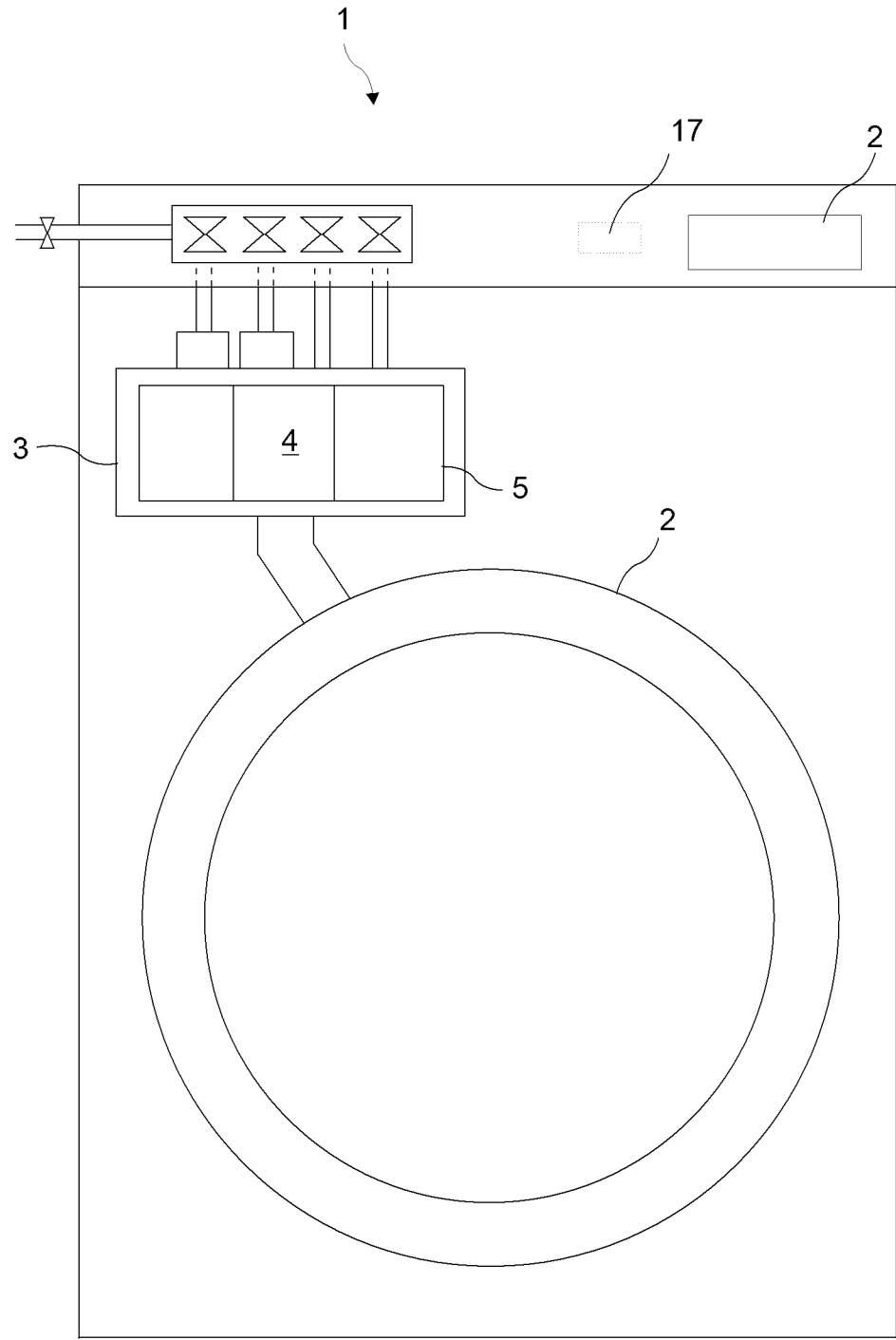


Figure 2

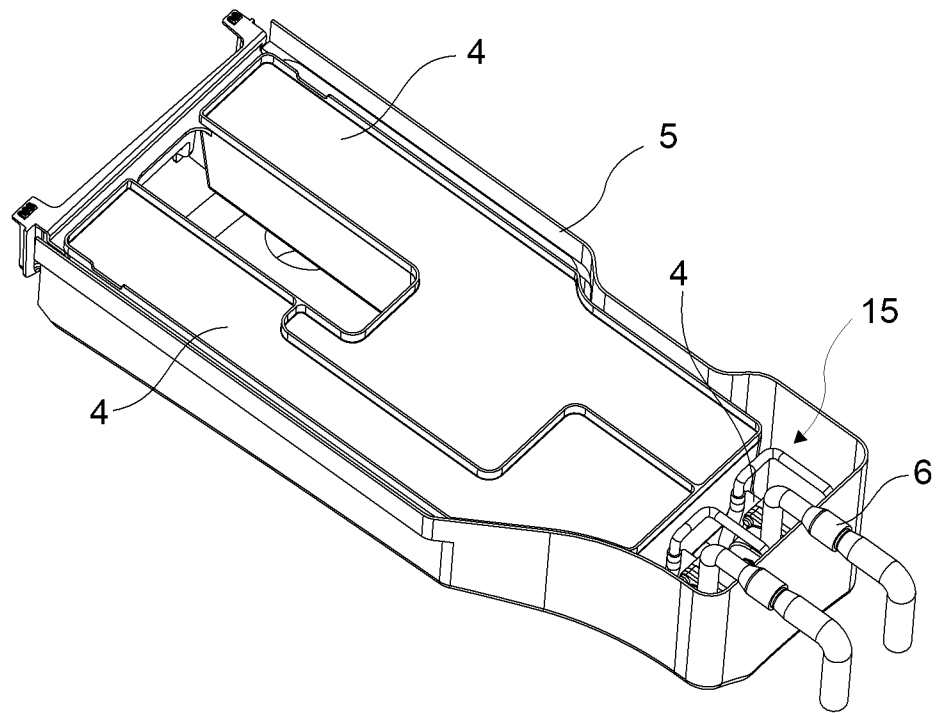


Figure 3

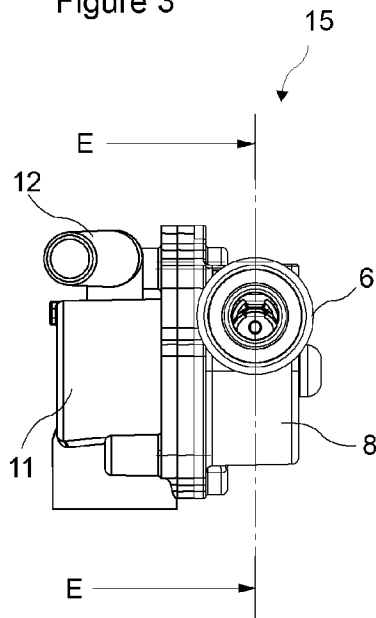


Figure 4

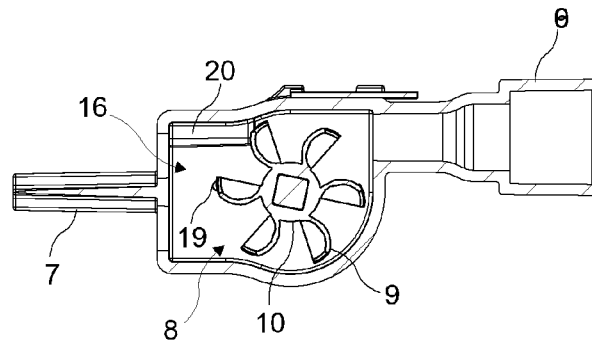


Figure 5

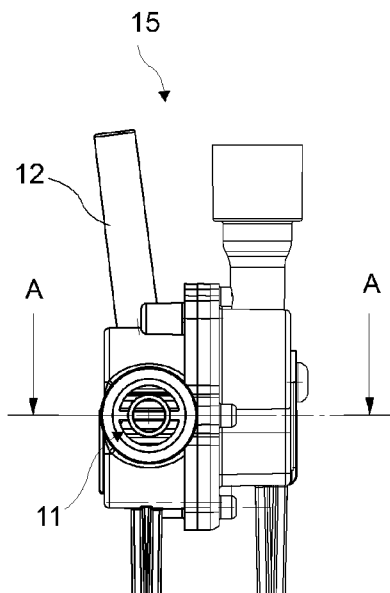
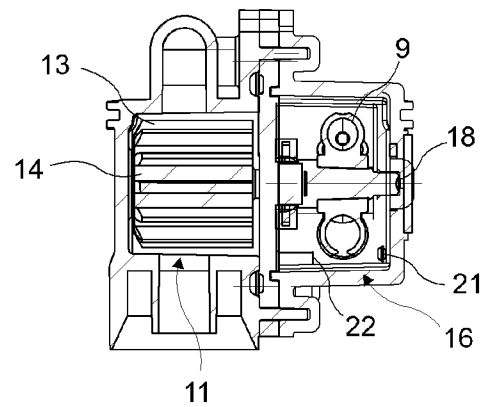


Figure 6



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

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ADD. D06F33/02 G01F1/06

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 G01F

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.
A	WO 2017/114637 A1 (ARCELIK AS [TR]) 6 July 2017 (2017-07-06) paragraph [0027] - paragraph [0030]; figures 1, 2a, 2b, 3-5 paragraph [0038]	1-3
A	US 2015/252513 A1 (SEO BOSUNG [KR] ET AL) 10 September 2015 (2015-09-10) paragraph [0209] - paragraph [0213]; figure 17 paragraph [0219] - paragraph [0223]; figures 18-21 paragraph [0243] - paragraph [0259] paragraph [0264] - paragraph [0275] paragraph [0285] - paragraph [0307]; figure 22 ----- -/-	1-3



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Date of the actual completion of the international search

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Sabatucci, Arianna

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/067450

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 102 182 049 B (YAOQIANG LI; LIN WEIMING) 11 July 2012 (2012-07-11) see machine translation; figure 1 -----	1-3
A	WO 2013/108958 A1 (KANG HYO SHIN [KR]) 25 July 2013 (2013-07-25) see machine translation; figures 3, 4 -----	1-6
A	WO 90/06493 A1 (NOREN ANDERS [SE]) 14 June 1990 (1990-06-14) page 3, line 7 - line 32; figures 1, 2 -----	4-7

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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