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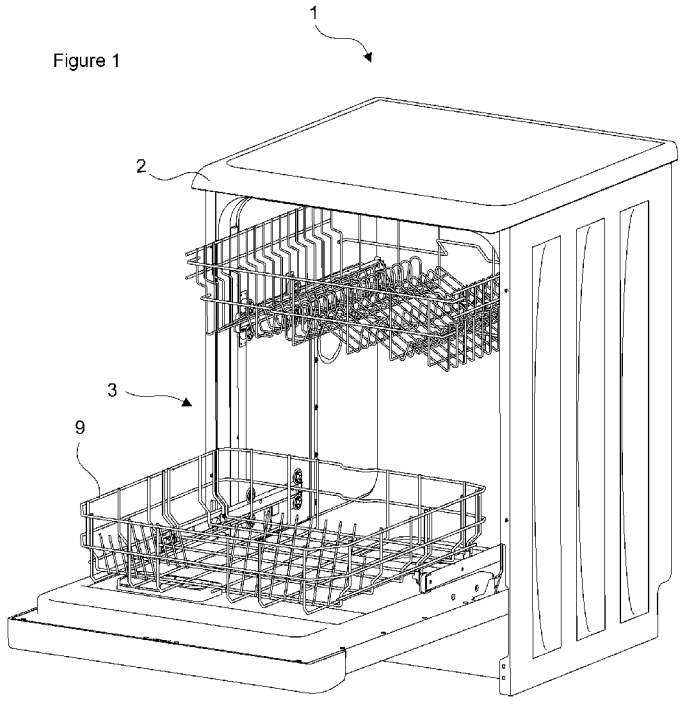
(54) Title: A DISHWASHER WITH IMPROVED WASHING PERFORMANCE

Figure 1



(57) Abstract: The present invention relates to a dishwasher (1) comprising a body (2); a washing tub (3) that is arranged in the body (2) and wherein the washing process is performed; a water line (4) that is arranged in the body (2); a driving spray arm (5) that is arranged on the base of the washing tub (3), that rotates around its own axis and that is connected to the water line (4), and an eccentric spray arm (6) that is connected to the driving spray arm (5) in fluid communication on an eccentric axis relative to the axis at which the water line (4) is connected to the driving spray arm (5).

WO 2019/037995 A1

[Continued on next page]

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Description

A DISHWASHER WITH IMPROVED WASHING PERFORMANCE

[0001] The present invention relates to a dishwasher comprising two spray arms that can rotate around different axes.

[0002] Since washing tubs of the dishwashers generally have rectangular cross-sections and the spray arms create a circular washing area by rotating around their axes, dishes placed at the corners of the washing tub cannot be cleaned effectively. The use of spray arms placed one above the other that rotate around different axes for solving this problem is known. The lower spray arm preferably rotates around an axis at the center of the base of the washing tub while the upper spray arm connected to the lower spray arm rotates around an eccentric axis. Thus, the end of the upper spray arm better reaches the corners of the washing tub, and the dishes at the corners are enabled to be cleaned more effectively. The weight of the upper spray arm is transferred by the point through which the upper spray arm is connected to the lower spray arm, and as the lower spray arm is connected to the base, the weight of the upper spray arm creates an imbalance. This imbalance creates wobbling especially during the rotation of the spray arms and causes the spray arms to hit the dishes.

[0003] In the state of the art United States Patent Application No. US2015359408, a dishwasher is disclosed, comprising a counterweight disposed on the lower of the two spray arms connected to two different axes so as to be one above the other.

[0004] In the state of the art Japanese Patent Application No. JPH10117993, a dishwasher is disclosed, comprising a spray arm that rotates around an axis that is eccentric relative to the axis to which the water line disposed at the base of the washing tub is connected.

[0005] The aim of the present invention is the realization of a dishwasher wherein the dishes placed at the corners of the washing tub are enabled to be washed more effectively.

[0006] The dishwasher realized in order to attain the aim of the present invention explicated in the first claim and the respective claims thereof, comprises an eccentric spray arm that is disposed above a driving spray arm

connected to the water line and that is connected to the driving spray arm at a different axis than the axis at which the water line is connected to the driving spray arm, wherein in order to compensate the imbalance caused by the eccentric spray arm on the driving spray arm water is used as a counterweight in the opposite direction of the force that creates the imbalance on the driving spray arm. By using water in the driving spray arm as counterweight, the need for using a solid weight in the driving spray arm is eliminated, decreasing production costs.

[0007] In an embodiment of the present invention, the imbalance created by the eccentric spray arm is compensated by pumping water into the driving spray arm at the beginning of the washing process. In a version of this embodiment, the water used as the counterweight in the driving spray arm is discharged at the end of the washing process. By means of these embodiments, hygiene is provided by using water as the counterweight.

[0008] In another embodiment of the present invention, the driving spray arm is enabled to rotate by itself by providing the water exit through a first hole provided on the side surface thereof. By means of this embodiment, the need for using an element such as a motor to rotate the driving spray arm is eliminated.

[0009] In another embodiment of the present invention, the downwards vertical push force created during the spraying of the water upwards from the eccentric spray arm is balanced by spraying water upwards through a second hole that is arranged on the driving spray arm and that is positioned so as to be opposite to said push force relative to the balance point. By means of this embodiment, a dynamic balancing is provided, and since the possible variations that may occur in the water pressure due to the fact that the eccentric spray arm and the driving spray arm are fed by the same water line change the forces acting on both the balancing arms proportionally, the spray arms are prevented from becoming unbalanced.

[0010] By means of the dishwasher of the present invention, the weights of the spray arms that placed one above the other that rotate around different axes to enable the dishes placed at the corners of the washing tub to be washed more effectively and the push forces created during the spraying

of the water are balanced by using water as the counterweight. Thus, the production costs are decreased by using a lower number of components in the dishwasher, and the weight is decreased by avoiding the use of a permanent weight in the spray arm.

[0011] A dishwasher realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0012] Figure 1 - is the perspective view of the dishwasher.

[0013] Figure 2 - is the schematic view of the driving spray arm in an embodiment of the present invention.

[0014] Figure 3 - is the perspective view of the base of the washing tub in an embodiment of the present invention.

[0015] Figure 4 - is the perspective view of the water line and the driving spray arm in an embodiment of the present invention.

[0016] The elements illustrated in the figures are numbered as follows:

1. Dishwasher
2. Body
3. Washing tub
4. Water line
5. Driving spray arm
6. Eccentric spray arm
7. First hole
8. Second hole
9. Rack
10. Gear

[0017] The dishwasher (1) comprises a body (2); a washing tub (3) that is arranged in the body (2) and wherein the washing process is performed; a water line (4) that is arranged in the body (2); a driving spray arm (5) that is arranged on the base of the washing tub (3), that rotates around its own axis and that is connected to the water line (4), and an eccentric spray arm (6) that is connected to the driving spray arm (5) in fluid communication on an eccentric axis relative to the axis at which the water line (4) is connected to the driving spray arm (5). In order to better wash the corners of the washing tub (3) with a rectangular cross-section, the driving spray

arm (5) connected to the water line (4) and the eccentric spray arm (6) that is connected to the driving spray arm (5) on a different axis are used. By connecting the spray arms (5, 6) in an eccentric manner, the eccentric spray arm (6) sweeps a Reuleaux triangle area while rotating around its own axis and enables water to be delivered to almost all the parts of the washing tub (3). The movement of the eccentric spray arm (6) is provided by means of gears (10) arranged in the driving spray arm (5). Racks (9) are used for loading the dishes into the washing tub (3).

[0018] In the dishwasher (1) of the present invention, water is used as the counterweight in the driving spray arm (5). In the dishwasher (1) of the present invention, by connecting the eccentric spray arm (6) to the driving spray arm (5) at an eccentric axis, the moment created by the weight of the eccentric spray arm (6) on the axis at which driving spray arm (5) is connected to the water line (4) is balanced by the moment created by the water filled into the driving spray arm (5) on the axis at which the driving spray arm (5) is connected to the water line (4). The water is pumped into the driving spray arm (5) so as to create a moment in the direction opposite to the direction of the moment created by the eccentric spray arm (6). Thus, the eccentric spray arm (6) is prevented from wobbling during its rotation due to the weight imbalance. By providing a balanced and smooth rotation movement of the driving spray arm (5), the quality of the washing process is improved and the perception of quality of the user is increased. In different embodiments of the present invention, the driving spray arm (5) can have a form that becomes wider as moving away from the axis to which the water line (4) is connected such that a greater moment can be obtained with a smaller amount of water.

[0019] The dishwasher (1) of the present invention comprises the driving spray arm (5) that is connected to the water line (4) at a point different than the center thereof, that is filled with water and that balances during the washing process the weight of the eccentric spray arm (6) that is connected to the driving spray arm (5) at a point between the part of the eccentric spray arm (6) where the eccentric spray arm (6) is connected to the water line (4) and the end of the eccentric spray arm (6). As explained

above, the imbalance created due to the fact that the spray arms (5, 6) are connected to each other at different axes is compensated by means of the driving spray arm (5) filled with water. The driving spray arm (5) is connected to the water line (4) at a part on the bottom surface thereof between the center thereof and the end thereof. The eccentric spray arm (6) is connected to the driving spray arm (5) at the top surface thereof at a point between the part where the eccentric spray arm (6) is connected to the water line (4) and the end of the eccentric spray arm (6). Thus, the arm of the driving spray arm (5) to which the eccentric spray arm (6) is connected is shorter than the other arm thereof. Consequently, the moment the eccentric spray arm (6) applies to the part, that is the support point of the eccentric spray arm (6), to which the water line (4) is connected is balanced by means of the moment applied by the longer arm filled with water of the driving spray arm (5) to the support point.

[0020] In an embodiment of the present invention, in the dishwasher (1), water is pumped into the driving spray arm (5) at the beginning of the washing process. In case the water is used as the counterweight in the driving spray arm (5), the water in the driving spray arm (5) may create unpleasant odors, etc. in the course of time. By means of this embodiment, by pumping water into the driving spray arm (5) at the beginning of each washing process, a hygienic operation is obtained.

[0021] In another embodiment of the present invention, in the dishwasher (1), the water in the driving spray arm (5) is discharged at the end of the washing process. In parallel with the embodiment above, by discharging the water in the driving spray arm (5) at the end of each washing process, the water in the driving spray arm (5) is prevented from creating unpleasant odors, etc. Furthermore, the interior of the driving spray arm (5) is enabled to be regularly washed and kept clean by replacing the water in driving spray arm (5) that is used as the counterweight.

[0022] In another embodiment of the present invention, the dishwasher (1) comprises a first hole (7) that is arranged on the lateral surface of the driving spray arm (5) and that enables the driving spray arm (5) to rotate around its own axis by discharging water. During the washing process, the

water line (4) pumps water into the driving spray arm (5) and the driving spray arm (5) is enabled to rotate around its own axis by discharging water through the first hole (7) provided on the lateral surface of the driving spray arm (5), the first hole (7) being positioned preferably at a point away from the connection axis of the water line (4).

[0023] In another embodiment of the present invention, the dishwasher (1) comprises a second hole (8) that is arranged on the top surface of the driving spray arm (5) and that enables the eccentric spray arm (6) to be dynamically balanced by discharging water upwards during the washing process. The water sprayed from the eccentric spray arm (6) during the washing process creates a downwards push force on the eccentric spray arm (6). This push force creates a moment on the connection axis of the driving spray arm (5) to the water line (4) other than the moment created due to the weight of the eccentric spray arm (6), and this causes imbalance in the movements of the spray arms (5, 6) when the water is sprayed only from the eccentric spray arm (6). Said push force is balanced by spraying water upwards through the second hole (8) arranged on the top surface of the driving spray arm (5), almost opposite to the moment created by the eccentric spray arm (6) while spraying water. In a version of this embodiment, the eccentric spray arm (6) and the second hole (8) are fed from the same water conduit, and thus the dynamic balancing is provided only when the eccentric spray arm (6) sprays water.

[0024] By means of the present invention, by balancing the weight of the eccentric spray arm (6) using water, the need for using a solid weight as the counterweight is eliminated and thus, the number of parts is decreased, improving production costs. Furthermore, by means of the higher mobility of the liquid weight relative to the solid weight, the balancing is performed smoothly and the service life is extended.

Claims

1. A dishwasher (1) **comprising** a body (2); a washing tub (3) that is arranged in the body (2) and wherein the washing process is performed; a water line (4) that is arranged in the body (2); a driving spray arm (5) that is arranged on the base of the washing tub (3), that rotates around its own axis and that is connected to the water line (4), and an eccentric spray arm (6) that is connected to the driving spray arm (5) in fluid communication on an eccentric axis relative to the axis at which the water line (4) is connected to the driving spray arm (5), **characterized by** the use of water as the counterweight in the driving spray arm (5).
2. A dishwasher (1) as in Claim 1, **characterized by** the driving spray arm (5) that is connected to the water line (4) at a point different than the center thereof, that is filled with water and that balances during the washing process the weight of the eccentric spray arm (6) that is connected to the driving spray arm (5) at a point between the part of the eccentric spray arm (6) where the eccentric spray arm (6) is connected to the water line (4) and the end of the eccentric spray arm (6).
3. A dishwasher (1) as in Claim 1 or 2, **characterized by** pumping water into the driving spray arm (5) at the beginning of the washing process.
4. A dishwasher (1) as in Claim 3, **characterized by** discharging the water in the driving spray arm (5) at the end of the washing process.
5. A dishwasher (1) as in any one of the above claims, **characterized by** a first hole (7) that is arranged on the lateral surface of the driving spray arm (5) and that enables the driving spray arm (5) to rotate around its own axis by discharging water.
6. A dishwasher (1) as in any one of the above claims, **characterized by** a second hole (8) that is arranged on the top surface of the driving spray arm (5) and that enables the eccentric spray arm (6) to be dynamically balanced by discharging water upwards during the washing process.

Figure 1

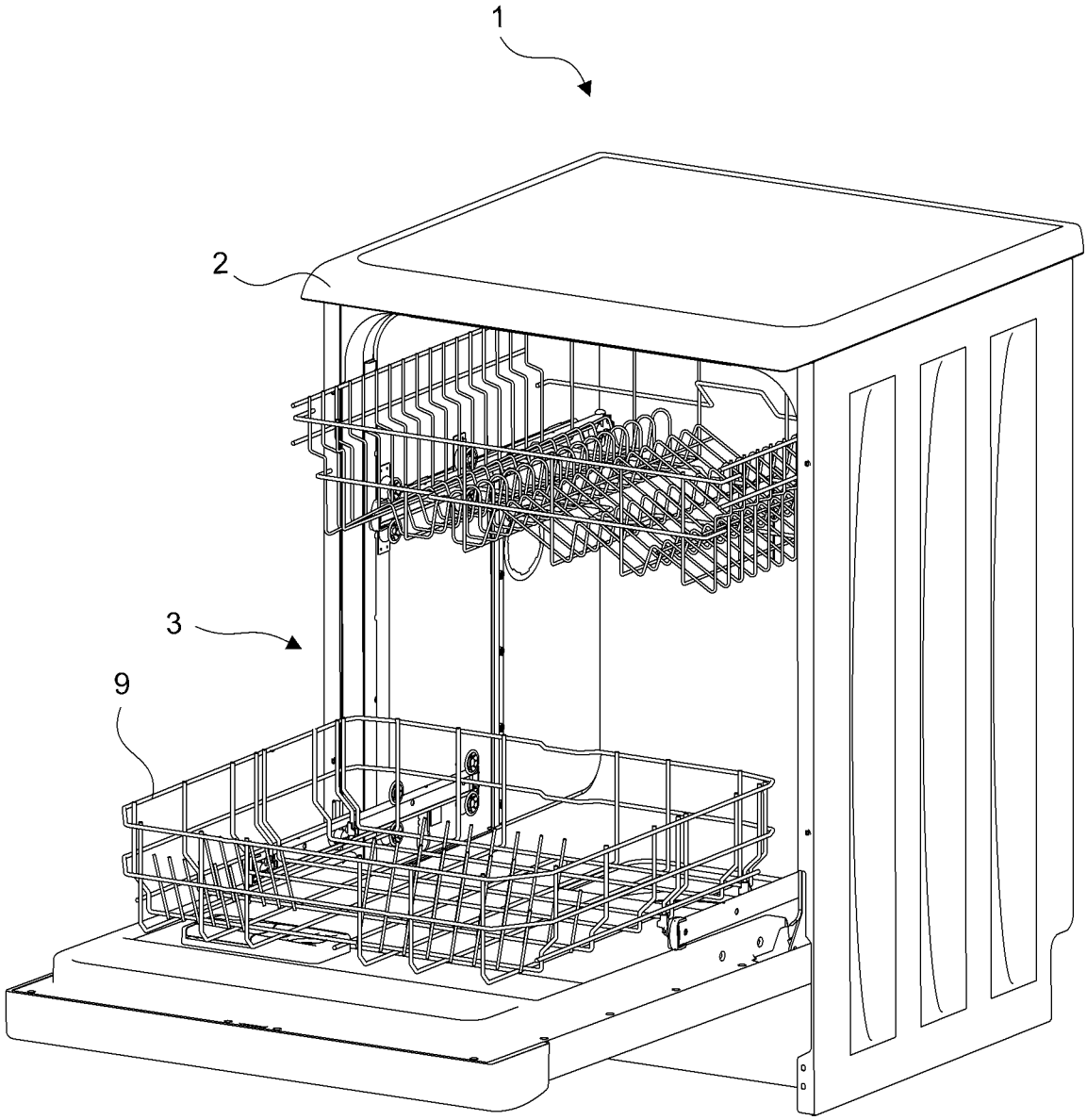


Figure 2

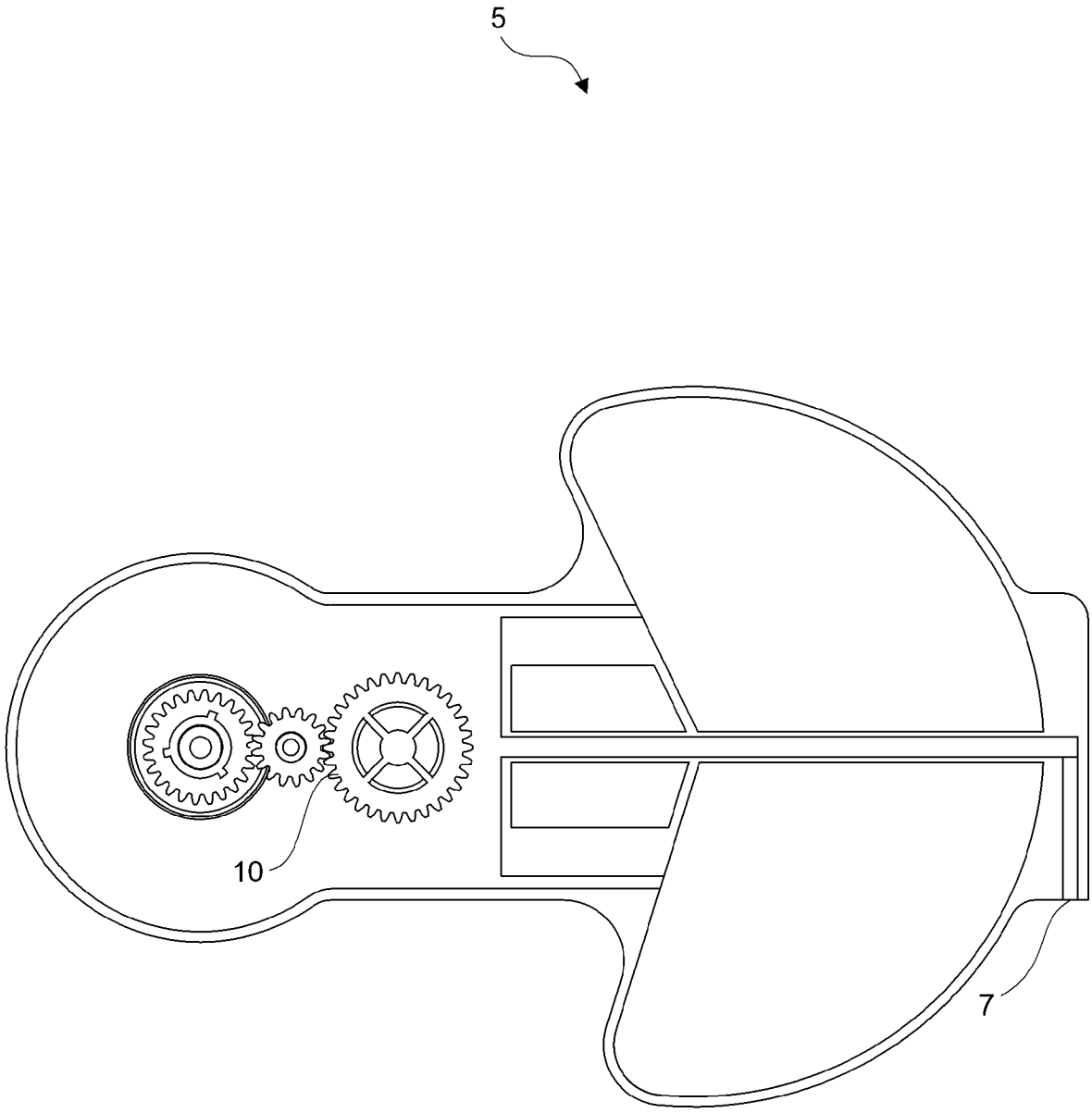


Figure 3

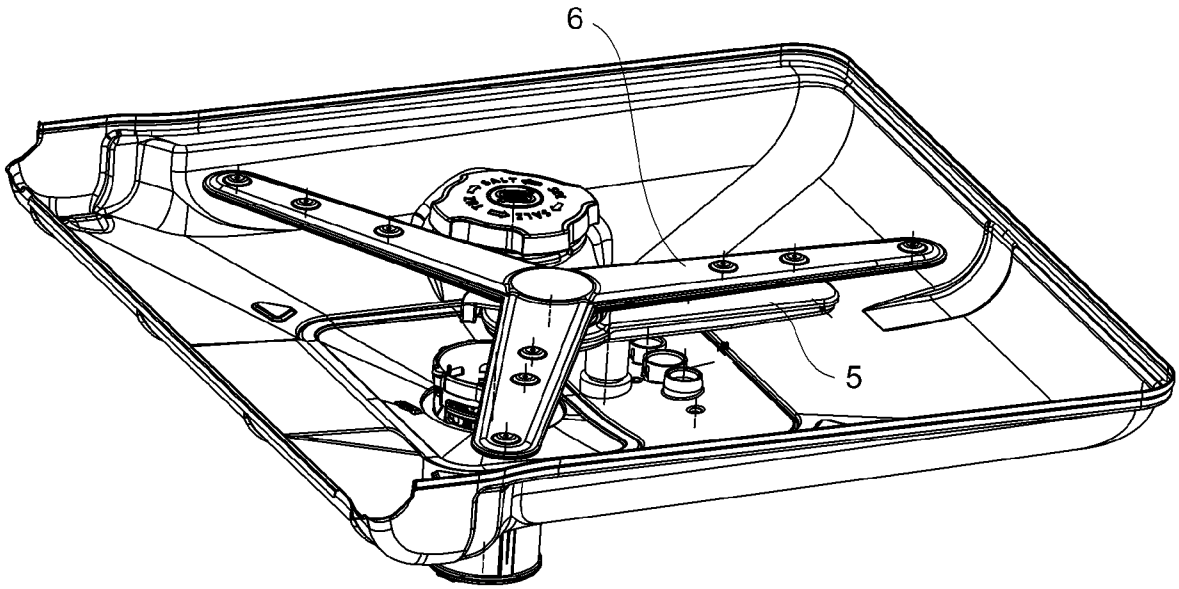
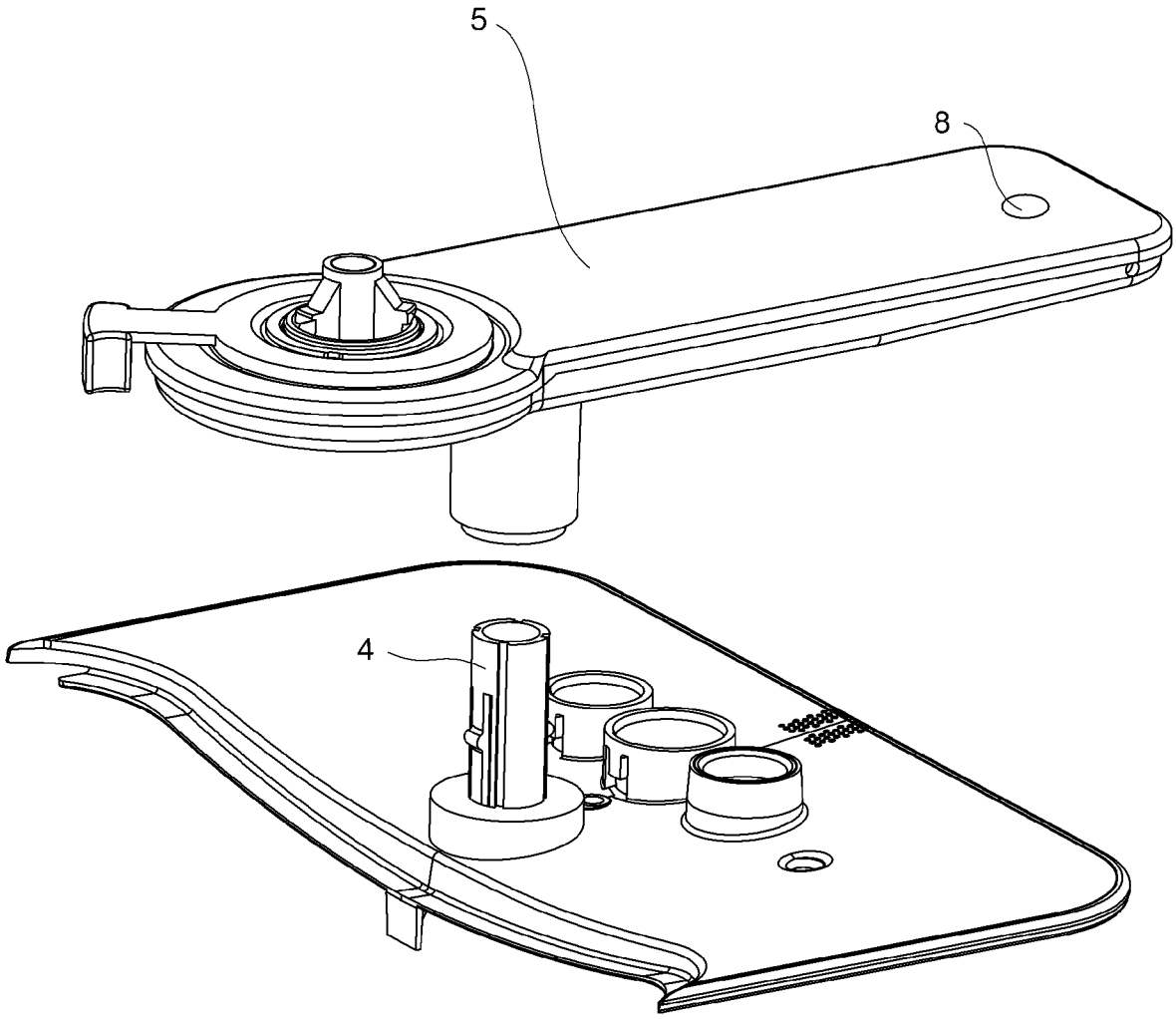


Figure 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/069890

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L15/23 A47L15/20
ADD.

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)
A47L

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 5 477 874 A (YURA MASAKI [JP] ET AL) 26 December 1995 (1995-12-26)	1-4,6
Y	column 7, line 19 - line 61; figures 11,12	5
X	US 2013/125936 A1 (FOERSTER SARAH [DE] ET AL) 23 May 2013 (2013-05-23) paragraphs [0023], [0032]; figures 2,3b	1-4,6
X	JP 2014 121353 A (PANASONIC CORP) 3 July 2014 (2014-07-03)	1-4,6
Y	paragraph [0032]; figures 3,4	5
X	US 2013/139860 A1 (FOERSTER SARAH [DE] ET AL) 6 June 2013 (2013-06-06) paragraphs [0011], [0012], [0026]	1

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

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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2

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/069890

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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2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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