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(54) **A DISHWASHER HAVING IMPROVED WASHING PERFORMANCE**

GESCHIRRSPÜLMASCHINE MIT VERBESSERTER WASCHLEISTUNG

LAVE-VAISSELLE PRÉSENTANT UNE PERFORMANCE DE LAVAGE AMÉLIORÉE

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Description

[0001] The present invention relates to a dishwasher, in particular to a dishwasher having an actuator and a spray arm rotatable attached to the actuator so as to improve the washing performance of the dishwasher.

[0002] In dishwashers, the items placed on to the dishwasher drawers close or on to the corner regions of a tub may not be cleaned well due to the washing tubs generally having a rectangular cross-section and the pivoting spray arms forming an annular washing area. By use of multiple spraying arms rotating on different axes and heights relative to the bottom of the tub are known as a solution to overcome this problem. In order to create the momentum necessary to rotate the actuator and the spray arm attached to the actuator, multiple nozzles are provided on the spray arm so as to eject the water thereby rotating the spray arm. The actuator rotates on the base of the tub and pivots around an axis, created by the momentum of water sprayed through the nozzles provided on the spray arm. The spray arm rotates about another axis offset from the axis of the actuator. By this, the end of the spray arm extends farther to the corner regions, enabling better cleaning of the items near the corner regions. In such applications, the spray arm and the actuator are coupled to each other via a plurality of gears so as to rotate them during washing and rinsing. The gears that are exposed to the washing water inside the tub may malfunction due to food particles getting stuck in between the wheels of the gears. This necessitates protection of gears from the outer conditions.

[0003] A prior art publication in the technical field of the present invention may be referred to as US5464482 among others, the document disclosing a dishwasher comprising a primary and secondary wash arms.

[0004] In the state of the art European Patent Application No. EP2233057, a dishwasher is disclosed an improved drying system and a relevant operating cycle.

[0005] In the state of the art China Patent Application No. CN107028572, relates to spray arm device for a dishwasher which comprises: a spray arm holder; a sun gear provided at a water outlet of the spray arm holder wherein the relative position of the sun gear and the spray arm holder are fixed; a planetary gear being in a drive connection with the sun gear via a transmission gear; a carrier with the sun gear, the transmission gear, and the planetary gear being rotatably disposed under the carrier, wherein the spray arm body is fixedly connected with the planetary gear, and the spray arm body is provided with an injection hole communicating with the spray arm holder.

[0006] An objective of the present invention is to rotate the agitator and the spray arm about different axes so as to clean the dishes near corner regions and more importantly eliminating the possibility of food particles getting in between the wheels of the gear.

[0007] The dishwasher realized to achieve the aim of the present invention is defined in the independent claim.

Preferred embodiments of this dishwasher are defined in the dependent claims.

[0008] An embodiment comprises a dishwasher having a body, having a tub wherein washing, rinsing and drying operations take place. An actuator is rotatable attached to the bottom of the tub around a stationary axis via a base gear. The base gear is connected to a water conduit transferring water inside the tub via a pump that is used to pressurize the water. A spray arm is attached to the actuator and rotates about a moving vertical axis offset from the stationary axis, thereby the spray arm extends farther to the corner regions of the tub, enabling better cleaning of the dishes near the corner regions. The spray arm is in fluid communication with the actuator, so that the water pumped inside the actuator passes through the actuator, spray arm and nozzles of the spray arm respectively. The spray arm gear and the base gear are connected to each other via at least an intermediary gear. The intermediary gear provides the rotation of the base gear which in turn rotates the actuator. The intermediary gear is located inside a gear room isolated from the rest of the actuator and the tub. The spray arm gear and the base gear are partially located inside the gear room so as to rotatable couple with the intermediary gear. By this means, matching parts of the gears are isolated from the tub and the actuator, preventing food particles to get in between the wheel of the gears thereby prolonging the use of the actuator.

[0009] In an embodiment of the invention, the gear room is insulated from the rest of the dishwasher in a waterproof manner. By this means, food particles floating inside the washing water is prevented to enter inside the gear room therefore preventing food particles to get in between the wheels of the gears. Therefore, maintenance costs caused by replacement parts are decreased.

[0010] In an embodiment of the invention, the gear room is in the shape of a ring. The base gear is located off the center of the gear room. Due to asymmetrical location of the base gear inside the gear room and also the actuator, spray arm rotates in a Reuleaux triangle reaching the corners of the tub and cleaning the dishes in an effective way. The gear room is a circular waterproof chamber around the base gear with one side being wider wherein the intermediary gear and the spray arm gear is located. The spray arm gears forms a protrusion protruding upwards from a hole provided on the gear room. The wheels of the spray arm gear and the base gear are located inside the gear room.

[0011] In an embodiment of the invention, the spray arm gear has at least one lug protruding towards the spray arm embodiment of the invention and extending through an opening provided on the actuator. The lugs are originated from the spray arm gear and are in the shape of a rectangular prism. The lugs and the spray arm gear are produced in one piece. By use of the lugs, the spray arm is fitted on to the spray arm gear robustly.

[0012] In an embodiment of the invention, the central gear is connected to the spray arm gear via a plurality of

intermediary gears. The total number of gears, including the central gear and the spray arm gear, must be an odd number so as to rotate the spray arm in the opposite direction with respect to the actuator. The base gear is produced so as not to move with respect to the actuator. Upon rotation of the spray arm, the spray arm gear starts to rotate with the same direction of the spray arm. The Intermediary gear rotates in opposite direction and starts to turn around the base gear forcing the actuator to rotate in a direction opposite to the spray arm. Therefore, the corners of the tub are sprayed effectively with water and cleaning agent sprayed through the spray arm.

[0013] In an embodiment of the invention, the spray arm is configured to be attached on to the spray arm gear in a specific click-fit orientation so as to provide a robust assembly.

[0014] A major advantageous effect of the invention is that the gears are isolated from the washing water thereby clogging of food particles inside the wheels of the gears is prevented. Another advantageous effect of the invention is that the agitation of the water and detergent mix by the gears is minimized thereby resulting in foaming at a reasonable level.

[0015] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in the claims without recourse to the technical disclosure in the description of the present invention.

Figure 1 - is a perspective view of the dishwasher.

Figure 2 - is a perspective view of the bottom of the tub with the actuator and the spray arm.

Figure 3 - is a cross sectional view along the A-A line in Figure - 2.

Figure 4 - is a cross sectional view along the B-B line in Figure - 2.

[0016] The following numerals are assigned to different parts demonstrated in the drawings and referred to in the present detailed description of the invention:

1. Dishwasher
2. Body
3. Tub
4. Actuator
5. Base gear
6. Water inlet
7. Spray arm
8. Spray arm gear
9. Gear room
10. Intermediary gear
11. Lug

[0017] The present invention relates to a dishwasher (1) comprising; a body (2), a tub (3) inside the body (2) wherein the washing operation takes place, an actuator (4) rotatable attached to the bottom of the tub (3) around a stationary axis via a base gear (5) having a hollow cent-

er to transfer water delivered from a water inlet (6) inside the actuator (4), a spray arm (7) in fluid communication with the actuator (4) so as to spray the dishes with water, and wherein the spray arm (7) is rotatable placed on to the actuator (4) around a moving vertical axis via a spray arm gear (8), which upon rotation, rotates around the stationary vertical axis in a circular trajectory.

[0018] The present invention relates to a dishwasher (1) comprising; the actuator (4) comprising a gear room (9) having an inner volume separated from the inner volume of the actuator (4) wherein at least an intermediary gear (10) is placed and wherein the intermediary gear (10) connects the spray arm gear (8) and the base gear (5) to provide power transmission. The actuator (4) is rotatable attached to the bottom of the tub (3). The base gear (5) is formed in the shape of a hollow cylindrical tube having a hollow center and is connected to the water inlet (6) to transfer water inside the tub (3) for washing and rinsing operations. In an embodiment, the actuator (4) comprises the spray arm gear (8) which is used to rotatable connect the actuator (4) to the spray arm (7). During the activation of the pump, the water is pumped through the water inlet (6), the base gear (5), the spray arm gear (8) and the spray arm (7) respectively. Nozzles provided along the spray arm (7) ejects the water towards the dishes and starts to rotate the spray arm (7) around the moving vertical axis. This rotation is transferred via the spray arm gear (8) to the intermediary gear (10). Upon rotation of the intermediary gear (10) around the base gear (5), the actuator (4) starts to rotate around the stationary vertical axis. The parts of the base gear (5) and spray arm gear (8) interacting with the intermediary gear (10) and the intermediary gear (10) are located inside the gear room (9). By this means, the intermediary gear (10) and corresponding parts of the base gear (5) and spray arm gear (8) is isolated from the inside of the dishwasher (1) preventing particles of food to get in between the gears. Therefore, malfunctions caused by jamming of gears is prevented. Another advantageous effect of the present invention is that the number of revolutions of the spray arm (7) is fixed prolonging the use of the spray arm (7) and therefore that of the dishwasher (1).

[0019] In another embodiment, the gear room (9) is insulated from the actuator (4) and the tub (3) in a watertight manner via a plurality of seals. During washing and rinsing, particles of food are mixing with water and permeates the parts of the dishwasher (1). By isolating the gear room (9) from the rest of the dishwasher (1) it is ensured that the particles of food will not be able to enter the gear room (9) causing malfunctions by getting between the gears.

[0020] In another embodiment, the gear room (9) is in the form of a ring having an off-center bore with the base gear (5) passing through the gear room (9). The base gear (5) is located off the center of the gear room (9) meaning that the rotational centers of the actuator (4) and the spray arm (7) do not coincide. This way it is ensured that the spray arm (7) reaches the corners of the

tub (3) and clean the dishes in an effective way. Upon placing the base gear (5) through the gear room (9) via the bore provided, wheels of the base gear (5) reaches inside the gear room (9) and are coupled with the intermediary gear (10). The spray arm gear (8) is at least partly inside the gear room (9) and is coupled with the intermediary gear (10). The spray arm gear (8) protrudes upwards towards the spray arm (7) via the hole provided on the gear room (9) and through the rest of the actuator (4) in a waterproof manner.

[0021] In another embodiment, the spray arm gear (8) has at least a lug (11) protruding towards the spray arm (7) by extending along and radially outward from the moving vertical axis to connect the actuator (4) form fittingly upon placement of the spray arm (7) on to the spray arm gear (8). Multiple lugs (11) are formed extending along and radially outward from the moving vertical axis and are formed in the shape of a rectangular prism, first longitudinal face being attached to the spray arm gear (10) and second neighboring longitudinal face being connected to the second neighboring longitudinal face of an adjacent lug (11) along the moving vertical axis. Multiple lugs (11) are connected symmetrically around the moving vertical axis forming congruent angles in between. The angle formed between two lugs (11), three lugs (11) or four lugs (11) are, 180 degrees, 120 degrees and 90 degrees respectively. The water entering the actuator (4) is transferred between the adjacent lugs (11) towards the spray arm (7). Therefore, a means to transfer the water towards the spray arm (7) is achieved that will not be clogged by the particles of food inside the water.

[0022] In another embodiment, the spray arm gear (8) is coupled to the base gear (5) via an odd number of intermediary gears (10). Use of odd number of gears, including the spray arm gear (8) and the base gear (5), ensures that the spray arm (7) and the actuator (4) rotates in opposite directions. As a result of this, the corners of the tub (3) are sprayed with water mixed with cleaning agent, thereby improving cleaning capacity and quality of the dishwasher (1). Another advantageous effect of using the intermediary gear (10) is that the number of rotations of the spray arm gear (8) can be adjusted by using a double layer gear as the intermediary gear (10). Therefore, higher number of rotations per unit time can be achieved, increasing the cleaning capacity of the dishwasher (1).

[0023] In another embodiment, the spray arm (6) is configured to be engaged and mounted on to the spray arm gear (8) in a specific click-fit orientation. During washing and rinsing operations, the spray arm (7) is rotating with a high angular velocity to ensure effective cleaning of the dishes. The connection between the spray arm (7) and the spray arm gear (8) is in the form of a click-fit orientation which is resistant to disengagement of the spray arm (7) from the spray arm gear (8). Click-fit connection also guides the user during assembly and disassembly making the dishwasher (1) easier to clean and maintain.

[0024] By means of this invention, a dishwasher, having an actuator (4) rotatable attached to the bottom of the tub (3) wherein the actuator (4) comprises a gear room (9) separating an intermediary gear (10) and the connection between the intermediary gear (10) and the base gear (5) and the spray arm gear (8) from the tub (3) in a waterproof manner, is provided. Therefore, a longer lifetime for the actuator (4) is achieved.

Claims

1. A dishwasher (1) comprising;

a body (2),
a tub (3) inside the body (2) wherein the washing operation takes place,
an actuator (4) rotatable attached to the bottom of the tub (3) around a stationary axis via a base gear (5) having a hollow center to transfer water delivered from a water inlet (6) inside the actuator (4),
a spray arm (7) in fluid communication with the actuator (4) so as to spray the dishes with water, and wherein the spray arm (7) is rotatable placed on to the actuator (4) around a moving vertical axis via a spray arm gear (8), which upon rotation, rotates around the stationary vertical axis in a circular trajectory,
wherein the actuator (4) comprises a gear room (9) in the form of a ring having an off-center bore with the base gear (5) passing through the gear room (9) and having an inner volume separated from the inner volume of the actuator (4) wherein at least an intermediary gear (10) is placed and wherein the intermediary gear (10) connects the spray arm gear (8) and the base gear (5) to provide power transmission.

2. A dishwasher (1) according to claim 1, wherein the gear room (9) is insulated from the actuator (4) and the tub (3) in a waterproof manner via a plurality of seals.

3. A dishwasher (1) according to any one of the preceding claims, wherein the spray arm gear (8) has at least a lug (11) protruding towards the spray arm (7) by extending along and radially outward from the moving vertical axis to connect the actuator (4) form fittingly upon placement of the spray arm (7) on to the spray arm gear (8).

4. A dishwasher (1) according to any one of the preceding claims, wherein the spray arm gear (8) is coupled to the base gear (5) via an odd number of intermediary gears (10).

5. A dishwasher (1) according to any one of the pre-

ceding claims, wherein the spray arm (7) is configured to be engaged and mounted on to the spray arm gear (8) in a specific click-fit orientation.

Patentansprüche

1. Eine Geschirrspülmaschine (1) umfasst

einen Körper (2),
eine Wanne (3) im Inneren des Körpers (2), in der der Waschvorgang stattfindet,
einen Aktuator (4), der drehbar am Boden der Wanne (3) um eine stationäre Achse über ein Basisgetriebe (5) mit hohlem Zentrum befestigt ist, um von einem Wassereinlass (6) geliefertes Wasser in das Innere des Aktuators (4) zu übertragen,
einen Sprüharm (7), der in Fluidverbindung mit dem Aktuator (4) steht, um das Geschirr mit Wasser zu besprühen, wobei der Sprüharm (7) über ein Sprüharmgetriebe (8) drehbar um eine sich bewegende vertikale Achse am Aktuator (4) angebracht ist, das sich bei Drehung um die stationäre vertikale Achse auf einer kreisförmigen Bahn dreht,
wobei
der Aktuator (4) einen Getrieberraum (9) in Form eines Rings mit einer außermittigen Bohrung umfasst, wobei das Basisgetriebe (5) durch den Getrieberraum (9) verläuft und ein vom Innenvolumen getrenntes Innenvolumen des Aktuators (4) aufweist, wobei mindestens ein Zwischenzahnrad (10) platziert ist und wobei das Zwischenzahnrad (10) das Sprüharmgetriebe (8) und das Basisgetriebe (5) verbindet, um eine Kraftübertragung bereitzustellen.

2. Eine Geschirrspülmaschine (1), wie in Anspruch 1 aufgeführt, wobei der Getrieberraum (9) über mehrere Dichtungen wasserdicht gegenüber dem Aktuator (4) und der Wanne (3) isoliert ist.

3. Eine Geschirrspülmaschine (1), wie in einem der vorherigen Ansprüchen aufgeführt, wobei das Sprüharmgetriebe (8) mindestens einen Vorsprung (11) aufweist, der in Richtung des Sprüharms (7) vorsteht, indem er sich entlang der beweglichen vertikalen Achse und radial nach außen erstreckt, um den Aktuator (4) beim Aufsetzen des Sprüharms (7) formschlüssig mit dem Sprüharmgetriebe (8) zu verbinden.

4. Eine Geschirrspülmaschine (1), wie in einem der vorherigen Ansprüchen aufgeführt, wobei das Sprüharmgetriebe (8) über eine ungerade Anzahl von Zwischenzahnradern (10) mit dem Basisgetriebe (5) gekoppelt ist.

5. Eine Geschirrspülmaschine (1), wie in einem der vorherigen Ansprüchen aufgeführt, wobei der Sprüharm (7) so konfiguriert ist, dass er in einer bestimmten Rastausrichtung mit dem Sprüharmgetriebe (8) in Eingriff gebracht und daran befestigt werden kann.

Revendications

1. Un lave-vaisselle (1) comprenant :

un corps (2),
une baignoire (3) à l'intérieur du corps (2) dans laquelle se déroule l'opération de lavage,
un actionneur (4) rotatif fixé au fond de la baignoire (3) autour d'un axe fixe par l'intermédiaire d'un engrenage de base (5) ayant un centre creux pour transférer l'eau provenant d'une entrée d'eau (6) à l'intérieur de l'actionneur (4),
un bras de pulvérisation (7) en communication fluide avec l'actionneur (4) afin de pulvériser de l'eau sur la vaisselle, et dans lequel le bras de pulvérisation (7) est rotatif, placé sur l'actionneur (4), autour d'un axe vertical mobile par l'intermédiaire d'un engrenage de bras de pulvérisation (8) qui, lors de la rotation, tourne autour de l'axe vertical stationnaire selon une trajectoire circulaire,
dans lequel
l'actionneur (4) comprend une chambre d'engrenage (9) sous la forme d'un anneau ayant un alésage décentré avec l'engrenage de base (5) traversant la chambre d'engrenage (9) et ayant un volume intérieur séparé du volume intérieur de l'actionneur (4) dans lequel au moins un engrenage intermédiaire (10) est placé et dans lequel l'engrenage intermédiaire (10) relie l'engrenage du bras de pulvérisation (8) et l'engrenage de base (5) pour assurer la transmission de la puissance.

2. Un lave-vaisselle (1) selon la déclaration 1, dans lequel la salle des engrenages (9) est isolée de l'actionneur (4) et de la baignoire (3) de manière étanche par l'intermédiaire d'une pluralité de joints.

3. Un lave-vaisselle (1) selon l'une quelconque des déclarations précédentes, dans lequel l'engrenage du bras de pulvérisation (8) comporte au moins un ergot (11) faisant saillie vers le bras de pulvérisation (7) en s'étendant le long et radialement vers l'extérieur de l'axe vertical mobile pour relier l'actionneur (4) de manière ajustée lors du placement du bras de pulvérisation (7) sur l'engrenage du bras de pulvérisation (8).

4. Un lave-vaisselle (1) selon l'une quelconque des déclarations précédentes, dans lequel l'engrenage du

bras de pulvérisation (8) est couplé à l'engrenage de base (5) par l'intermédiaire d'un nombre impair d'engrenages intermédiaires (10).

5. Un lave-vaisselle (1) selon l'une quelconque des déclarations précédentes, dans lequel le bras d'aspersion (7) est configuré pour être engagé et monté sur l'engrenage du bras d'aspersion (8) dans une orientation spécifique d'encliquetage.

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Figure 1

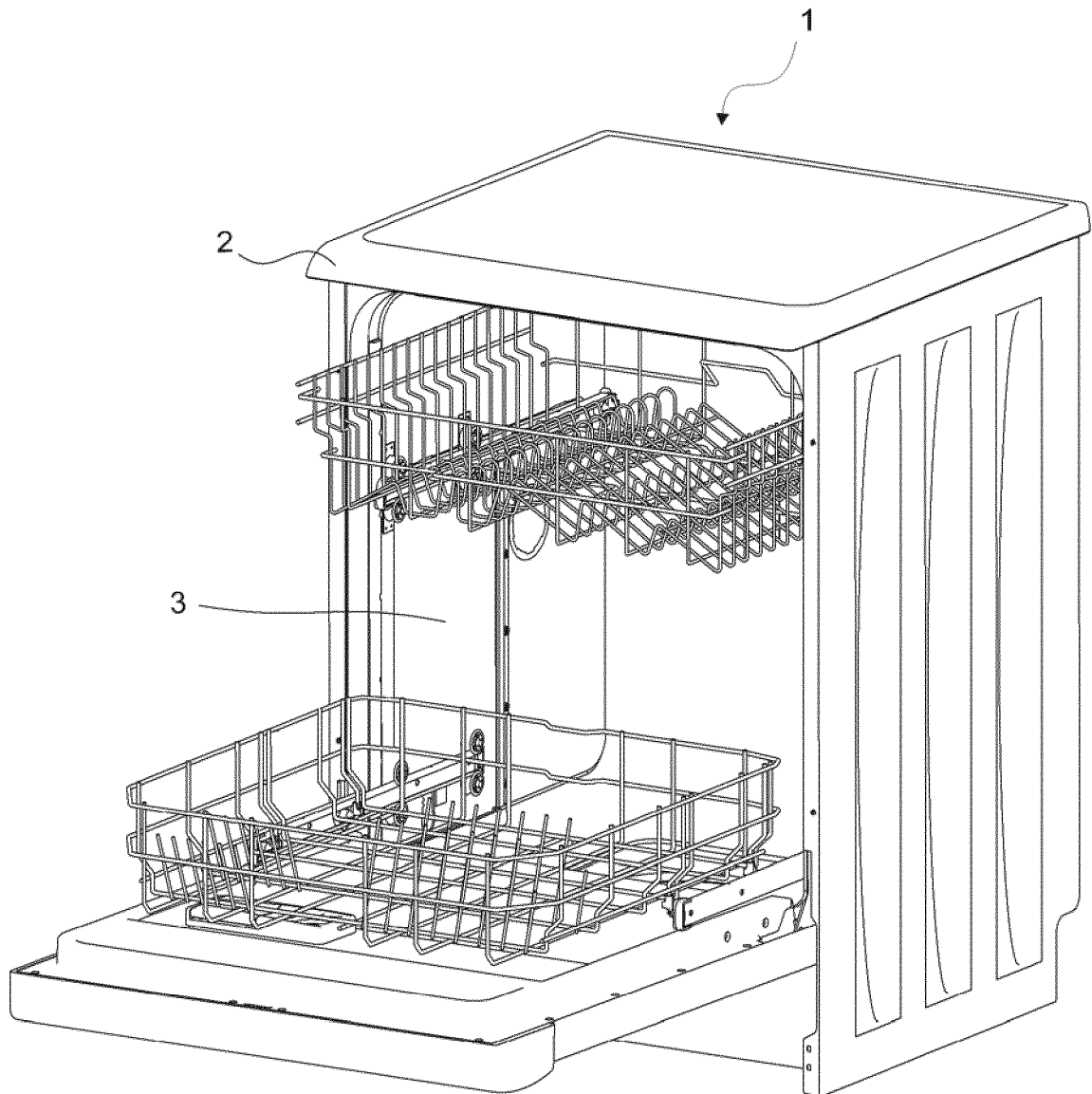


Figure 2

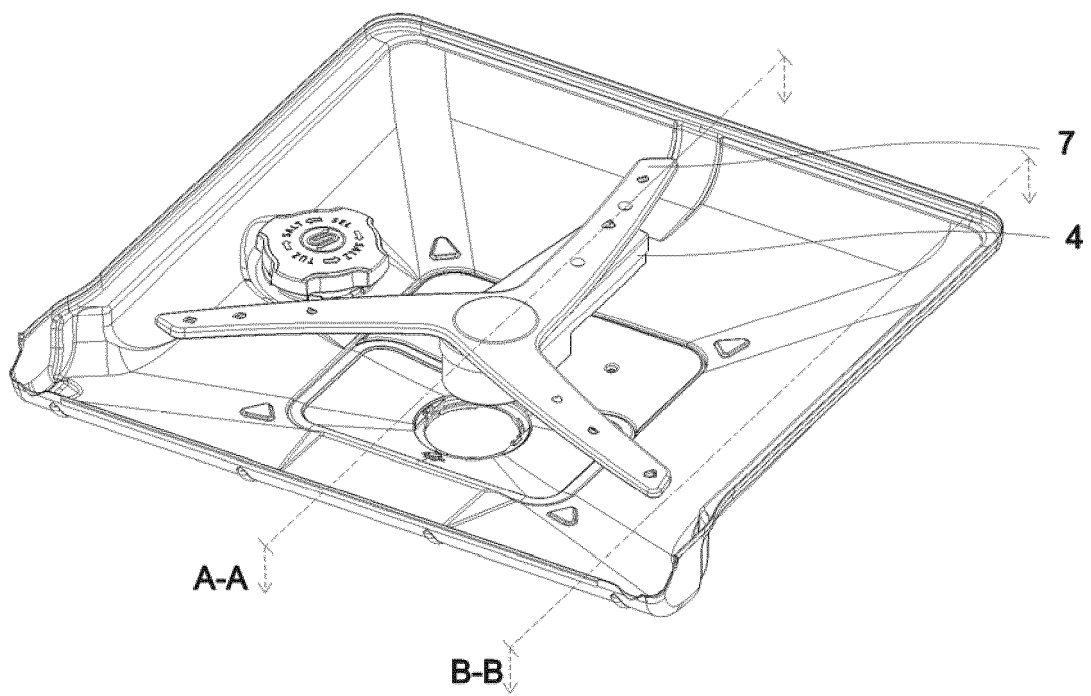


Figure 3

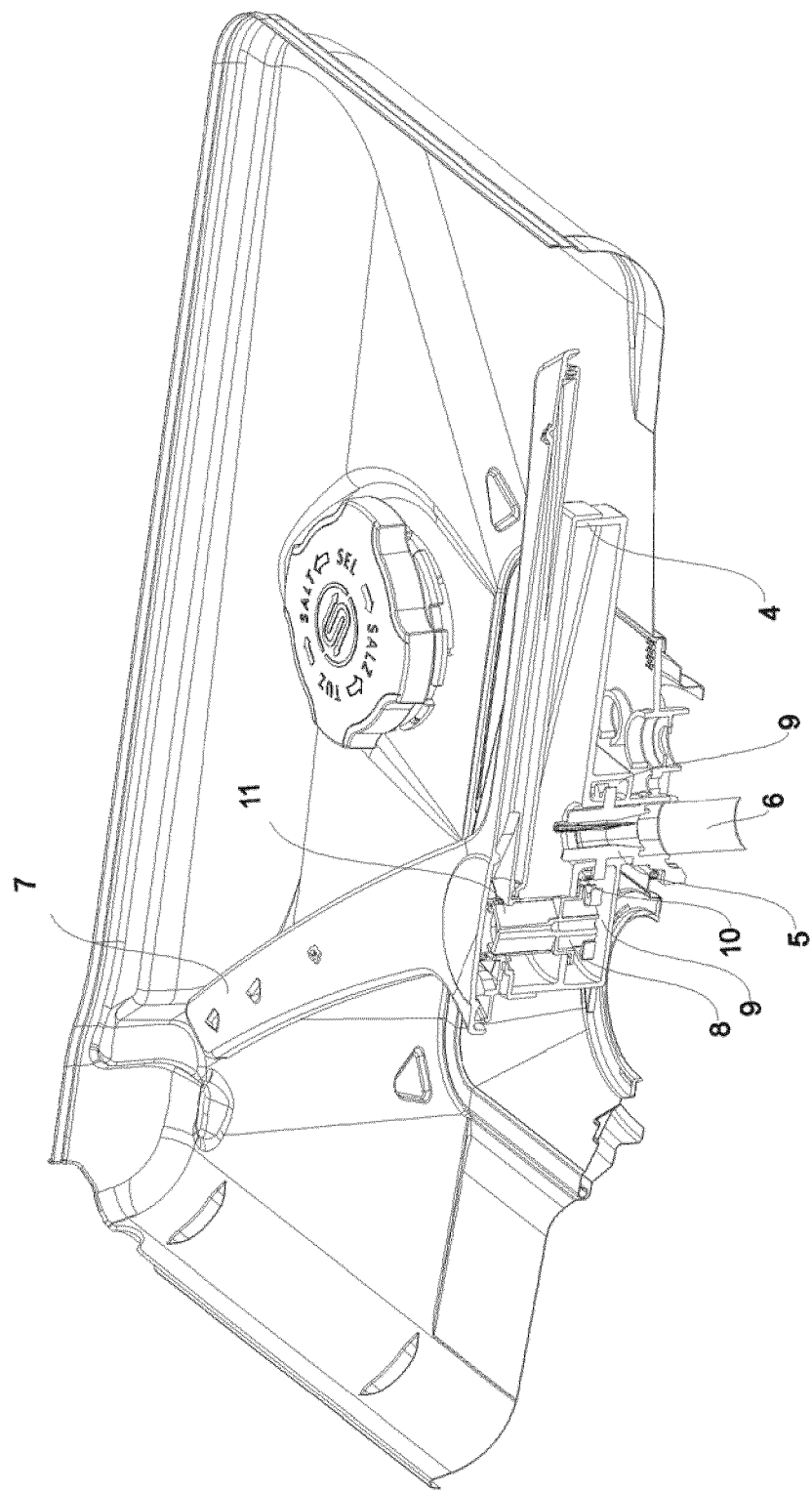
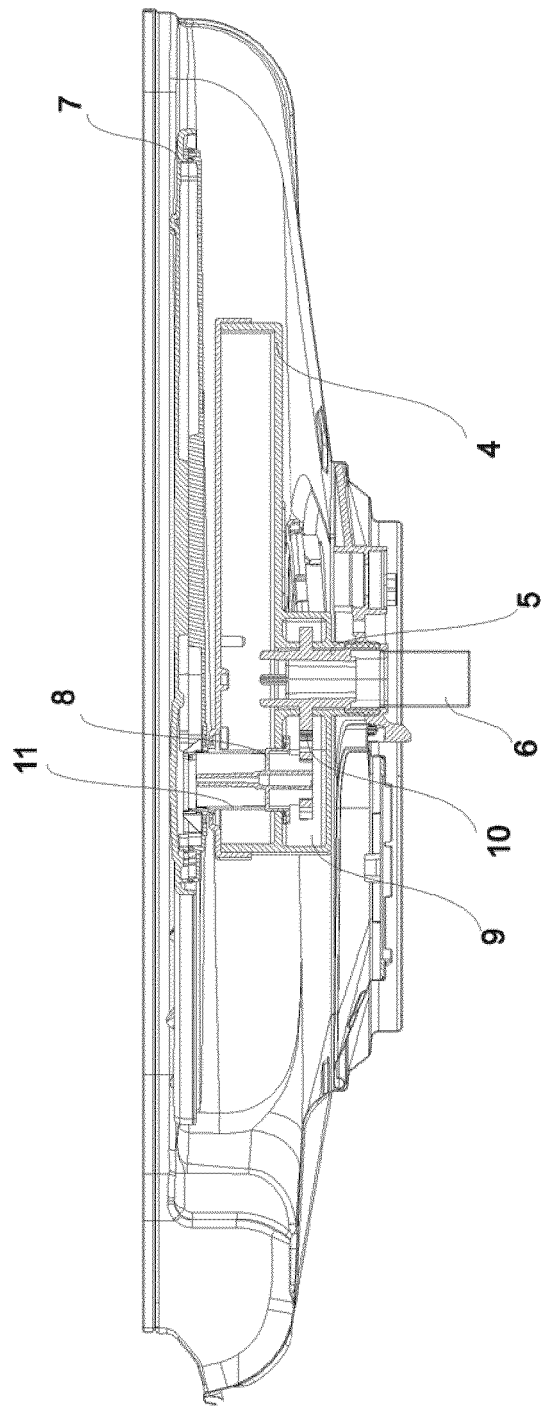


Figure 4



REFERENCES CITED IN THE DESCRIPTION

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