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(54) **Sprinkling assembly for dishwashers comprising a secondary oscillating sprinkler**

(57) A sprinkling assembly for dishwashers includes a primary revolving sprinkler (1) and a secondary oscillating sprinkler (2) coaxially pivoted on a support (3) through which water under pressure is fed, the secondary sprinkler (2) having such a length as to project beyond the primary sprinkler (1) and being provided with opposite wash and propulsion nozzles (2a, 2b, 2c, 2d) located in the end portions projecting beyond the primary sprinkler (1) and therefore suitable to reach the portions of a rectangular wash tank not covered by the primary sprinkler (1). The sequential emission of water jets from said wash and propulsion nozzles (2a, 2b, 2c, 2d) is controlled by a rotating shutter (10) whose rotation is controlled by the rotation of the primary sprinkler (1) according to a transmission ratio greater then unity, whereby the oscillating frequency of the secondary sprinkler (2) is lower than the revolving frequency of the primary sprinkler (1).

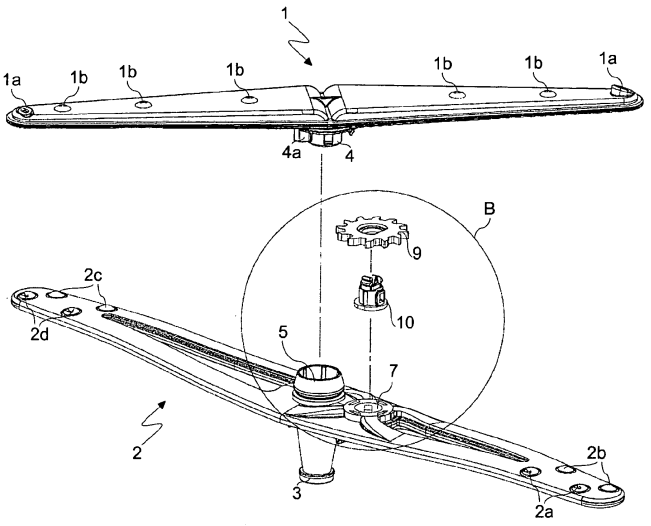

Fig.3

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Description

[0001] The present invention relates to sprinkling assemblies for dishwashers, and in particular to a sprinkling assembly comprising a primary revolving sprinkler and a secondary sprinkler capable of moving with an oscillatory motion in the horizontal plane.

[0002] It is known that conventional revolving sprinklers essentially consist of a single device pivoted on a vertical axis central shaft and provided with at least one propulsion nozzle at one end, as well as with other nozzles arranged along said device to sprinkle the dishes contained in the dishwasher rack. Since the rotation axis of said device is fixed, the resulting paths of the nozzles consist of circumferences centered on the rotation axis.

[0003] From this follows that the above-mentioned device directly sprinkles always and only the surfaces of the dishes which are along said circular paths, with a limited washing effectiveness. Moreover, the area which can be reached by the water ejected from the nozzles approximately corresponds to the area of the square circumscribed about the circular path of the outermost nozzle.

[0004] The simplest solution in trying to overcome this latter limit is that of giving a greater inclination to the end nozzles of the sprinkler so that the water jets emitted therefrom reach beyond the area of rotation. For example, it is possible to use a sprinkler provided with a nozzle inclined at about 75° so as to cover also the foremost portion of the rack in a dishwasher whose width is smaller than its length (typically 45 x 60 cm).

[0005] This solution has a first drawback of poor washing effectiveness in the end portion of the rack, since very inclined jets are unable to properly enter between the dishes arranged side by side like the almost vertical jets emitted by the other nozzles can do. Moreover, a second drawback stems from the fact that such inclined jets hit the walls of the washing space with a considerable horizontal component thus causing a significant noisiness of the dishwasher.

[0006] An improvement with respect to this simple type of sprinkler is the mobile sprinkler disclosed in EP 0727176 which is pivoted on a shaft located at the end of a support arm which is in turn vertically pivoted at its other end to a feed duct integral with the wash tank. This support arm is therefore provided also with a horizontal reciprocating motion generated by the sprinkler itself due to the distance between the axis of the shaft on which it is pivoted and the point where the support arm is pivoted on the feed duct.

[0007] In fact, the inclined jet coming out from a propulsion end nozzle of the sprinkler generates a reaction force which can be broken up in the horizontal plane into a first component along the longitudinal axis of the sprinkler and a second component along a direction perpendicular thereto. While this second component is the one which generates the rotation of the sprinkler, the component along the longitudinal axis is discharged on the shaft located at the end of the support arm. This results, therefore, in a horizontal rotation of said arm pivoted on the vertical axis of the feed duct, moving alternately from right to left and backwards according to the rotation of the sprinkler, i.e. according to the direction from which the axial component arrives on the sprinkler shaft.

[0008] This arrangement allows to sprinkle also the outermost dishes when they are arranged in a rectangular tank and also increases the surface directly sprinkled by the jets emitted from the nozzles, since thanks to the combination of the revolving motion of the sprinkler with the reciprocating motion the nozzle paths have a much more complex development. However in this type of structure the revolving and reciprocating motions of the sprinkler are mutually bound, i.e. at each rotation of the sprinkler corresponds a translation thereof due to the oscillation of the support arm.

[0009] This implies that a high revolving frequency of the sprinkler corresponds to a high oscillating frequency of the support arm and therefore to a certain noisiness since the support arm hits the end stops at the end of each travel. Moreover, it is impossible to reduce said oscillating frequency of the arm without decreasing the revolving speed of the sprinkler thus negatively affecting the washing effectiveness.

[0010] An improvement over this arrangement is disclosed in EP 1201178 that provides a sprinkling assembly wherein the ratio between the revolving frequency of the sprinkler and the oscillating frequency of the support arm is no longer one but much greater. In other words, it is possible to set a transmission ratio whereby the oscillation of the support arm occurs only every given number of rotations of the sprinkler, with the advantage of lower noisiness and lower wear achieved thanks to the reduction of the oscillating frequency of the support arm.

[0011] To achieve this, in brief, the support arm is provided with two opposite nozzles suitable to emit jets that cause the oscillation of the arm, the emission of said jets being controlled by a rotating shutter whose rotation is controlled by the rotation of the sprinkler through a lower ring externally provided with a tooth suitable to engage with an adjacent horizontal toothed wheel which is integral with the shutter.

[0012] Although this sprinkling assembly provides significant advantages with respect to the sprinkling assembly disclosed in EP 0727176, nonetheless it is not free from drawbacks substantially due to the presence of the cantilevered support arm which still implies problems of cost, complexity and reliability.

[0013] Therefore the object of the present invention is to provide a revolving sprinkling assembly that overcomes the above-mentioned limits of prior art sprinklers.

[0014] This object is achieved by means of a sprinkling assembly in which the revolving sprinkler is no longer mounted on a cantilevered support arm but rather on a secondary oscillating sprinkler which is longer and coaxial thereto. In other words, a mechanism similar to the

mechanism that in EP 1201178 was used to achieve the oscillation of the support arm only every given number of rotations of the revolving sprinkler, in this new arrangement is used to achieve a periodical oscillation of said secondary sprinkler that having a greater length can reach the portions of the tank not covered by the revolving sprinkler.

[0015] The fundamental advantage of the sprinkling assembly according to the present invention resides in its greater simplicity, inexpensiveness and reliability obtained thanks to the elimination of the cantilevered support arm and to the coaxial arrangement of the two sprinklers in the middle of the wash tank.

[0016] A further advantage stems from the possibility of easily setting within a certain range the transmission ratio between the two sprinklers, i.e. the time interval between the oscillations of the secondary sprinkler.

[0017] These and other advantages and characteristics of the sprinkling assembly according to the present invention will be clear to those skilled in the art from the following detailed description of two embodiments thereof, with reference to the annexed drawings wherein:

Fig.1 is a diagrammatic, partially sectional side view of a first embodiment of the sprinkling assembly;
Fig.2 is an enlarged view of detail A of Fig.1.
Fig.3 is a diagrammatic exploded view of the sprinkling assembly;
Fig.4 is an enlarged view of detail B of Fig.3;
Fig.5 is a diagrammatic top plan view of the sprinkling assembly placed at the center of the wash tank of a dishwasher whose width is smaller than its length;
Fig.6 is an enlarged view of detail C of Fig.5; and
Fig.7 is a diagrammatic top plan view of a second embodiment of the sprinkling assembly placed in the same wash tank of Fig.5 but at an eccentric position.

[0018] Referring to figures 1 to 6, there is seen that the sprinkling assembly according to the present invention essentially consists of a primary revolving sprinkler 1 and a secondary oscillating sprinkler 2, with the former coaxially pivoted on the latter which is in turn pivoted on a support 3 arranged at the end of a water supply duct (not shown).

[0019] In practice, as shown in the detail of Fig.2, sprinkler 1 is centrally snap-fitted on sprinkler 2 through a bottom ring 4 that engages a top socket 5 of sprinkler 2, which is in turn centrally snap-fitted through a bottom ring 6 that engages support 3 and is in communication with the top socket 5. In this way, the supply duct reaching support 3 feeds both sprinklers 1 and 2.

[0020] The primary sprinkler 1 is a conventional hollow sprinkler with two opposite arms provided with a wash and propulsion nozzle 1a at the end of each arm and with wash nozzles 1b along its length, which substantially corresponds to the shorter side of the rectangular tank in which it is located (the width in the illustrated example).

[0021] The secondary sprinkler 2 has a shape similar to the primary sprinkler 1 but, on the contrary, its length substantially corresponds to the longer side of the rectangular tank (the length in the illustrated example) and it is provided only with wash and propulsion nozzles in the end portions projecting beyond the primary sprinkler 1, said nozzles being arranged in two opposite pairs 2a, 2b at the end of the first arm and two opposite pairs 2c, 2d at the end of the second arm.

[0022] As a consequence, while the primary sprinkler 1 is a simple revolving sprinkler that continuously revolves in the same direction, the secondary sprinkler 2 is an oscillating sprinkler that alternately moves in the two directions thanks to the push of the jets sequentially emitted from the end nozzles 2a, 2b, 2c and 2d as explained hereafter.

[0023] In fact, a fraction of the pressurised water arriving through the supply duct and support 3 rather than flowing into the primary sprinkler 1 is laterally diverted into a chamber 7, open at the top, which is formed in the first arm of the secondary sprinkler 2 next to the top socket 5. Said chamber 7 has four lateral openings 7a, 7b, 7c, 7d putting it into communication with four ducts 8a, 8b, 8c, 8d extending in the two arms between chamber 7 and nozzles 2a, 2b, 2c, 2d respectively.

[0024] The bottom ring 4 of the primary sprinkler 1 is externally provided with a tooth 4a that at each rotation of sprinkler 1 engages an adjacent horizontal toothed wheel 9 which is integral with an underlying cylindrical shutter 10. Said shutter 10 is provided with a lateral opening 10a and rotatably snap-fitted within chamber 7 so as to close it at the top and allow the water out only through said lateral opening 10a.

[0025] In practice, as shown in the detail of Fig.6, opening 10a has a size equal to the size of openings 7a, 7b, 7c, 7d and when it is aligned with one of said openings it allows the water to flow out into the relevant duct 8a, 8b, 8c, 8d so as to reach the respective end nozzles 2a, 2b, 2c, 2d.

[0026] The simple and effective operation of the sprinkling assembly according to the invention is therefore readily understood in the light of the description given above.

[0027] Assuming that nozzles 1a are oriented to rotate sprinkler 1 clockwise (as seen from above), it follows that tooth 4a at each rotation causes a partial counter-clockwise rotation of the toothed wheel 9. The number of rotations of sprinkler 1 corresponding to a complete rotation of the toothed wheel 9 is obviously defined by the transmission ratio between said members 1 and 9, namely in practice by the number of teeth of wheel 9 (twelve in the illustrated example). However, both ring 4 and the toothed wheel 9 could have a different number of teeth so as to obtain a different transmission ratio.

[0028] Consider to start from the position of Fig.6 where opening 10a of shutter 10 has just arrived into alignment with opening 7a of chamber 7. In this position the water flows into duct 8a and reaches nozzles 2a generating jets that cause a counter-clockwise oscillation of

the secondary sprinkler 2, as indicated by the arrow in Fig.5. Sprinkler 2 thus reaches the position indicated in broken lines in Fig.5, defined by and end stop, and along its path nozzles 2a sprinkle the rear portion of the wash tank not covered by the nozzles of the primary sprinkler 1.

[0029] Since in the illustrated example the transmission ratio between sprinkler 1 and the toothed wheel 9 is 12:1, upon the following rotation of sprinkler 1 the toothed wheel 9 will rotate through 30° and the same applies to shutter 10 integral therewith. Therefore opening 10a will no longer be aligned with opening 7a thus stopping the jets emitted from nozzles 2a, and the same applies for the following rotation through 30° during which opening 10a is still along the wall of chamber 7 between openings 7a and 7b.

[0030] At the third rotation through 30°, opening 10a arrives at opening 7b whereby the water can flow into duct 8b and reach nozzles 2b generating jets that cause a clockwise oscillation opposite to the preceding one, thus taking the secondary sprinkler 2 back to the position of Fig.5. This position is obviously also defined by an end stop and along the path nozzles 2b sprinkle the rear portion of the wash tank.

[0031] The oscillating cycle of the secondary sprinkler 2 is completed with a similar back-and-forth oscillatory movement when the following rotations of shutter 10 take opening 10a into alignment first with opening 7c and then with opening 7d, whereby the water is emitted from nozzles 2c, 2d that sprinkle the front portion of the wash tank not covered by the nozzles of the primary sprinkler 1.

[0032] Therefore it is clear how this simple structural arrangement allows to oscillate the secondary sprinkler 2 only every three rotations of the primary sprinkler 1, and it is also clear that it is sufficient to change the number of teeth of wheel 9 and/or of ring 4 to change said oscillating frequency. Moreover, if one desires to extend the pushing and sprinkling time of the end nozzles 2a, 2b, 2c, 2d there can be provided openings 7a, 7b, 7c, 7d and/or an opening 10a having a greater width, e.g. extending over an arc of rotation of 60° rather than 30° such that chamber 7 remains in communication with the respective duct 8a, 8b, 8c, 8d through two rotations of the primary sprinkler 1.

[0033] Similarly, the rotating shutter 10 could be provided with a second opening 10a diametrically opposite to the first opening illustrated above so as to put chamber 7 in communication simultaneously with the two arms, i.e. with ducts 8a, 8c or ducts 8b, 8d. In this way it is possible to achieve the sprinkling of both the front portion and the rear portion of the wash tank at every oscillation of the secondary sprinkler 2.

[0034] If support 3 is located not at the center of the rectangular wash tank but at an eccentric position such that the primary sprinkler 1 arrives close to three sides of the tank, the portion not reached by the wash nozzles is on one side only of the tank. In this case it is possible to adopt the second embodiment illustrated in Fig. 7 that is different from the first embodiment in that the secondary sprinkler 2', while still being coaxially pivoted on the primary sprinkler 1, only has one arm extending beyond the latter with the relevant end nozzles 2a', 2b' fed through ducts 8a', 8b'.

[0035] The members defining the oscillating frequency of the secondary sprinkler 2', namely ring 4, chamber 7', toothed wheel 9 and rotating shutter 10 may remain the same or be consequently changed, providing a different transmission ratio and/or openings greater in number and/or larger in size. When retaining the same members of the first embodiment it is obvious that the oscillating frequency of the secondary sprinkler 2' is reduced by half.

[0036] It is clear that the number of nozzles of sprinklers 1, 2 and 2' can change with respect to the number of nozzles of the illustrated embodiments and that the secondary sprinkler 2, 2' could also have "uncontrolled" ducts, i.e. ducts constantly in communication with the supply duct, provided with simple wash nozzles that continuously sprinkle without affecting the oscillation.

[0037] Finally, it should be noted that the illustrated embodiments relating to a sprinkling assembly located at the bottom of the tank under the bottom rack are mere examples, since the same structure can be similarly applied in other ways. For example, the sprinkling assembly can be located also above the top rack by turning it upside down, since in that case support 3 extends downwards from the tank ceiling and the sprinkling takes place from above, or below the top rack by swapping the positions of the primary and secondary sprinklers since in that case support 3 extends downwards from the top rack and the sprinkling takes place from below.

Claims

1. A sprinkling assembly for dishwashers including a primary revolving sprinkler (1) centrally pivoted on a support (3) through which water under pressure is fed, **characterized in that** it further includes a secondary oscillating sprinkler (2; 2') coaxially pivoted on said primary sprinkler (1) and provided with at least one arm having such a length as to project beyond the primary sprinkler (1), said at least one arm being provided with opposite wash and propulsion nozzles (2a, 2b, 2c, 2d; 2a', 2b') located in the end portion(s) projecting beyond the primary sprinkler (1), and **in that** the emission of water jets from said wash and propulsion nozzles (2a, 2b, 2c, 2d; 2a', 2b') is controlled by a rotating shutter (10) provided with at least one opening (10a), the rotation of said rotating shutter (10) being controlled by the rotation of the primary sprinkler (1) according to a transmission ratio greater then unity.

2. A sprinkling assembly according to claim 1, **characterized in that** the rotation of the shutter (10) is controlled by the primary sprinkler (1) through a lower ring (4) externally provided with at least one tooth

(4a) suitable to engage with an adjacent horizontal toothed wheel (9) which is integral with the shutter (10).

3. A sprinkling assembly according to claim 1 or 2, **characterized in that** the shutter (10) is fitted within a cylindrical chamber (7) in which there are formed four lateral openings (7a, 7b, 7c, 7d) that put said cylindrical chamber (7) in communication with four ducts (8a, 8b, 8c, 8d) extending between the chamber (7) and the respective wash and propulsion nozzles (2a, 2b, 2c, 2d).

4. A sprinkling assembly according to claim 3, **characterized in that** the shutter (10) is provided with two diametrically opposite openings (10a) so as to put the chamber (7) in communication simultaneously with two opposite ducts (8a, 8b, 8c, 8d).

5. A sprinkling assembly according to any of the preceding claims, **characterized in that** the secondary sprinkler (2; 2') is pivoted between the primary sprinkler (1) and the support (3).

6. A dishwasher with a rectangular wash tank, **characterized in that** it includes at least one sprinkling assembly according to any of the preceding claims.

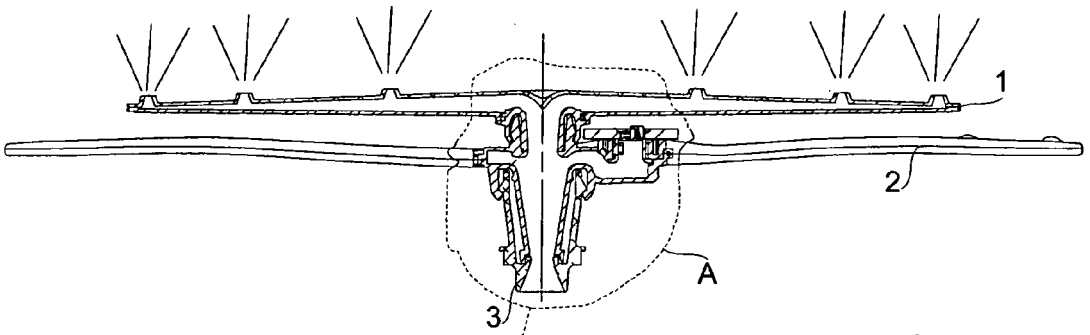

Fig.1

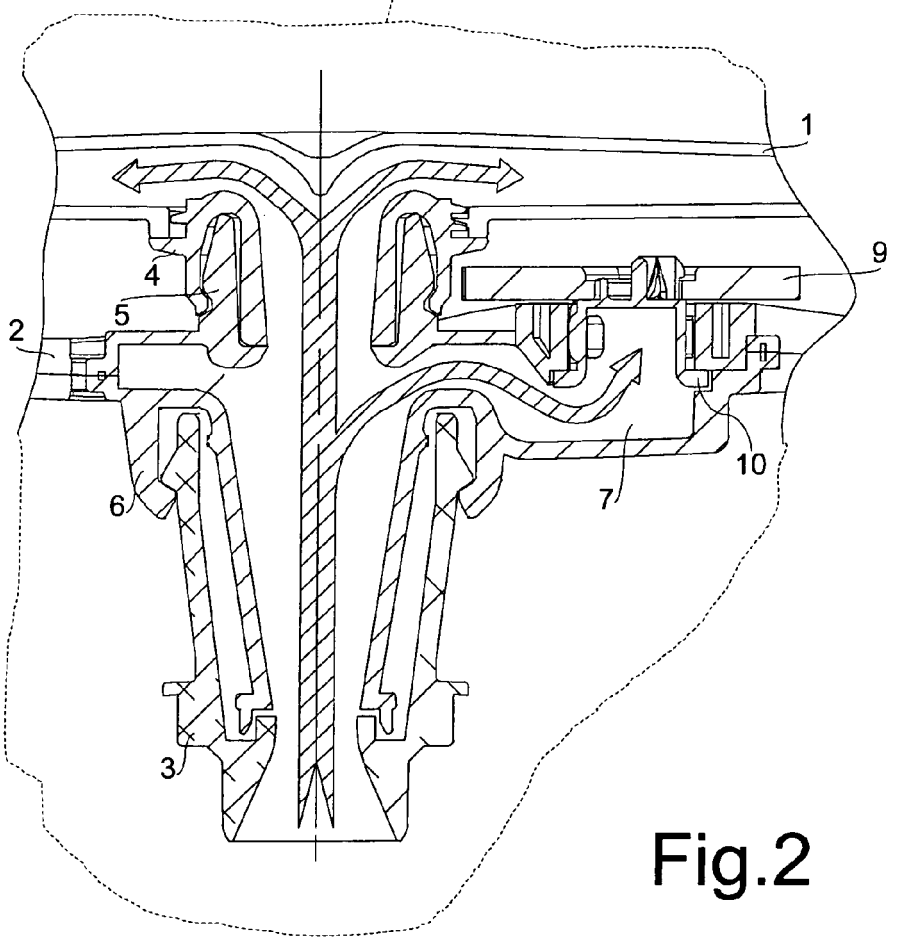

Fig.2

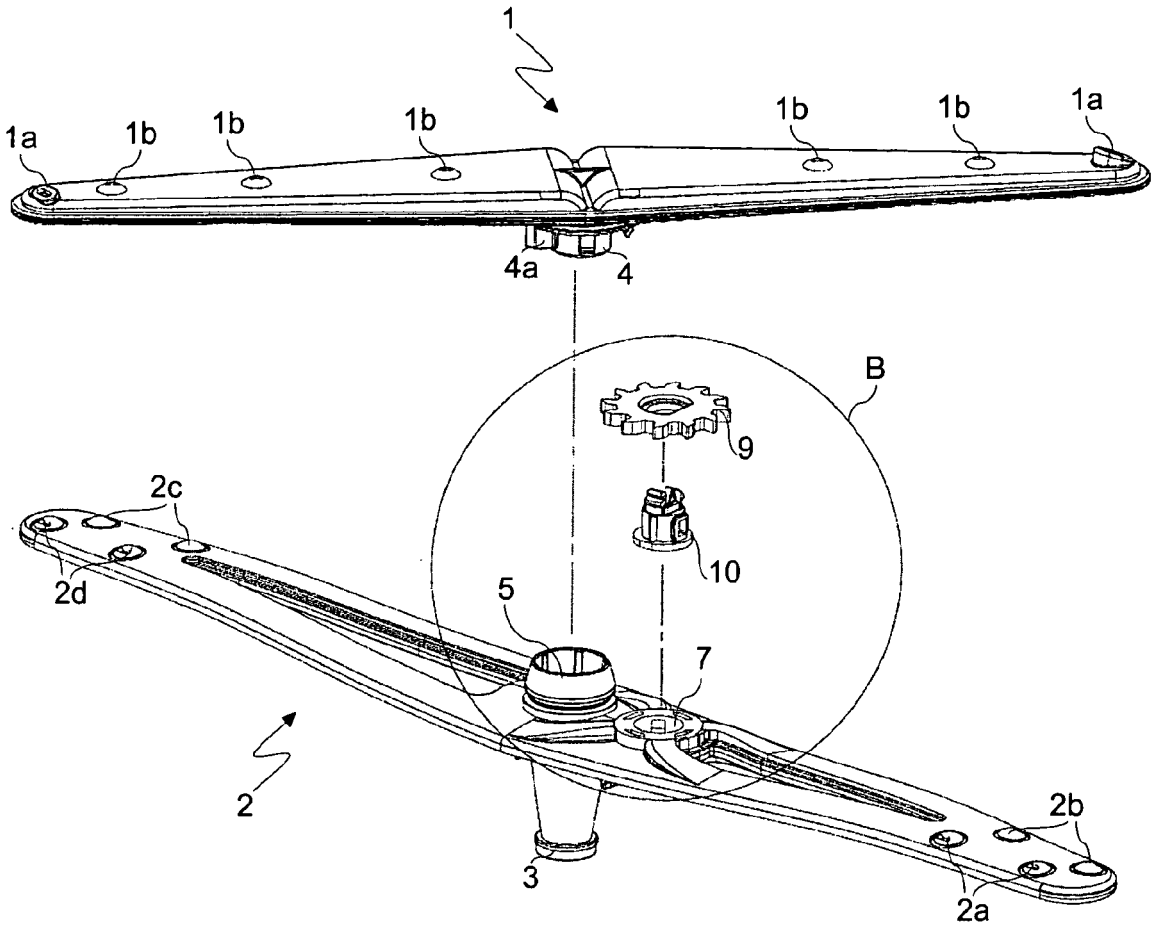

Fig.3

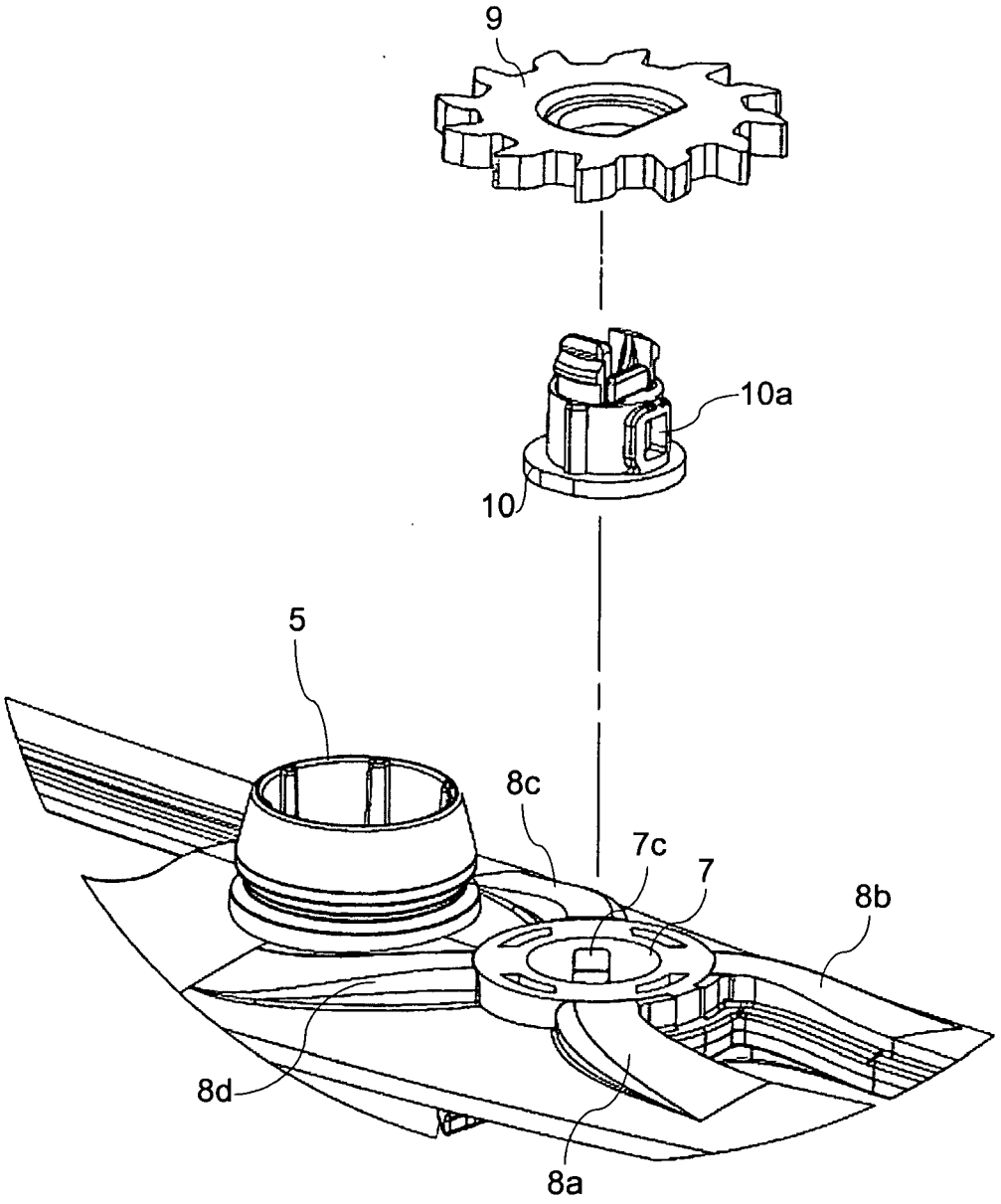

Fig.4

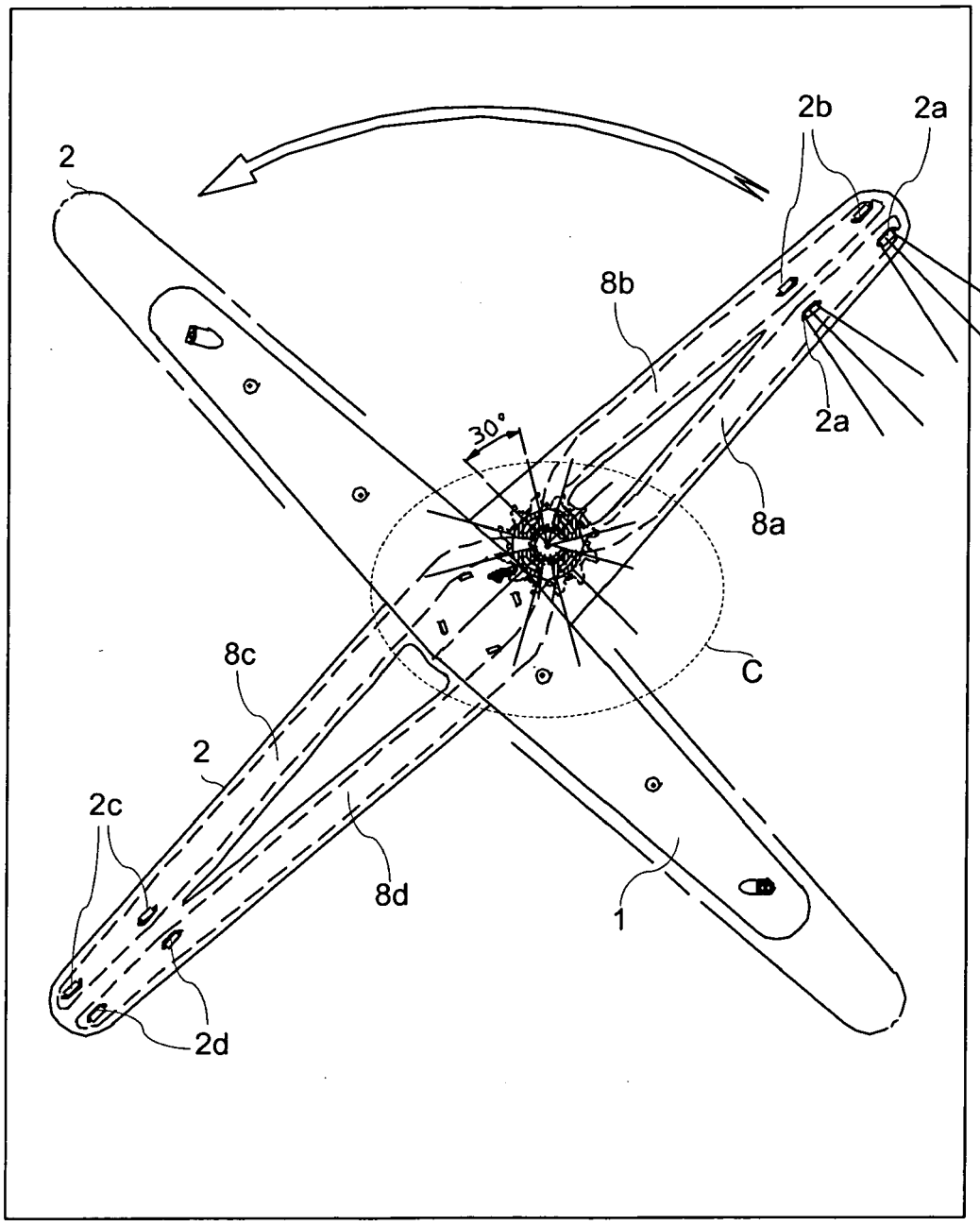

Fig.5

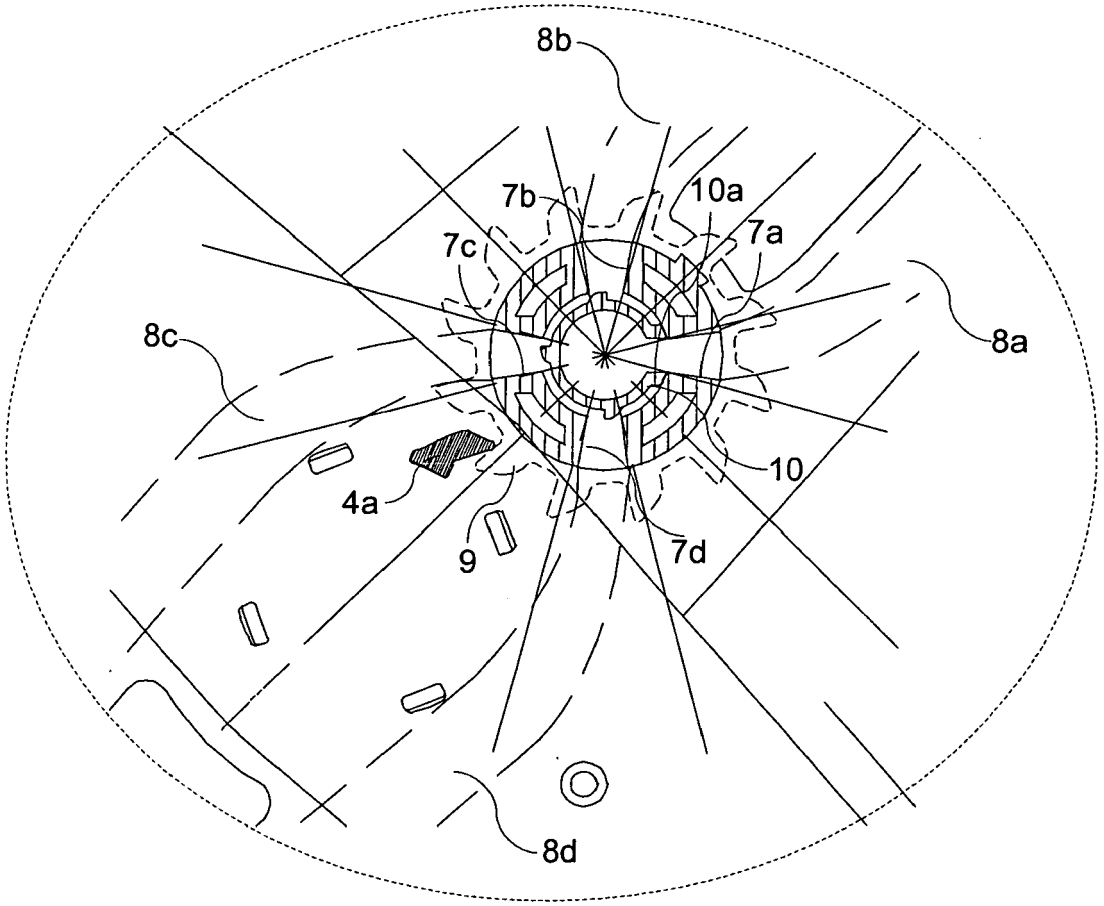

Fig.6

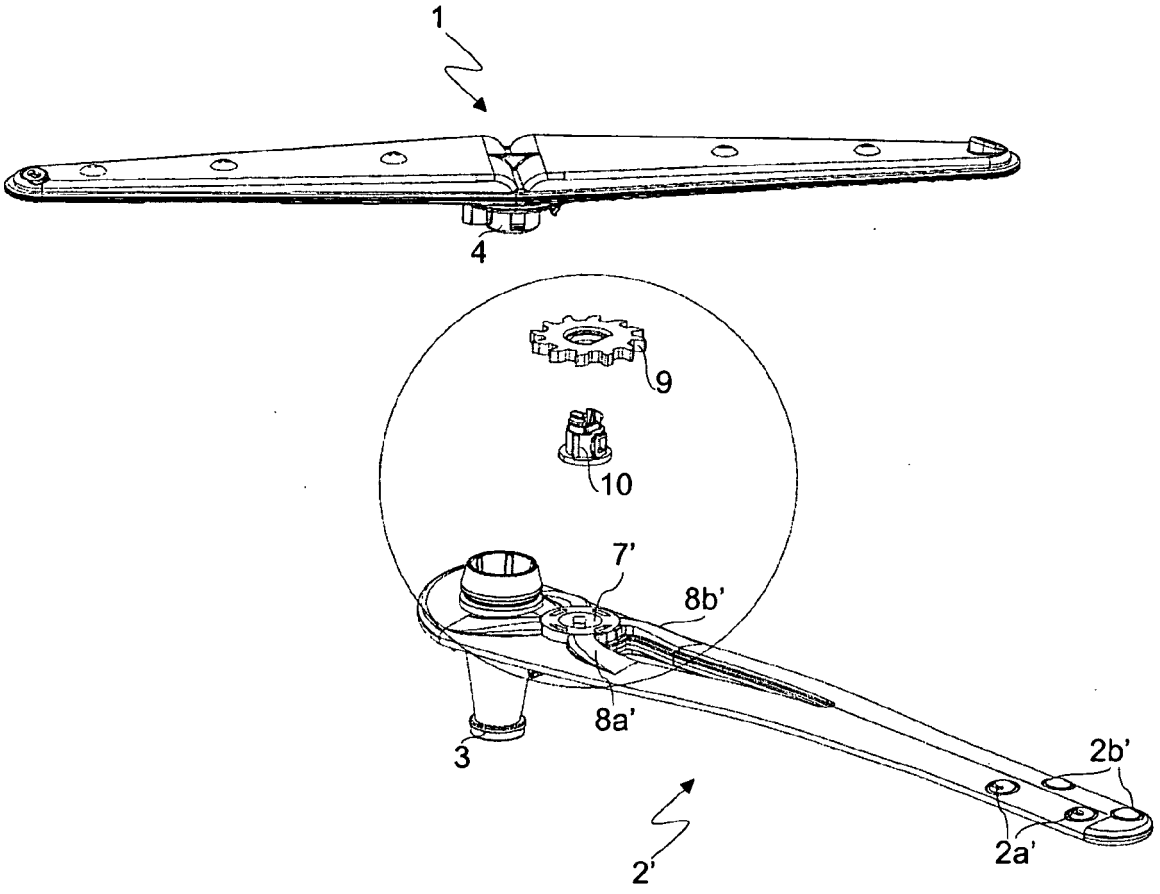

Fig.7

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EUROPEAN SEARCH REPORT

Application Number
EP 11 42 5050

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 201 178 A1 (BONFERRARO SPA [IT]) 2 May 2002 (2002-05-02) * paragraphs [0015] - [0027]; figures * -----	1	INV. A47L15/23 A47L15/20

TECHNICAL FIELDS SEARCHED (IPC)

A47L

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 September 2011	Lopez Vega, Javier

CATEGORY OF CITED DOCUMENTS

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05-09-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1201178 A1	02-05-2002	DE 60000170 D1	11-07-2002
		DE 60000170 T2	30-01-2003
		ES 2174812 T3	16-11-2002

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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