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(54) **A dishwasher**

(57) A dishwasher comprises a washing chamber (2) having a bottom wall (2a) and an opening, at least one crockery basket (3) arranged to come out, at least partly, from the washing chamber (2), a pump (4) that can be connected to a source of washing liquid, connected to a delivery pipe (5) placed beneath the bottom wall (2a) of the washing chamber (2), the delivery pipe (5) being in fluid communication with a feed pipe (6) placed inside the washing chamber (2), at least one main sprayer device (7), rotatable about a first rotation axis (X1), being in fluid connection with the feed pipe (6), and at least one auxiliary sprayer device (8) being rotatable about a second rotation axis (X2) and being in fluid communication with the pump (4). A supply pipe (9) is placed in fluid communication with the delivery pipe (5) and the auxiliary sprayer device (8) in order to supply the latter with washing liquid, the supply pipe (9) being developed beneath the bottom wall (2a) of the washing chamber (2).

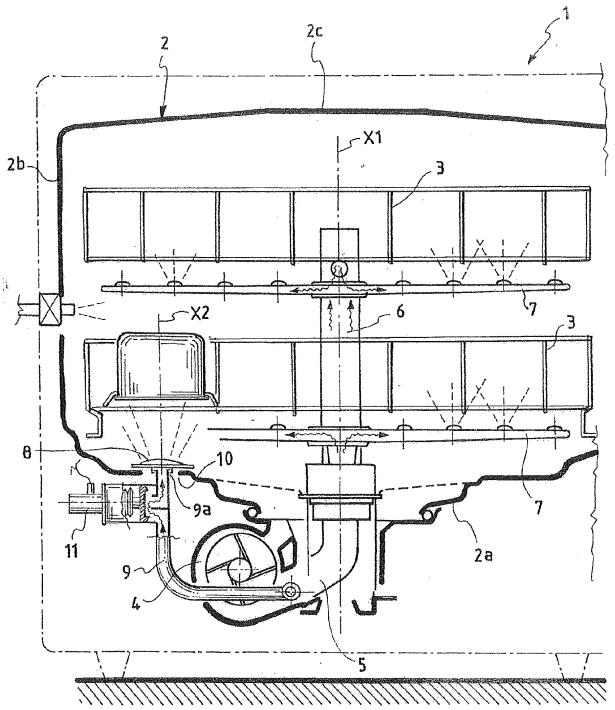

Fig. 1

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Description

[0001] The present invention relates to a dishwasher, i.e. a domestic electrical appliance used to automatically wash crockery.

[0002] In the last few decades, the dishwasher has become a very widespread household electrical appliance, also due to the fact that the water consumption of a dishwasher is less than that required for washing by hand. A typical present-day dishwasher comprises a washing chamber inside of which are usually provided two crockery baskets placed one above the other. One or a pair of sprayer devices, usually provided with two arms that can be rotated about a single rotation axis, on which arms are arranged a plurality of distributing nozzles, provide for spraying the crockery baskets, and therefore the crockery, with washing liquid. The sprayer devices are hydraulically connected to a delivery pipe of a pump which provides for supplying washing liquid, in particular water, to the sprayer devices. The sprayer devices are placed in rotation by the same washing liquid which, by coming out of the nozzles, transmits angular moments to the two arms causing their rotation about the rotation axis. Heating components are also provided, usually electrical resistances, active on the delivery pipe in order to heat the washing liquid during one or more stages of the wash cycle.

[0003] Clearly, especially in the last few years, dishwashers have been notably improved both in terms of functionality and in terms of energy consumption. However, in a market that is continually evolving in requiring dishwashers to have ever higher performance levels and be ever more efficient, the Applicant has perceived a need for users to have at their disposal dishwashers that are particularly effective in terms of the degree of cleaning of crockery, in particular capable of cleaning their own type of crockery effectively. In other words, the Applicant has observed that users prefer acquiring dishwashers capable of cleaning effectively the crockery that they are generally accustomed to using. Clearly, the type of crockery used depends on the number of members in the family unit, on the type of food cooked, and on many other factors; nevertheless, for every combination of crockery and degree of encrustation thereon, there is a specific dishwasher layout capable optimising performance. It is nevertheless inconceivable for a manufacturer to make available an almost unlimited number of possible dishwasher layouts, clearly for reasons of costs of design, production and logistics.

[0004] In this context, the problem underlying the present invention is that of proposing a dishwasher capable of satisfying the greatest number of users, i.e. capable of washing with effectiveness the greatest number of possible combinations of crockery.

[0005] The problem is solved in accordance with one or more of the appended claims.

[0006] The dishwasher that is an object of the present invention will now be described in detail with reference to the appended drawings, which are given purely by way of indication and in a non-limiting manner, and in which:

- Figure 1 shows a cross-sectional partial front view of a dishwasher in accordance with the present invention;
- Figure 2 is the dishwasher of Figure 1 in a second embodiment;
- Figure 3 is the dishwasher of Figure 1 in a third embodiment;
- Figure 4 is the dishwasher of Figure 1 in a fourth embodiment; and
- Figure 5 is the dishwasher of Figure 1 in a fifth embodiment;.

[0007] Referring to the drawings together, the label 1 indicates in an overall sense a dishwasher in accordance with the present invention.

[0008] The dishwasher 1 comprises a substantially box-shaped washing chamber 2, comprising a bottom wall 2a, three side walls 2b and a top wall 2c. A front opening of the washing chamber 2, defined between two side walls 2b (only one of which is shown in the drawings), the bottom wall 2a and the top wall 2c, is closed by a door (not illustrated) which can be opened to allow access to the washing chamber 2 and to close the latter in a fluid-tight manner when the dishwasher is operating.

[0009] The dishwasher 1 also comprises at least one crockery basket 3, preferably two crockery baskets 3 placed one above the other, slidably bound in the washing chamber 2 and arranged to come out, at least partly, from the opening of the washing chamber in order to allow crockery to be easily loaded into and unloaded from the basket 3.

[0010] A hydraulic pump 4 which can be connected to a source of washing liquid, such as for example the water supply system, is connected to a delivery pipe 5 placed beneath the bottom wall 2a of the washing chamber 2. The delivery pipe 5 is connected with a feed pipe 6 which is extended into the washing chamber 2. Preferably, the feed pipe 6 is placed close to or behind a side wall 2b of the washing chamber, in particular the side wall opposite the opening of the washing chamber 2. The feed pipe 6 supplies one or more main sprayer devices 7 with washing liquid. These latter devices can rotate inside the washing chamber 2 about a first rotation axis X1, preferably vertical, in order to spray washing liquid towards the crockery baskets 3. Preferably, there is associated with each crockery basket 3 a respective main sprayer device 7. Preferably, each main sprayer device 7 is placed underneath the respective basket 3 and is arranged to spray water upwards, i.e. towards the respective basket 3. The rotating coupling between the main sprayer device 7 and the feed pipe 6 is implemented in a manner known per se. Preferably, the main sprayer devices 7 are in direct communication with the pump 4, i.e. there are no shutoff valves placed along the hydraulic route which connects the pump 4 to the main sprayer devices 7.

[0011] The dishwasher 1 also comprises at least one auxiliary sprayer device 8 which can rotate about a second rotation axis X2 that is different from the first rotation axis X1. "Auxiliary sprayer device" is understood to mean, in the context of the present invention, a sprayer device having smaller dimensions and capacity relative to the main sprayer device. The auxiliary sprayer device performs its effect locally, i.e. in localised and restricted regions or portions within the washing chamber. The auxiliary sprayer device is particularly effective for removing dirt and/or encrustations present on some of the crockery placed in the washing chamber. The auxiliary sprayer device is in fluid communication with the pump 4.

[0012] Advantageously, the dishwasher comprises a supply pipe 9 placed in fluid communication with the delivery pipe 5 and the auxiliary sprayer device 8 in order to supply the auxiliary sprayer device 8 with washing liquid. The supply pipe 9 is developed beneath the bottom wall 2a of the washing chamber 2 and not extended into the washing chamber itself.

[0013] Thus, it is possible to provide dishwashers having one or more auxiliary sprayer devices 8, which are active in any area of the washing chamber 2 without necessarily having to make provision for different washing chambers and feed pipes. In other words, with only one type of washing chamber and only one type of feed pipe (i.e. the pipe supplying the main sprayer devices 7), it is possible to produce dishwashers that are different from one another in terms of the position and number of auxiliary sprayer devices 8. Indeed, the connection between the pump 4 and the auxiliary sprayer device 8 does not require connections with the feed pipe 6 which serves the main sprayer devices 7 and does not require different feed pipes 6 according to the position which the auxiliary sprayer device 8 shall occupy.

[0014] The bottom wall 2a of the washing chamber 2 comprises a hole 10 taken up by a terminal portion 9a of the supply pipe 9. The auxiliary sprayer device 8 is fitted directly or indirectly on the hole 10, in a fluid-tight manner with the terminal portion 9a of the supply pipe 9.

[0015] According to a first embodiment illustrated in Figure 1, the auxiliary sprayer device 8 is fitted directly on the hole 10. In particular, the auxiliary sprayer device 8 is revolvably coupled to the bottom wall 2a of the washing chamber 2 at the hole 10. The terminal portion 9a of the supply pipe 9 and the auxiliary sprayer device 8 are mechanically bound together in such a way that the auxiliary sprayer device 8 revolves with respect to the supply pipe 9. Such a coupling is preferably implemented by retaining teeth (not illustrated) on the sprayer device 8 which surround an annular shoulder of the terminal portion 9a of the supply pipe 9. The rotation of the auxiliary sprayer device 8 takes place through the effect of the flow of washing liquid supplied by it, giving rise to a torque about the rotation axis X2 of the sprayer device 8. In this embodiment of the invention, a shutoff valve 11 is provided, which is active on the supply pipe 9 upstream of the auxiliary sprayer device 8, i.e. in a position between the delivery pipe and the hole 10 on the bottom wall 2a of the washing chamber 2. The function of the shutoff valve 11 is to stop or allow the supply of washing liquid to the auxiliary sprayer device 8, such that the latter can be selectively activated during the crockery washing stages. In other words, the auxiliary sprayer device 8 can be deactivated even when washing liquid is supplied to the main sprayer devices 7. Preferably, the shutoff valve 11 is an electromechanical valve equipped with one inlet and one outlet. The opening and closing of the shutoff valve 11 is controlled by a control and monitoring unit (not illustrated) of the dishwasher. It is to be noted that the shutoff valve 11 also lies beneath the bottom wall 2a of the washing chamber 2.

[0016] In a second embodiment illustrated in Figure 2, the auxiliary sprayer device 8 is not fitted directly on the hole 10. In this embodiment, an extension pipe 12 is arranged inside the washing chamber 2 and is fitted on the hole 10 at a first end 12a. A second end 12b of the extension pipe 12 is mechanically and hydraulically coupled to the auxiliary sprayer device 8. In particular, the extension pipe 12 is revolvably coupled to the bottom wall 2a of the washing chamber 2 at the hole 10. The terminal portion 9a of the supply pipe 9 and the first end 12a of the extension pipe 12 are mechanically bound together in such a way that the extension pipe revolves with respect to the supply pipe 9. Such a coupling is preferably implemented by retaining teeth (not illustrated) on the first end 12a of the extension pipe 12 which surround an annular shoulder of the terminal portion 9a of the supply pipe 9. Thus, by rotating the extension pipe 12, it is possible to position the sprayer device 8 in different positions inside the washing chamber 2, for example exactly beneath a particularly dirty item of crockery. The auxiliary sprayer device 8 is coupled to the second end 12b of the extension pipe 12 in such a way that the auxiliary sprayer device 8 revolves with respect to the extension pipe 12. Preferably, such a coupling is implemented by retaining teeth (not illustrated) on the sprayer device 8 which surround an annular shoulder of the second end 12b of the extension pipe 12. The rotation of the auxiliary sprayer device 8 takes place through the effect of the flow of washing liquid supplied by it, giving rise to a torque about the rotation axis of the sprayer device 8. Also in this embodiment of the invention, a shutoff valve 11 is provided, which is active on the supply pipe 9 upstream of the auxiliary sprayer device 8, in particular upstream of the extension pipe 12. The function of the shutoff valve 11 is to stop or allow the supply of washing liquid to the auxiliary sprayer device 8, such that the latter can be selectively activated during the crockery washing stages. In other words, the auxiliary sprayer device 8 can be deactivated even when washing liquid is supplied to the main sprayer devices 7. Preferably, the shutoff valve 11 is an electromechanical valve equipped with one inlet and one outlet. The opening and closing of the shutoff valve 11 is controlled by a control and monitoring unit (not illustrated) of the dishwasher. It is to be noted that the shutoff valve 11

also lies beneath the bottom wall 2a of the washing chamber 2.

[0017] According to a third embodiment illustrated in Figure 3, the bottom wall 2a of the washing chamber 2 comprises a second hole 10 taken up by a further terminal portion 9b of the supply pipe 9. A second auxiliary sprayer device 8 is fitted on the aforementioned second hole 10. In accordance with this embodiment, the supply pipe 9 has, as mentioned, two terminal portions 9a, 9b, each of which is taken up by a respective auxiliary sprayer device 8. Preferably, the supply pipe has only one fluid connection with the delivery pipe 5, as illustrated in Figure 3. Each terminal portion 9a, 9b of the supply pipe 9 and the respective auxiliary sprayer device 8 are mechanically bound together in such a way that the auxiliary sprayer device 8 revolves with respect to the supply pipe 9. Such a coupling is preferably implemented by retaining teeth (not illustrated) on the sprayer device 8 which surround an annular shoulder of the terminal portion 9a, 9b of the supply pipe 9. The rotation of each auxiliary sprayer device 8 takes place through the effect of the flow of washing liquid supplied by it, giving rise to a torque about the rotation axis X2 of the sprayer device 8. In this embodiment of the invention, a shutoff valve 11 is provided for each auxiliary sprayer device 8 and is active on the supply pipe 9 upstream of the auxiliary sprayer device 8, i.e. in a position between the delivery pipe 5 and the hole 10 on the bottom wall 2a of the washing chamber 2. The function of the shutoff valve 11 is to stop or allow the supply of washing liquid to the corresponding auxiliary sprayer device 8, such that the latter can be selectively activated during the crockery washing stages. In other words, each auxiliary sprayer device 8 can be deactivated even when washing liquid is supplied to the main sprayer devices 7. Furthermore, it is possible to activate only one or both the auxiliary sprayer devices 8. Preferably, each shutoff valve 11 is an electromechanical valve equipped with one inlet and one outlet. The opening and closing of the shutoff valve 11 is controlled by a control and monitoring unit (not illustrated) of the dishwasher. It is to be noted that the shutoff valves 11 also lie beneath the bottom wall 2a of the washing chamber 2.

[0018] According to a fourth embodiment shown in Figure 4, the bottom wall 2a of the washing chamber 2 comprises a second hole 10 taken up by a further terminal portion 9b of the supply pipe 9. A second auxiliary sprayer device 8 is fitted on the aforementioned second hole 10. In accordance with this embodiment, the supply pipe 9 has, as mentioned, two terminal portions 9a, 9b, each of which is taken up by a respective auxiliary sprayer device 8. Preferably, the supply pipe has only one fluid connection with the delivery pipe 5, as illustrated in Figure 4. Each terminal portion 9a, 9b of the supply pipe 9 and the respective auxiliary sprayer device 8 are mechanically bound together in such a way that the auxiliary sprayer device 8 revolves with respect to the supply pipe 9. Such a coupling is preferably implemented by retaining teeth (not illustrated) on the sprayer device 8 which surround an annular shoulder of the terminal portion 9a, 9b of the supply pipe 9. The rotation of each auxiliary sprayer device 8 takes place through the effect of the flow of washing liquid supplied by it, giving rise to a torque about the rotation axis X2 of the sprayer device 8. Unlike the third embodiment described above, in the fourth embodiment there are no shutoff valves active on the supply pipe 9. The two auxiliary sprayer devices 8 are activated when the pump 4 is activated, i.e. together with the main sprayer devices 7.

[0019] According to a fifth embodiment shown in Figure 5, the bottom wall 2a of the washing chamber 2 comprises a second hole 10 taken up by a further terminal portion 9b of the supply pipe 9. A second auxiliary sprayer device 8 is fitted on the aforementioned second hole 10. In accordance with this embodiment, the supply pipe 9 has, as mentioned, two terminal portions 9a, 9b, each of which is taken up by a respective auxiliary sprayer device 8. Preferably, the supply pipe has only one fluid connection with the delivery pipe 5, as illustrated in Figure 5. Each terminal portion 9a, 9b of the supply pipe 9 and the respective auxiliary sprayer device 8 are mechanically bound together in such a way that the auxiliary sprayer device 8 revolves with respect to the supply pipe 9. Such a coupling is preferably implemented by retaining teeth (not illustrated) on the sprayer device 8 which surround an annular shoulder of the terminal portion 9a, 9b of the supply pipe 9. The rotation of each auxiliary sprayer device 8 takes place through the effect of the flow of washing liquid supplied by it, giving rise to a torque about the rotation axis X2 of the sprayer device 8. In this embodiment, a shutoff valve 11 is provided and is active on the supply pipe 9 upstream of both auxiliary sprayer devices 8, i.e. in a position between the delivery pipe and the two holes 10 on the bottom wall 2a of the washing chamber 2. The function of the shutoff valve 11 is to stop or allow the supply of washing liquid to both auxiliary sprayer devices 8, such that the latter devices can be selectively activated during the crockery washing stages. In other words, the auxiliary sprayer devices 8 can be deactivated even when washing liquid is supplied to the main sprayer devices 7. Preferably, the shutoff valve 11 is an electromechanical valve equipped with one inlet and one outlet. The opening and closing of the shutoff valve 11 is controlled by a control and monitoring unit (not illustrated) of the dishwasher. It is to be noted that the shutoff valve 11 also lies beneath the bottom wall 2a of the washing chamber 2.

[0020] In addition to the above, in the third, fourth and fifth embodiment, an extension pipe 12 can be provided, such as that described in relation to the second embodiment, which extension pipe 12 is active on only one or on both auxiliary sprayer devices 8.

[0021] Furthermore, in the first embodiment, a second auxiliary sprayer device 8 can be provided mounted on an extension pipe 12 connected to the single hole 10 made in the bottom wall 2a of the washing chamber 2. In this case, the shutoff valve 11 is a two-way valve, i.e.

equipped with one inlet and two outlets. The first auxiliary sprayer device 8 is connected to a first outlet, and the extension pipe 12, to which the second auxiliary sprayer device 8 is connected, is connected to the second outlet.

[0022] Further combinations between the first and the second hole 10, the first and the second auxiliary sprayer device 8, the shutoff valve 11 or the shutoff valves 11, the extension pipe 12 or the extension pipes 12, are possible according to the areas inside the washing chamber 2 which must be sprayed the most with washing liquid.

Claims

1. Dishwasher comprising:

a substantially box-shaped washing chamber (2), comprising a bottom wall (2a) and an opening;
at least one crockery basket (3) slidably inserted in the washing chamber (2) and arranged to come out, at least partly, from the opening of the washing chamber (2) in order to receive crockery;
a pump (4) connectable to a source of washing liquid, connected to a delivery pipe (5) placed beneath the bottom wall (2a) of the washing chamber (2); the delivery pipe (5) being in fluid communication with a feed pipe (6) placed inside the washing chamber (2);
at least one main sprayer device (7), which is rotatable about a first rotation axis (X1), placed inside the washing chamber (2) and in fluid connection with the feed pipe (6) in order to supply washing liquid inside the washing chamber (2);
at least one auxiliary sprayer device (8), which is rotatable about a second rotation axis (X2) that is different from the first rotation axis (X1) and in fluid communication with the pump (4);
characterised in that it comprises a supply pipe (9) placed in fluid communication with the delivery pipe (5) and the auxiliary sprayer device (8) in order to supply the auxiliary sprayer device (8) with washing liquid; the supply pipe (9) being developed beneath the bottom wall (2a) of the washing chamber (2).

2. Dishwasher according to Claim 1, in which the bottom wall (2a) of the washing chamber (2) comprises a hole (10) taken up by a terminal portion (9a) of the supply pipe (9); the auxiliary sprayer device (8) being fitted directly or indirectly on the hole (10) in a fluid-tight manner with the terminal portion (9a) of the supply pipe (9).

3. Dishwasher according to Claim 2, comprising a shutoff valve (11) active on the supply pipe (9) upstream of the auxiliary sprayer (8) and arranged to stop or allow the supply of washing liquid to the auxiliary sprayer device (8).

4. Dishwasher according to either Claim 2 or Claim 3, in which the auxiliary sprayer device (8) is revolvably coupled to the bottom wall (2a) of the washing chamber (2) at the hole (10).

5. Dishwasher according to either Claim 2 or Claim 3, comprising an extension pipe (12) arranged inside the washing chamber (2) and fitted on the hole (10) at a first end (12a); a second end (12b) of the extension pipe (12), opposite the first end (12a), being mechanically and hydraulically coupled to the auxiliary sprayer device (8).

6. Dishwasher according to Claim 5, in which the extension pipe (12) is revolvably coupled to the hole (10) and is revolvably bound to the auxiliary sprayer device (8).

7. Dishwasher according to Claim 2, in which the bottom wall (2a) of the washing chamber (2) comprises a second hole (10) taken up by a further terminal portion (9b) of the supply pipe (9); a second auxiliary sprayer device (8) being fitted directly or indirectly on the second hole (10).

8. Dishwasher according to Claims 3 and 7, comprising a further shutoff valve (11) active on the supply pipe (9) upstream of the second auxiliary sprayer device (8) and arranged to selectively stop or allow the supply of washing liquids to the second auxiliary sprayer device (8).

9. Dishwasher according to either Claim 7 or Claim 8, in which the second auxiliary sprayer device (8) is revolvably coupled to the bottom wall (2a) of the washing chamber (2) at the second hole (10).

10. Dishwasher according to Claims 5 and 7 or 8, comprising a further extension pipe (12) arranged inside the washing chamber (2) and fitted on the second hole (10) at a first end (12a); a second end (12b) of the further extension pipe (12), opposite the first end (12a), being mechanically and hydraulically coupled to the second auxiliary sprayer device (8).

11. Dishwasher according to Claim 10, in which the further extension pipe (12) is revolvably coupled to the second hole (10) and is revolvably bound to the further auxiliary sprayer device (8).

12. Dishwasher according to Claim 7, comprising a shutoff valve (11) placed on the supply pipe (9) upstream of the terminal portion (9a) and the further terminal portion (9b) and arranged to stop or allow supply of washing liquid to the auxiliary sprayer device (8) and

to the second auxiliary sprayer device (8).

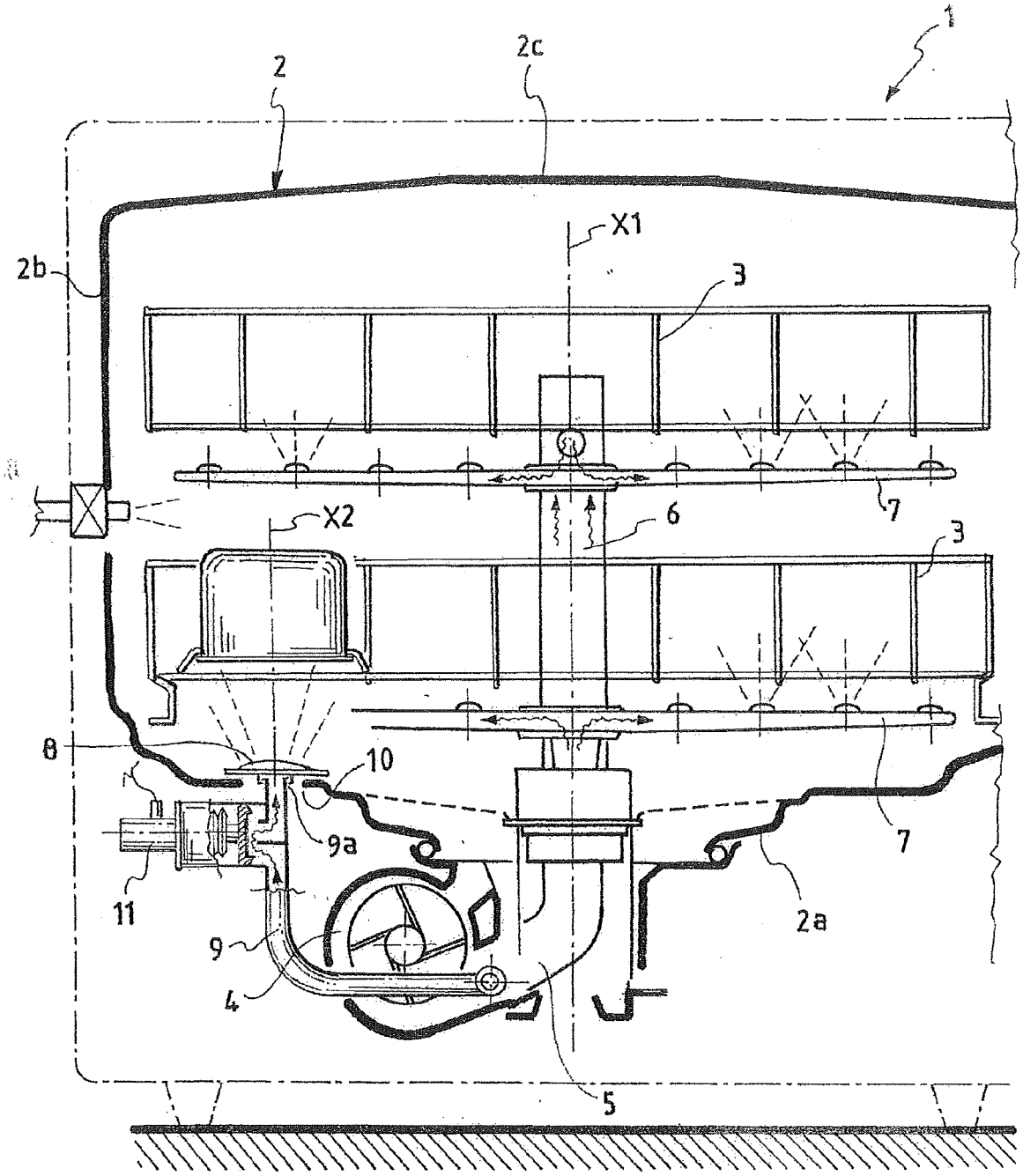

Fig. 1

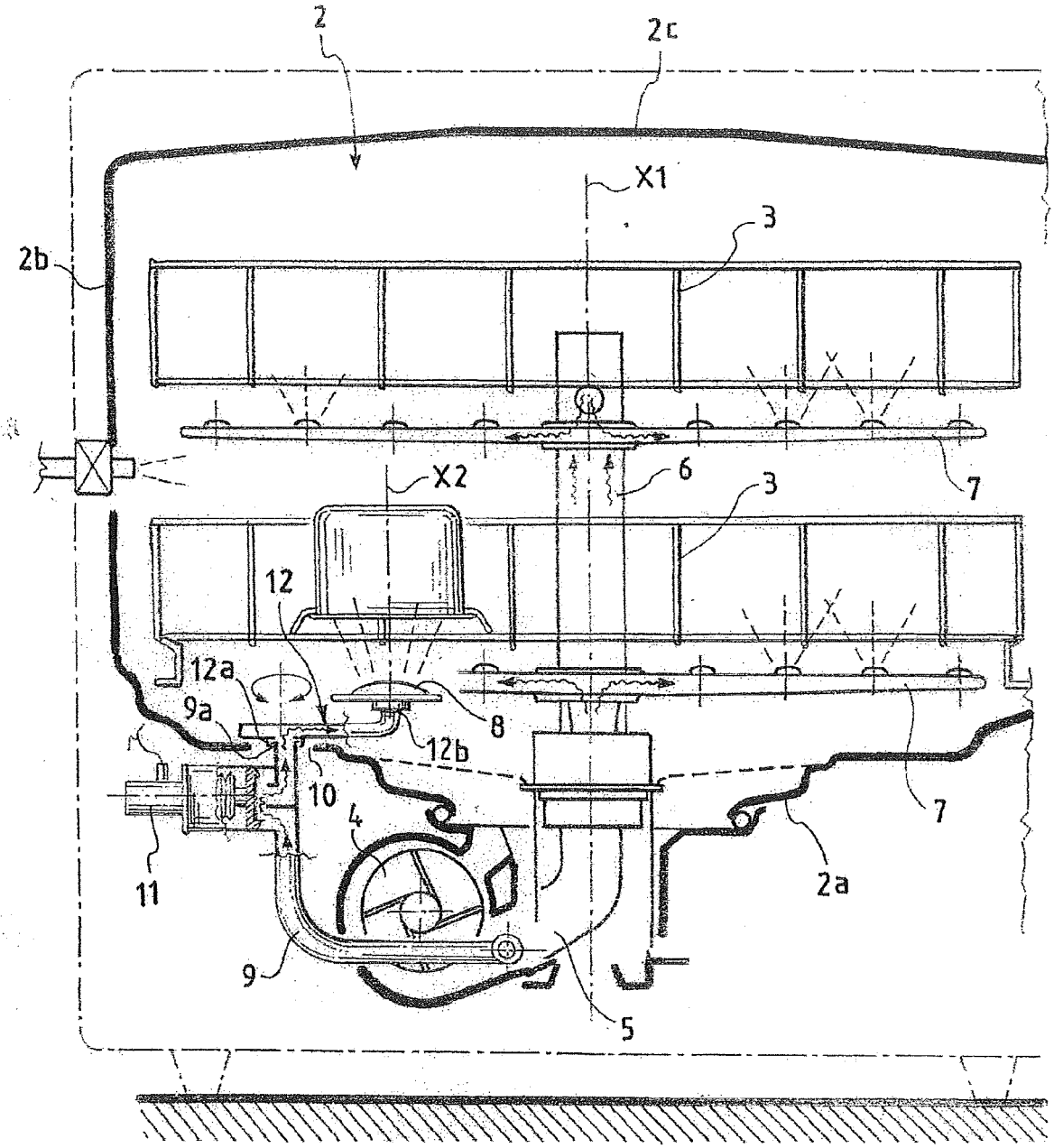

Fig.2

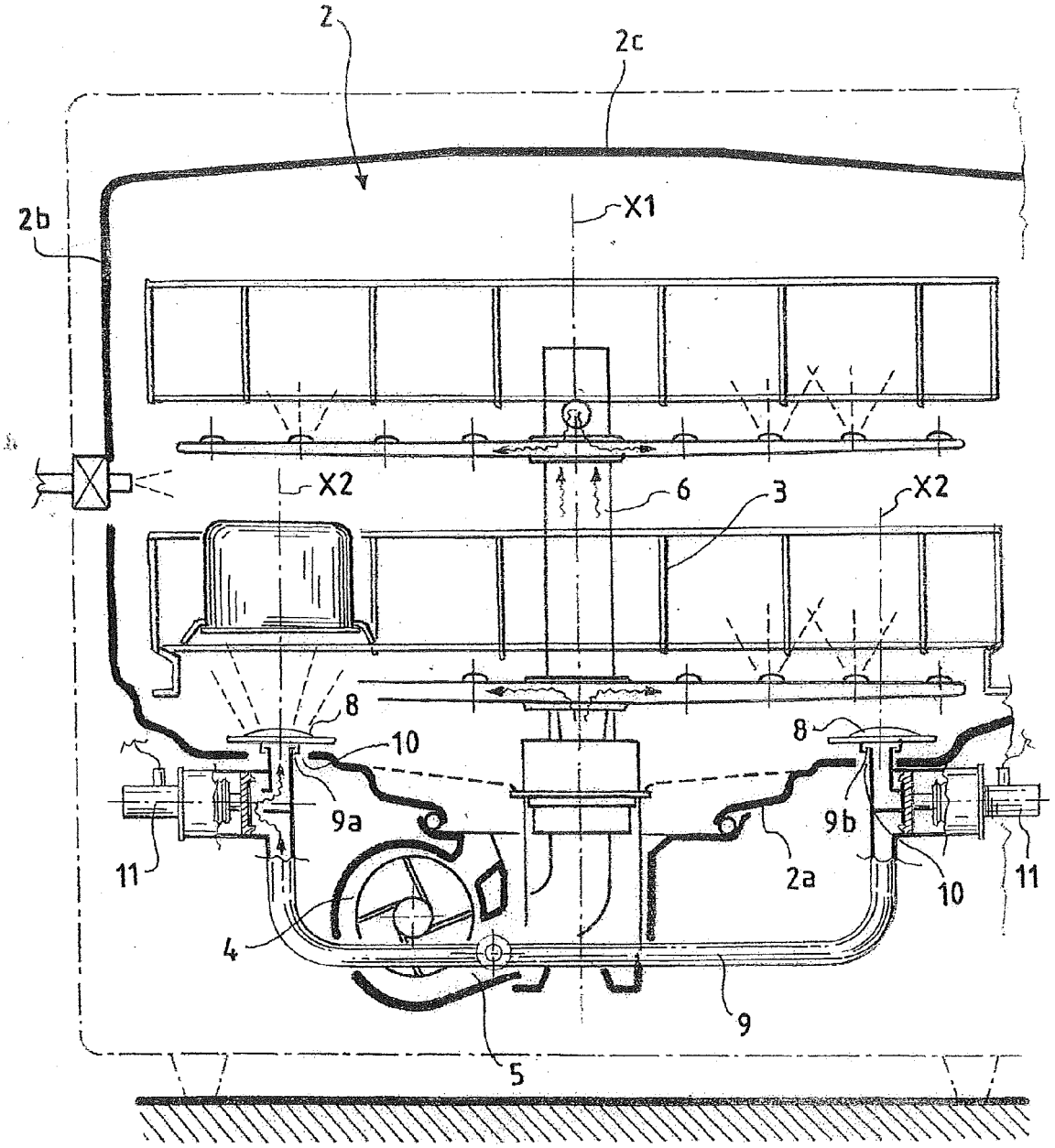

Fig.3

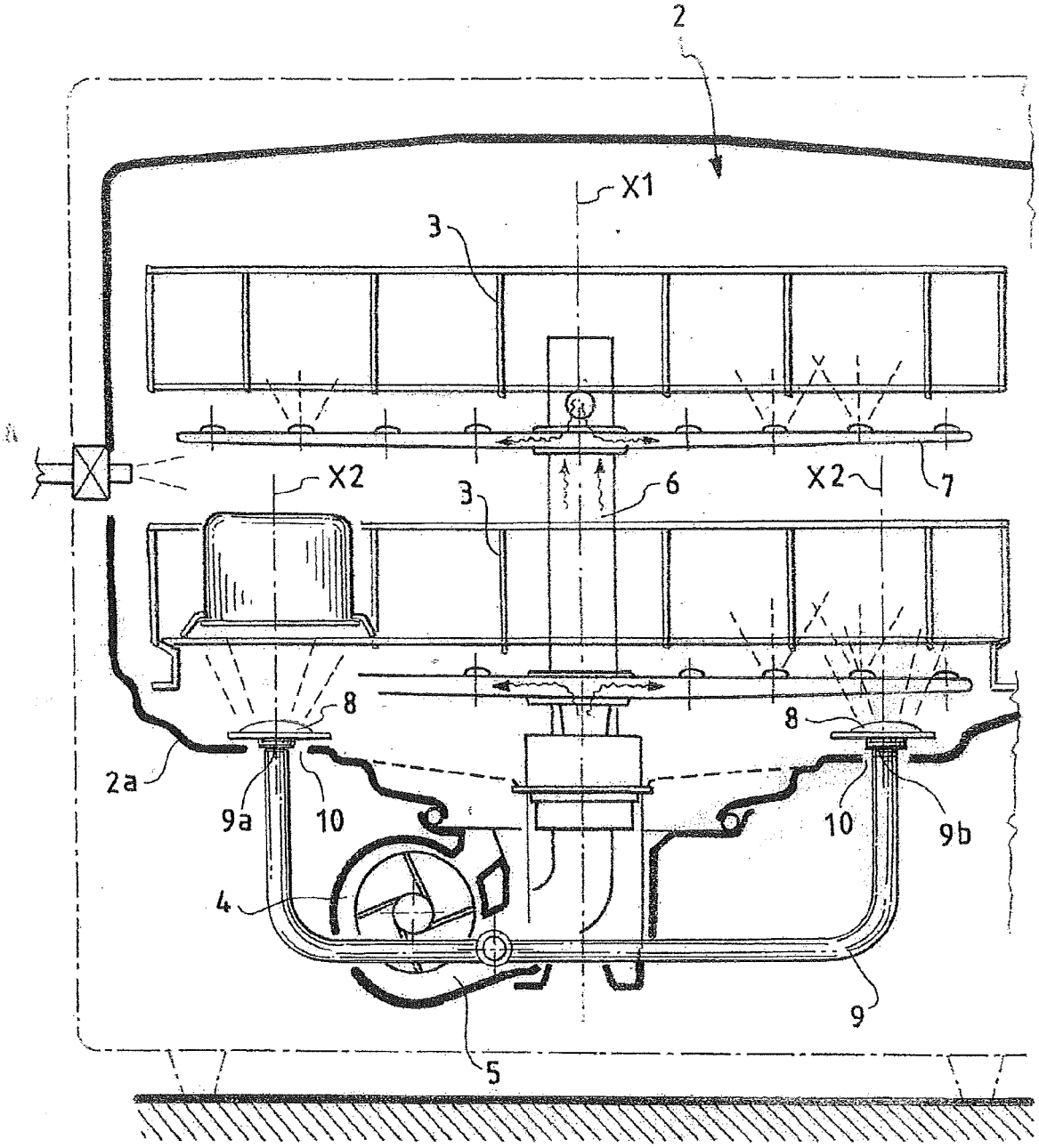

Fig.4

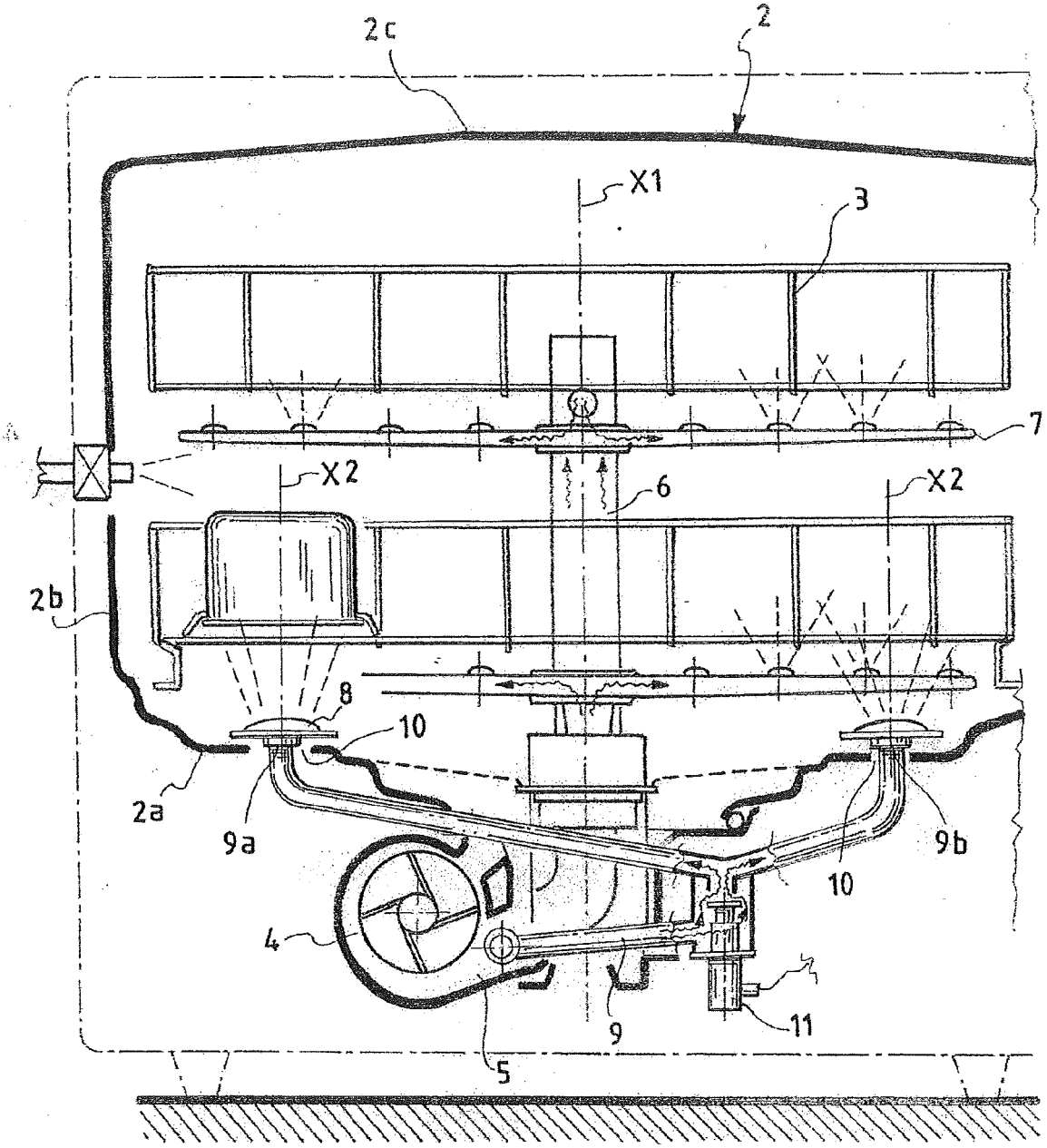

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5122

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 November 2012	Lodato, Alessandra

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 42 5122

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