

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 023 869 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.08.2000 Bulletin 2000/31

(51) Int Cl.7: **A47L 15/48**

(21) Application number: **00200295.4**

(22) Date of filing: **28.01.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant: **T & P S.p.A.**
21049 Tradate (Varese) (IT)

(72) Inventor: **Carli, Carlo**
21041 Albizzate (VA) (IT)

(30) Priority: **29.01.1999 IT TO990064**

(74) Representative: **Dini, Roberto, Dr. Ing.**
Via Castagnole, 59
10060 None (Torino) (IT)

(54) Device for the drying of dishes and diswashing machine using said device

(57) A device for the drying of crockery is described, of the type apt to induce a condensation of steam being present within the wash tub (1) of a dishwasher by means of the cooling of at least one wall of said tub (1),

characterized in that means (15-19) are provided for directing onto the inner surface of said wall a jet or spray of liquid apt to determine a cooling of said wall, so as to favour the condensation on said wall of at least a part of the steam being present within said tub (1).

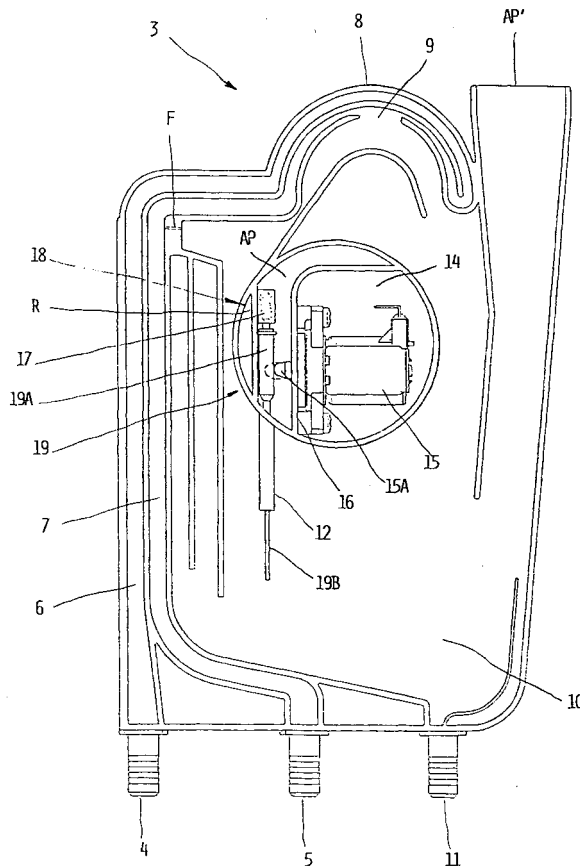


FIG. 2

EP 1 023 869 A2

Description

[0001] The present invention relates to a device for the drying of dishes and to a dishwashing machine using such a device.

[0002] As known, at the end of a wash cycle household dishwashers provide for a cycle for drying the crockery and remove the steam contained inside the wash tub.

[0003] According to the more conventional solutions, the removal of the steam from the tub and of the dampness from the crockery is obtained by leaving the latter inside the machine, for a lapse of given time, during which the steam is substantially eliminated through a "condensation effect" exerted by the walls of the tub, and partially by letting a portion of the steam to enter a multifunction device wherein it may condense.

[0004] However, the results of such a drying method are often unsatisfactory, since a portion of steam remaining stagnant in the wash tub tends to condense again on the crockery.

[0005] Some dishwashing machines, vice-versa, are provided with an appropriate fan for generating air circulation inside the wash tub, so as to achieve a final forced drying cycle of the crockery.

[0006] However, this method, which allows for achieving improved drying results with respect to the conventional technique, has the drawback of requiring expensive components, such as a suitable fan with a relevant motor; another drawback of this solution is further due to the overall dimensions of the fan with its complete scroll and relevant motor, which is difficult to house in the tiny spaces available inside the cabinet or on the door of the dishwashing machine.

[0007] For some dishwashing machines, it is also known, to provide means for the cooling of at least one wall of the wash tub, with a view to facilitate steam condensation on such a wall.

[0008] According to such solutions, a tank or multifunction device having a large surface is applied adjacent to the external side of at least one wall of the wash tub of the machine; during the crockery drying phase provided by a wash program, the control system of the machine let fresh water from the water mains to flow within said device.

[0009] Thus, the water flow gradually filling the tank determines a certain cooling of the wall of the tub, so favouring the condensation of the steam contained in the tub; the water contained in the tank may then be used during a wash program to be performed later.

[0010] However, the method described above, which allows for ensuring improved drying results with respect to the more conventional technique previously mentioned, has the drawback of requiring a tank or a multifunction device, which should have a large size, i.e. about the same size of the wall of the tub, in order to warrant a sufficient cooling of the wall. Now, besides an increase of the total cost of the machine and a more

complicated control system of the machine (in order to ensure water supply into the tank), such a solution obviously reduces the spaces available inside the machine cabinet, for example for the housing of sound-proofing materials or other devices.

[0011] It is the aim of the present invention to solve the above drawbacks and provide, in particular, a device for the drying of crockery, of the type being apt to favour the condensation of the steam contained in a dishwashing machine, which is efficient, has a simple and compact manufacture and is cost-effective.

[0012] In order to achieve such aims, it is the object of the present invention a device for the drying of crockery and a dishwashing machine using such a device, incorporating the features of the annexed claims, which form an integral part of the present description.

[0013] Further objects, features and advantages of the present invention will become apparent from the following detailed description and the annexed drawings, which are supplied by way of non limiting example, wherein:

- Fig. 1 shows schematically a portion of a dishwashing machine comprising the device for the drying of crockery, according to the present invention;
- Fig. 2 shows schematically in a vertical section a multifunction device integrating the device for the drying of crockery, according to the present invention;
- Fig. 3 shows schematically a prospective view, seen from a first side, of a multifunction device integrating the device for the drying of crockery, according to the present invention;
- Fig. 4 shows schematically a prospective view, seen from a second side, of a multifunction

device integrating the device for the drying of crockery, according to the present invention.

[0014] In Fig. 1, representing schematically a portion of a dishwashing machine comprising the device for the drying of crockery according to the present invention, reference 1 indicates the wash tub of the machine as a whole, which is manufactured according to known procedures and has a front loading door 2.

[0015] Reference 3 indicates schematically a multifunction device, which is apt for metering the water required for the regeneration of the decalcifying resins, for avoiding the back-flow of water to the mains and for condensing at least a portion of the steam produced inside the tub 1 during washing.

[0016] This device 3 has a body of reduced overall dimensions, whose structure is conveniently obtained from plastic material, such as moulding it in two parts, which are then welded together according to known procedures (for example, through a hot blade method).

[0017] As it can be seen, the device 3 is fastened on the external surface of a side wall of the tub 1, and therefore it is housed in a gap available between such a wall

of the tub and a wall of the cabinet of the dishwasher, or of the built-in cabinet wherein the dishwasher is housed (said elements are not represented in Fig. 1).

[0018] The device 3 has an opening AP in correspondence with a suitable opening being present on the wall of the tub 1; the opening on the wall of the tub usually has a round shape.

[0019] On its top portion, the device 3 also has an opening AP' facing the external environment, i.e. in the gap previously mentioned between the tub and the cabinet.

[0020] Fig. 2 and 3 represent the multifunction device 3 comprising a device for the drying of crockery according to the present invention, which is schematically shown through a vertical section and a prospective view, respectively; it should be noticed that the view of Fig. 3 does not show a wall of the multifunction device 3, for better clarity.

[0021] The multifunction device 3 has a hollow body, equipped with a set of inlet and outlet connectors for the water supplied from the water mains and destined to the devices contained within the machine; within the device 3, conduits and chambers are defined, through a plurality of septa or bulkheads, for the water passage and metering.

[0022] In particular, reference 4 indicates an inlet connector for the water coming from the water mains and reference 5 an outlet connector for the same water towards a water softener of the dishwasher, not represented in the figures.

[0023] The entry and the exit of water, through the connector 4 and connector 5 respectively, is controlled by means of solenoid valves actuated according to known procedures and appropriate times by the machine control system.

[0024] Between the connectors 4 and 5, a conduit 6 and a conduit 7 are present within the device 3. In the upper portion of the device 3, a so-called "air-break" or air gap device indicated as a whole with reference 8, is located between the two conduits 6 and 7.

[0025] Also the air-break device 8 is of a current type and operation; it will be enough to point out, here, that its function is to hinder the water contained in the hydraulic system of the dishwasher from being sucked into the water mains, should a depression occur in the latter.

[0026] To this purpose, the air-break device has an interruption 9, which can be overcome by the water supplied from the conduit 6 before entering the conduit 7, by virtue of the acquired kinetic energy.

[0027] The remaining internal part of the device 3 practically forms a container for metering and containing the water required for the regeneration of the softening resins.

[0028] Such a container has a chamber 10, which collects both the water supplied through a calibrated hole F being present the vertical side wall of the conduit 7 and the water which is unable to overcome the air-break 9.

[0029] The bottom of the chamber 10 has a second outlet connector 11. Also in this instance, water flowing out from the connector 11 is controlled by a solenoid valve, not represented in the figures, which is controlled in a usual way at the appropriate time by the machine control system.

[0030] In fact, water collected in the chamber 10 is periodically discharged through the connector 11 into a salt container of the softener device, forming a brine to be used for regeneration of the water softening resins; as said above, the procedure for water softening and regeneration of the above resins are currently known and do not need to be described in detail herein.

[0031] With AP the opening already mentioned above is indicated, which puts the inside of the multifunction device 3 in communication with the inside of the tub 1.

[0032] On the upper portion of the device 3 there is the opening AP' previously mentioned; if no water is contained inside the device 3, the opening AP' puts the inside of the wash tub 1 in communication with the external environment, by means of the opening AP.

[0033] Reference 14 indicates a closed recess, being defined next to the opening AP.

[0034] An electromagnetic actuator 15 is located within the recess 14, where it is fastened in a known manner, e.g. with screws or clamping teeth.

[0035] The actuator 15 has a coil provided with a movable core inside it; a pin 15A, which protrudes from the body of the actuator 15, is associated to the movable core.

[0036] The position of the pin 15A is determined by means of a spring laying within the coil, which spring pushes the movable core to which the pin 15A is associated towards the outside of the actuator body, when the actuator is not electrically supplied.

[0037] In this position the pin 15A compresses a portion of a conduit 19, which will be described later.

[0038] As it can be seen in the figures, the pin 15A is represented by an unbroken or continuous line in the position where it will be when the actuator 15 is electrically supplied, and by a dotted line when the actuator is not powered.

[0039] Operation of the electromagnetic actuator 15 is in itself known; quite schematically, for each electric pulse the actuator is submitted to, the movable core performs a linear movement towards the inside of the coil, caused by the magnetic field produced by the current circulating through the same coil; thus, a corresponding linear movement of the pin 15A is obtained.

[0040] Electric supply of the electromagnetic actuator 15 is obtained through the mechanical or electronic programmer of the dishwasher, in a known manner.

[0041] The wall 16 of the recess 14 has a through-hole for the pin 15A of the actuator 15.

[0042] Reference 18 indicates a spraying or nebulizer device being located laterally to the wall 16 of the recess 14.

[0043] This spraying or nebulizer device 18 compris-

es a nozzle 17 and a main conduit 19 hermetically connected to the nozzle 17.

[0044] The conduit 19 consists of two tubular parts connected to each other, and precisely an upper part 19A made from elastic material, such as rubber or plastic, and a lower part 19B made from semirigid plastic material. The two parts 19A and 19B are hermetically connected to each other.

[0045] The upper part 19A has a larger diameter with respect to the lower part 19B and its bottom end is substantially flared; within such a flared portion of the upper part 19A a sphere or ball is housed, whose diameter is larger than the diameter of the lower part 19B.

[0046] As it can be seen in Fig. 4, the nozzle 17 of the spraying or nebulizer device 18 and the upper part 19A of the conduit 19 are substantially located in the opening AP, sideways to the wall 16 of the recess 14, the upper part 19A extending in correspondence of the pin 15A of the actuator 15. When the pin 15A is in its rest position, i.e. with the electromagnetic actuator 15 not electrically supplied, it will cause a squashing of the upper part 19A.

[0047] On the other hand the lower part 19B is so positioned to have its bottom end within the chamber 10 of the device 3, immersed in the water contained therein during the dishwasher operation; in other words, the bottom end of the lower part 19B is located at a height being lower than the level normally reached by the regeneration water within the chamber 10.

[0048] Reference 12 indicates a hollow sleeve integral to the body of the device 3, wherein the lower part 19B is inserted for a correct position of the spraying or nebulizer device 18.

[0049] In Fig. 4, representing the side of the device 3 being in contact with the wash tub of the dishwasher, reference 14 A indicates the external part of the recess 14 containing the actuator 15, which protrudes over the surface of the multifunction device 3 and has such dimensions to be inserted in the opening of the wall of the tub 1 (see Fig. 1).

[0050] Reference 17 indicates the cited nozzle of the spraying or nebulizer 18, which has a first vertical portion 17A and a second horizontal portion 17B, perpendicular to the first one and directed towards the inside of the tub 1.

[0051] The horizontal portion 17B has sideways a hole 20 for the outlet and nebulization of a jet of liquid; the position of this hole 20 is such to have the nebulized jet of liquid directed to the inner side of the tub wall on which the multifunction device 3 is located. It will be appreciated that the diameter of such a hole has a clearly smaller section with respect to the section of the part 19A of the device 18; of course, the hole 20 is appropriately oriented, to hinder the liquid sprinkling coming out of it from reaching the crockery contained in the usual baskets in the tub 1.

[0052] The device 18 is substantially obtained according to the same known technique used for manufacturing common manual sprayers or atomizers of liquid ma-

terials for house cleaning purposes (such as the washing of glass windows).

[0053] Quite schematically, its operation is as follows. Let us assume to this purpose that the device 18 is already "loaded", i.e. both the part 19A and 19B contain liquid following previous utilizations of the device.

[0054] By squashing the part 19A, above the flared end housing the ball, a pressure is generated in the liquid in the internal recess of the part 19A itself; by virtue of the smaller section of the hole 20 of the nozzle 17, such a pressure tends to flow out downwards, i.e. towards the part 19B; in this way, however, the pressure pushes the ball against the flared portion of the part 19A, so occluding the liquid flow towards the part 19B, performing during this step the function of a stop valve. Thus, the pressure determined by the pin 15A can only flow out upwards, i.e. towards the portion of the part 19A extending above the squashing point, and therefore towards the nozzle 17; as a result, the liquid contained in the part 19A will be ejected in the form of a sprinkling or nebulized jet.

[0055] If the squashing action is stopped, the part 19A, by virtue of its own elasticity, will go back to its initial configuration.

[0056] Thus, a depression or vacuum is produced within the part 19A, causing the ball to move upwards, with a consequent opening of the passage between the upper part 19A and the lower part 19B, and a suction from part 19B into part 19A of a certain volume of liquid coming from the chamber 10.

[0057] The movement upwards of the ball due to the depression produced within the part 19A is limited by means of a teeth obtained inside the upper section 19A. These teeth also have the function of maintaining the ball within the part 19A, during manufacturing the spraying or nebulizing device.

[0058] It has to be pointed out that the device 3 has appropriate means for maintaining the nozzle 17 in its correct position for avoiding that, during the actuation of the device, the part 19A is displaced sideways from the pin 15A, instead of being squashed; said means may consist for example of an appropriate striker integral to an inner surface of the device 3, as schematically indicated with R in Fig. 2.

[0059] Therefore, the set of components described above behaves like a spraying and nebulizing small pump.

[0060] Operation of the device for drying the crockery comprising the spraying or nebulizing device 18 is also very simple and is as follows.

[0061] During the drying phase, the dishwasher programmer transmits electric pulses to the electromagnetic actuator 15; for each electric pulse a horizontal movement is performed by the movable core of the actuator, towards the inside of the actuator itself, with a consequent displacement of the pin 15A.

[0062] The pin 15A, releasing the upper part 19A of the conduit 19, causes this upper part to take its original

configuration again, by virtue of its own elasticity.

[0063] Thus, a depression is produced in it, as previously described, which causes a certain volume of liquid coming from the chamber 10 to be sucked from part 19B into part 19A.

[0064] If the electric pulse stops, the spring inside the coil pushes the pin 15A against the upper part 19A of the conduit 19 of the spraying or nebulizing device 18.

[0065] As previously described, the squashing exerted by the pin 15A on the elastic material of the part 19A causes the ejection through the hole 20 of the nozzle 17 of an nebulized jet or spray of water drawn from the chamber 10 of the multifunction device 3, through the part 19B.

[0066] As mentioned above, the jet or spray from the hole 20 is directed onto the inner side of the wall of the tub 1 on which the multifunction device 3 is positioned; water will then be able to deposit on the wall, and flow down from the top to the bottom of the wall itself, so causing a certain cooling of the latter; obviously, repeating of the water jets or sprays will increase the cooling degree of the wall.

[0067] Through this cooling, the steam contained in the tub will condense on the tub wall itself, so improving the drying result.

[0068] Practical tests have proved that the system described above allows a considerable increase of the drying performance compared to those more conventional solutions which only provide for keeping the crockery inside the machine for a certain lapse of time; advantages in terms of system efficiency have also been ascertained with respect to those cited solutions which provide for cooling a tub wall from its external surface, since these known systems requires a higher cooling power.

[0069] The features of the present invention are clear according to the above description.

[0070] In particular, the device for the drying of crockery, of the type apt to induce a condensation of the steam being present within the wash tub of a dishwasher by means of the cooling of at least a tub wall, provides means for directing a liquid jet or spray on the inner surface of the wall, which are apt to cause a substantial cooling of the wall and, as a result, favour condensation on it of at least a portion of the steam contained in the tub.

[0071] Such means for directing a liquid jet of spray to the inner surface of the wall are housed in a container for metering and/or collecting liquid being required for the operation of the dishwasher; such a container is apt to contain the liquid used by the dishwasher also for purposes other than drying the crockery.

[0072] The liquid contained in the container is used for regenerating the resins of a water softening system and/or used for the washing of crockery.

[0073] The means for directing a liquid jet or spray on the inner surface of the wall comprise a liquid sprayer and/or nebulizer, and an actuator for activating the

sprayer and/or nebulizer.

[0074] The sprayer and/or nebulizer comprises a nozzle connected to a conduit for the taking of the liquid to be sprayed and/or nebulized.

5 **[0075]** The actuator, in particular an electromagnetic actuator, is apt to stress an elastic portion of the conduit, so as to cause a liquid ejection from the nozzle.

[0076] The duct has an upper part and a lower part, in particular made from elastic material and semirigid material respectively, having a tubular shape.

10 **[0077]** The nozzle has a vertical portion, and a horizontal portion perpendicular to the vertical portion, with the horizontal portion being directed towards the inside of said tub, and being provided with a hole for the outlet and/or nebulization of a liquid jet.

15 **[0078]** The hole is so positioned to have the nebulized jet of liquid directed on the inner side of the tub wall on which the sprayer or nebulizer is located. In the metering container, a recess is delimited for housing the actuator.

20 **[0079]** The metering container has an opening communicating with the inside of the tub and at least the nozzle is positioned in correspondence of this opening.

[0080] The end of the lower part of the conduit is immersed in the liquid contained in the chamber of the metering container, at least during a drying phase of the crockery as provided by an operating program of the dishwasher.

25 **[0081]** A dishwashing machine, having a wash tub and a system for drying the crockery, which device is apt to induce a condensation of the steam being present within the tub of the machine, through the cooling of at least a tub wall, comprises a device for the drying of crockery, where means are provided to direct a liquid jet or spray on the inner surface of the wall, which is apt to cause a substantial cooling of the wall and, as a result, favour condensation on it of at least a portion of the steam contained in the tub.

30 **[0082]** According to the above description also the advantages of the present invention are clear. In particular the device described above:

- has restricted dimensions and is easy to manufacture by using simple, cost-effective, reliable components, which can be easily controlled;
- 45 - does not require any additional room, being integrated in another device being part of the dishwasher;
- does not require any additional holes or openings on the tub surface (as required vice-versa for the drying systems with ventilation), since it uses a breather hole which is necessarily present on the tub wall of dishwashing machines;
- it uses, for its own operation, a small portion of the liquid being provided for performing other machine operations, such as resins regeneration of a water softener device.

55 **[0083]** It is obvious that many changes are possible

for the man skilled in the art to the device for drying the crockery described above by way of example, without departing from the novelty spirit of the inventive idea.

[0084] For example, instead of directing the nebulized water jet on the inner side of a lateral wall of the tub 1, this may be directed on the inner side of its rear wall.

[0085] Nothing hinders the use of the spraying or nebulizing device 18 for obtaining the cooling of two walls of the tub 1 perpendicular to each other, so as to increase the internal cooling and obtain a consequent steam condensation on such walls. This may be obtained, for instance, providing a nozzle with two outlet holes perpendicular between them and directed to two different tub walls, and positioning the device 3 as close as possible to a tub corner.

[0086] Nothing hinders then to provide more than one nozzles, even at remote positions from each other and supplied by one device 18 alone.

[0087] Another variant may concern the source of the liquid used by the sprayer 18; in other words, the device according to the present invention may use water destined to crockery washing, instead of water provided for resins regeneration; this is easy to manufacture also in the instance of multifunction devices with a plurality of separate chambers, of which one or more provide in fact for the metering of the water required to perform a wash phase.

[0088] However, it is obvious, without prejudice to the principle of the present invention, that many changes are possible to the manufacturing features of the device for the drying of crockery described above by way of example, without departing from the novelty frames of the inventive idea; it is also clear that in the practical actuation of the invention, the components may differ in form and size from the ones described and be replaced with technical equivalent elements.

Claims

1. A device for the drying of crockery, of the type apt to induce a condensation of steam being present within the wash tub (1) of a dishwasher by means of the cooling of at least one wall of said tub (1), characterized in that means (15-19) are provided for directing onto the inner surface of said wall a jet or spray of liquid apt to determine a cooling of said wall, so as to favour the condensation on said wall of at least a part of the steam being present within said tub (1).
2. A device according to claim 1, characterized in that said means (15-19) are housed in a container (3) for metering and/or collecting of liquid being required for the dishwasher operation.
3. A device according to claim 2, characterized in that said container (3) is apt to contain liquid used by the dishwasher also for purposes other than the drying of crockery.
4. A device according to claim 3, characterized in that the liquid contained in said container (3) is used for regenerating the resins of a water softener device.
5. A device according to claim 3, characterized in that the liquid contained in said container (3) is used for washing the crockery.
6. A device according to claim 1, characterized in that said means (15-19) comprise a liquid sprayer and/or nebulizer (18).
7. A device according to claim 6, characterized in that said means (15-19) comprise an actuator (15-15A) for operating said sprayer and/or nebulizer (18).
8. A device according to claim 6, characterized in that said sprayer and/or nebulizer (18) comprise a nozzle (17), a conduit (19) being connected to said nozzle (17) for drawing the liquid to be sprayed and/or nebulized.
9. A device according to claims 7 and 8, characterized in that said actuator (15-15A), which is in particular an electromagnetic actuator, is apt to stress an elastic portion (19A) of said duct (19), so as to obtain a liquid ejection from said nozzle (17).
10. A device according to claim 8, characterized in that said conduit (19) has an upper part (19A) and a lower part (19B), in particular made from elastic material and semirigid material respectively.
11. A device according to claim 10, characterized in that said upper part (19A) and lower part (19B) have a tubular shape.
12. A device according to claim 10, characterized in that said upper part (19A) has an end being substantially flared.
13. A device according to one or more of the previous claims, characterized in that said nozzle (17) has a vertical portion (17A) and a horizontal portion (17B), being perpendicular to each other, said horizontal portion (17B) being directed towards the inside of said tub (1).
14. A device according to claim 13, characterized in that said horizontal portion (17B) has a hole (20) for the outlet and/or nebulization of a liquid jet.
15. A device according to claim 8 and/or 11, characterized in that said nozzle (17) and/or said hole (20) is so positioned to have the nebulized liquid jet being

directed to the inner part of the wall of the tub (1) on which the sprayer or nebulizer (18) is positioned.

- 16.** A device according to one or more of the previous claims, characterized in that a recess (14) for positioning said actuator (15-15A) is defined in said metering container (3). 5
- 17.** A device according to claim 2, characterized in that said container (3) has an opening (AP) communicating with the inside of said tub (1). 10
- 18.** A device according to claims 8 and 17, characterized in that at least said nozzle (17) is positioned in correspondence of said opening (AP). 15
- 19.** A device according to one or more of the previous claims, characterized in that a metering chamber (10) for the liquid is defined within said container (3), at least a portion of said liquid coming from, in particular, an air-break (9) and a calibrated hole (F). 20
- 20.** A device according to claims 10 and 19, characterized in that the end of said lower part (19B) is immersed in the liquid contained in said chamber (10) at least during a drying phase of the crockery being provided by an operation program of the dishwasher. 25
- 21.** A device according to claim 12, characterized in that a ball is present in said flared lower end. 30
- 22.** A device according to at least one of the previous claims, characterized in that said means (15-19) comprise two or more nozzles (17). 35
- 23.** A dishwashing machine comprising a wash tub (1) and a system for the drying of crockery, of the type apt to induce a condensation of the steam being present within said tub (1) by means of the cooling of at least one wall of said tub (1), characterized in that it comprises the device for the drying of crockery according to one or more of the previous claims. 40
- 24.** A dishwashing machine comprising a wash tub (1) and a system for the drying of crockery, of the type apt to induce a condensation of steam being present within said tub (1) by means of the cooling of at least one wall of said tub (1), characterized in that means (15-19) are provided for directing on the inner surface of said wall a liquid jet or spray, which is apt to cause a cooling of said wall, so as to favour condensation on said wall of at least a portion of the steam being present within said tub (1). 45
50
55

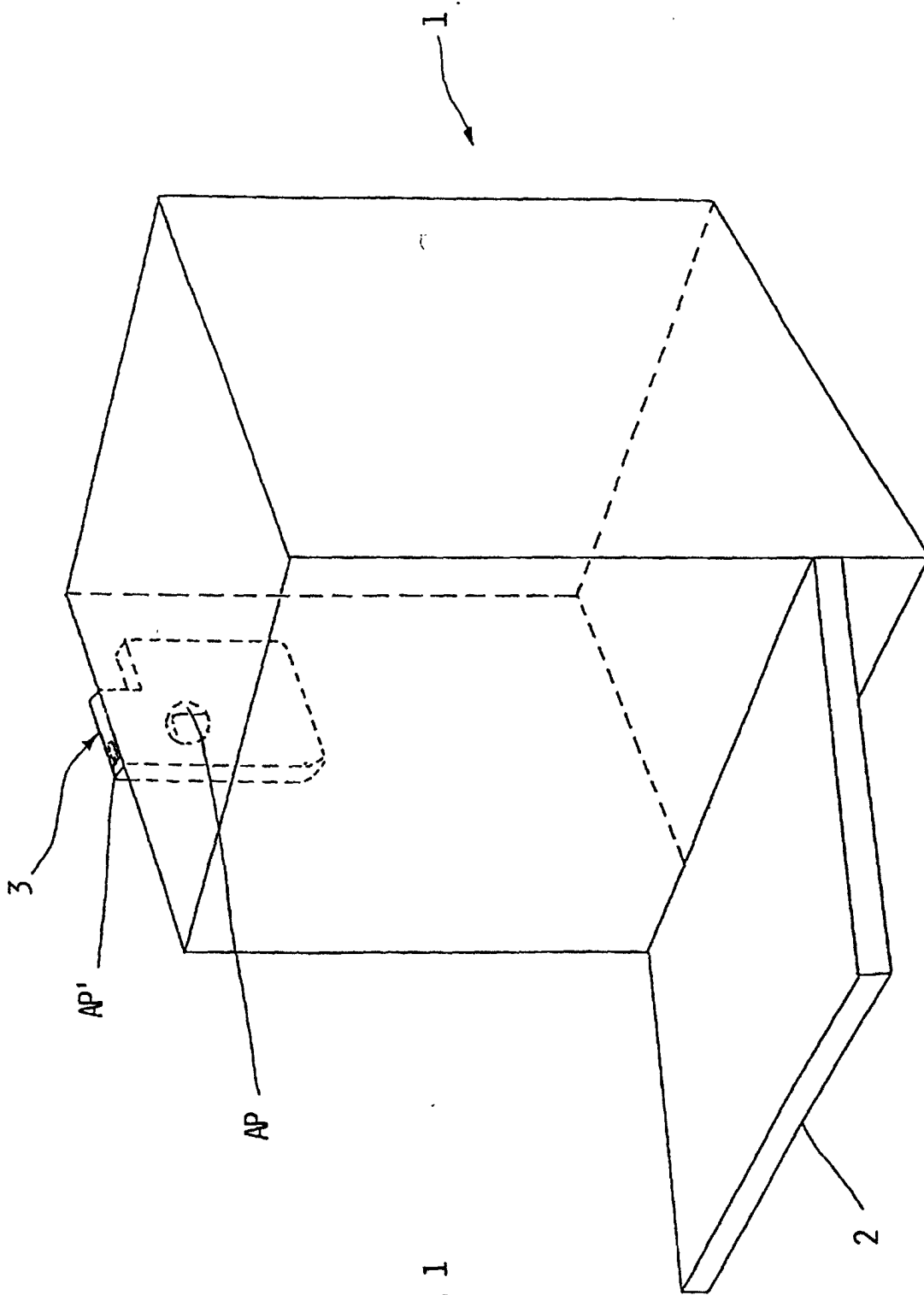


FIG. 1

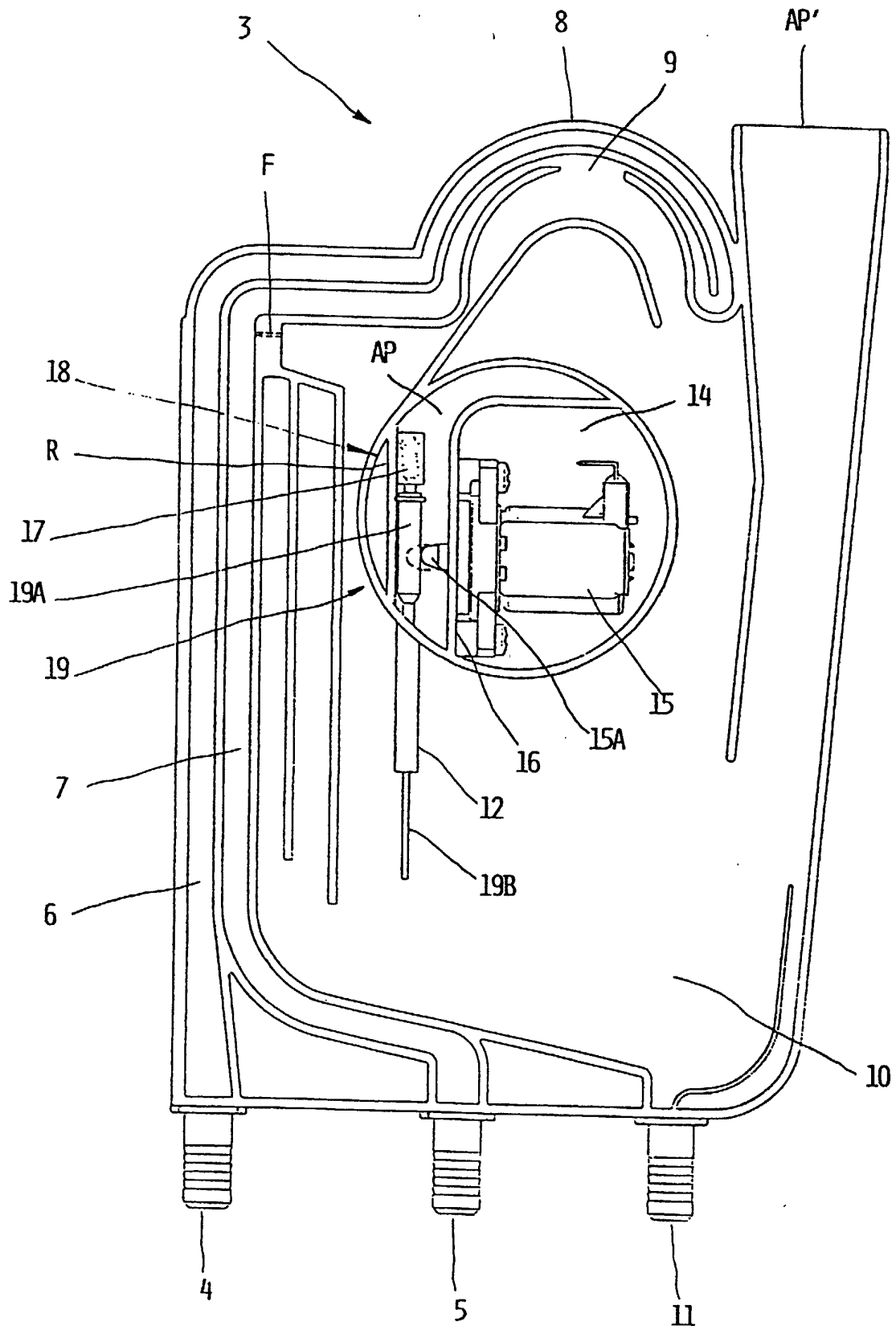


FIG. 2

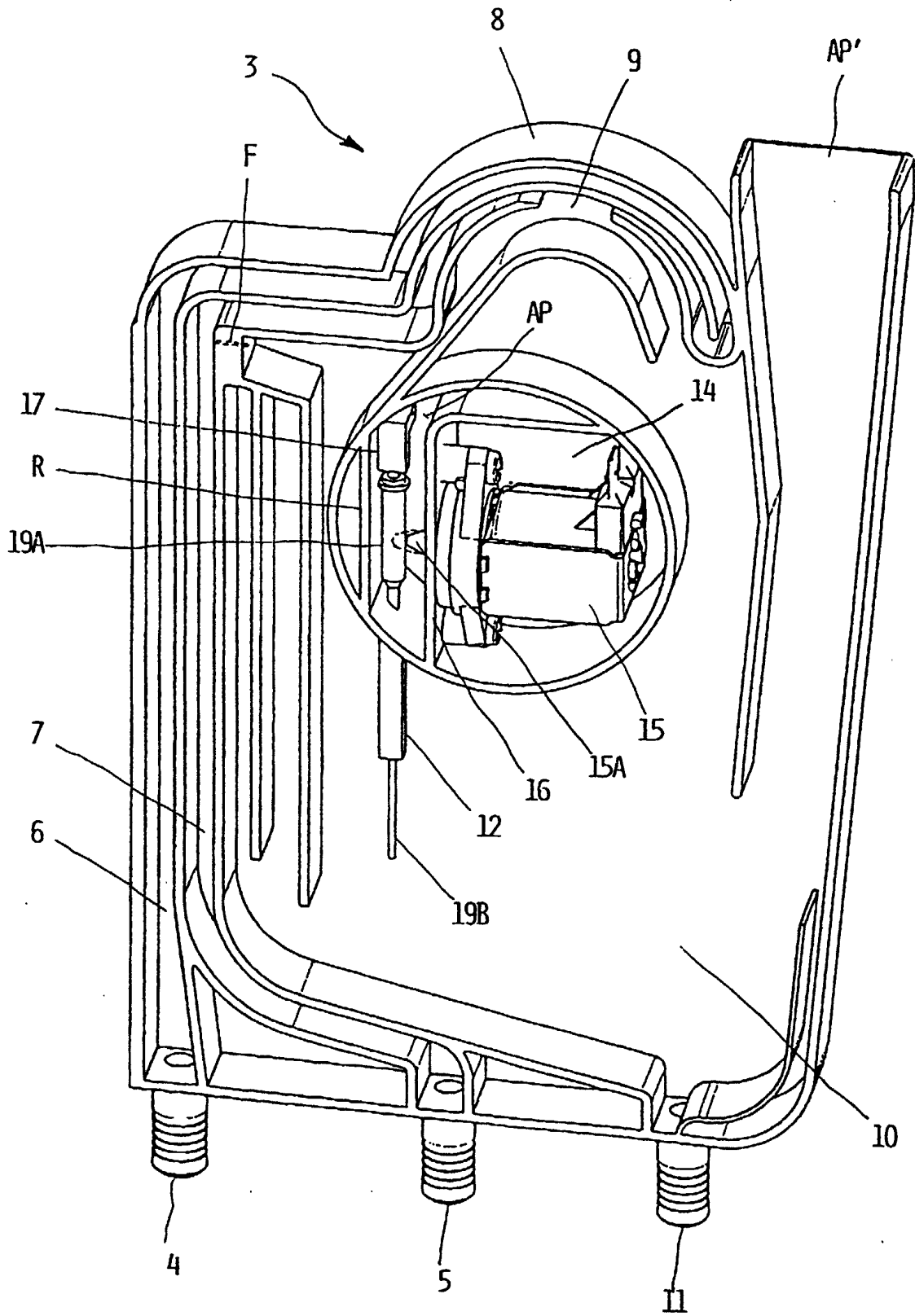


FIG. 3

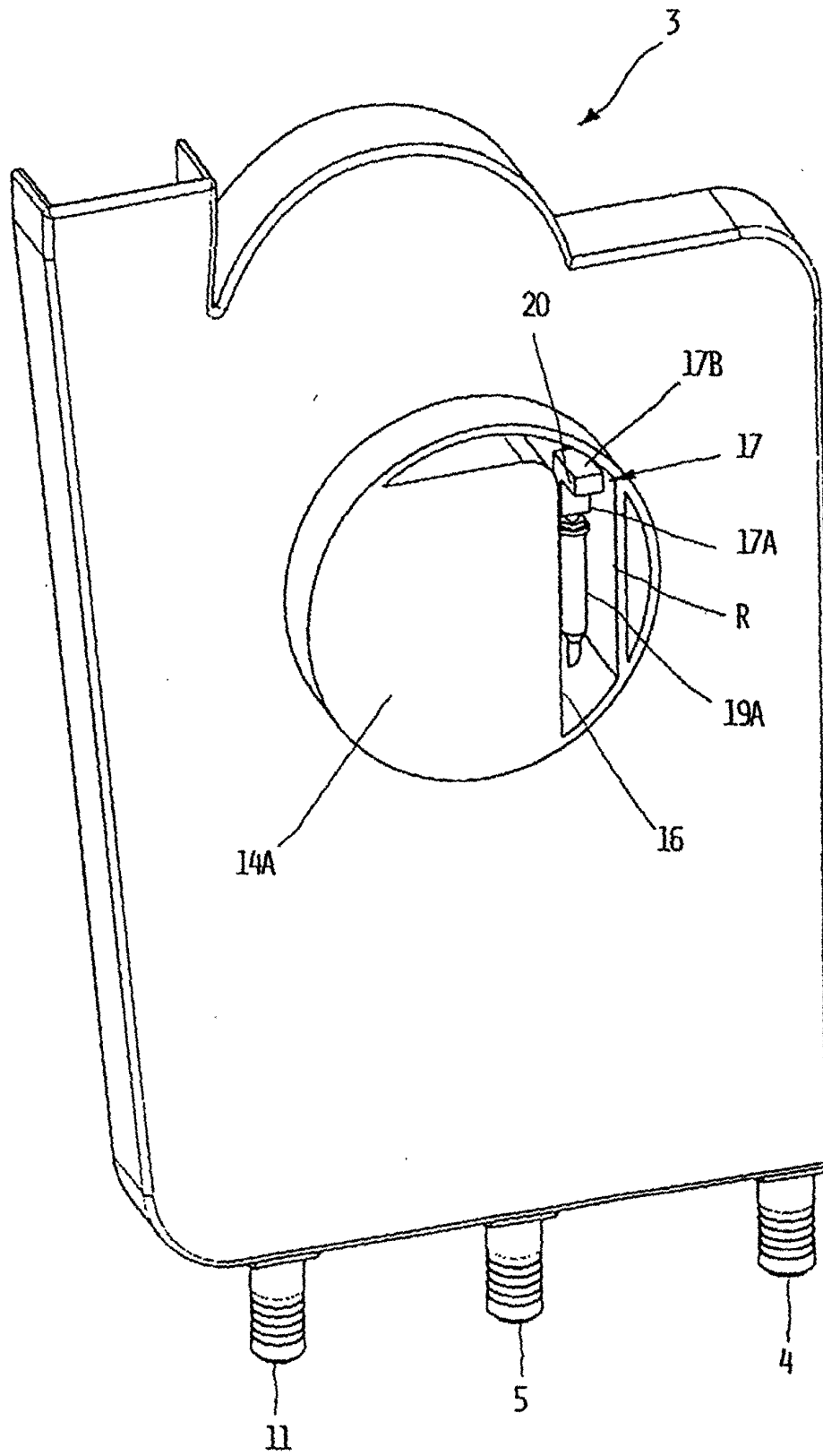


FIG. 4