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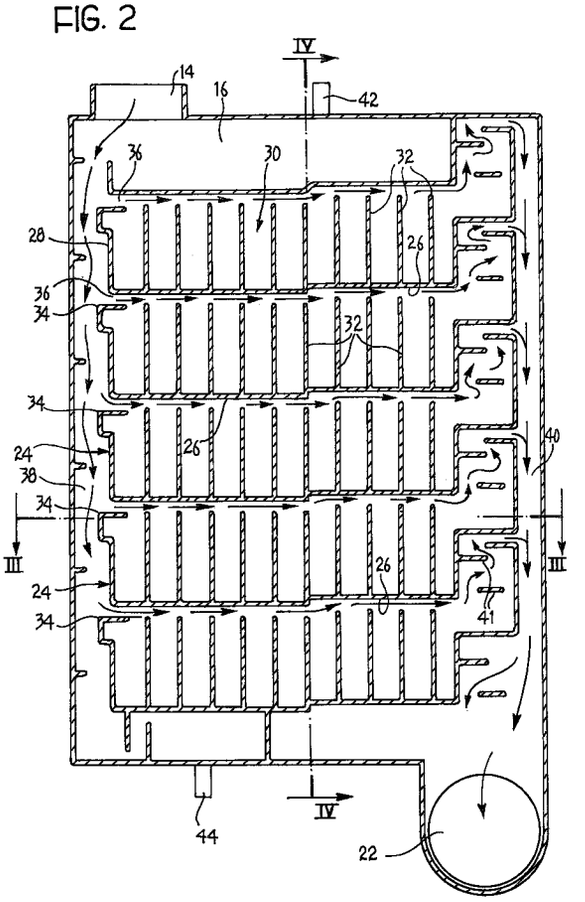
(54) Device for cooling and condensing steam formed in the washing tank of a dishwashing machine

(57) The device for cooling and condensing steam formed in the washing vessel (10) of a dishwashing machine includes a chamber (16) containing cold water which causes the condensation of the steam, and a fan (20) which transfers steam-laden air from the washing vessel (10) to the chamber (16).

A plurality of overlapping plates (24) is located in this latter, each of which includes a base part (26) and a side wall (28) to define a cavity (30) containing water. A space (36) into which the steam-laden air to be condensed can flow is defined between the base wall (26) of at least one plate (24) and the upper edge (34) of the side wall (28) of the immediately underlying plate (24).

FIG. 2



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Description

[0001] The present invention concerns a device for cooling and condensing the steam formed in the washing vessel of a dishwashing machine.

[0002] In more detail, the device includes:

- a chamber containing cold water which causes the condensation of the steam, and
- a fan which transfers steam-laden air from the washing vessel to the said chamber.

[0003] A device of this kind is known, for example, from EP-A-486 828 which describes how the steam-laden air is passed over the surface of the cold water at the bottom of the aforesaid chamber in order to dehumidify it.

[0004] The object of the present invention is to provide a condensation device of the type described at the start of this description, having an effective steam collection.

[0005] This object is achieved by virtue of a device having the characteristics specifically referred to in the following claims.

[0006] In the condensation chamber of the device of the invention, the steam-laden air is forced to pass between two cold surfaces, constituted respectively by the surface of the water in the cavity of a plate and the base wall of the plate above it. The heat exchange is therefore increased to give greater cooling of the air, which causes a more complete condensation of the steam.

[0007] Further advantages and characteristics of the present invention will become clear from the following description given by way of non-limitative example and with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of a dishwashing machine which includes a condensation device according to the invention;
Figure 2 is a side view in section of a chamber forming part of the condensation device of the invention;
Figure 3 is a view in section of a chamber taken on the line III-III of Figure 2; and
Figure 4 is a view in section of a chamber taken on the line IV-IV of figure 2.

[0008] A dishwashing machine includes (Figure 1) a washing vessel 10 and a device for cooling and condensing the steam formed therein during operation.

[0009] A duct 12 connects the vessel to an inlet aperture 14 of a chamber 16 which forms part of the condensation device and will be described in detail below. A further duct 18, in which is located a fan 20, connects an outlet aperture 22 of the chamber 16 to the washing vessel 10.

[0010] A plurality of plates 24 arranged substantially horizontally on top of each other is located in the chamber 16 (Figure 2). Each plate 24 comprises a base part 26 and a side wall 28 to define a cavity 30 housing a plurality of dividing barriers 32 (Figure 3) which extend substantially transversely with respect to the base wall 26 to subdivide the cavity 30 into a plurality of sub-cavities 33 containing cold water.

[0011] A narrow space 36 is defined between the base wall 26 of each plate 24 and the upper edge 34 of the side wall 28 of the plate 24 immediately below it.

[0012] The presence of the barriers 32 avoids the disadvantages that can arise, if the dishwashing machine is not standing on a perfectly flat surface, caused by the uncontrolled pouring of water from the plates 24 and/or the spaces 36 becoming blocked.

[0013] A first channel 38 within the chamber 16 extends substantially vertically to channel the steam-laden air coming from the aperture 14 into the spaces 36 which extend substantially transversely with respect to the first channel 38, and a second, substantially vertical channel 40 leads from the chamber 16 to the outlet aperture 22.

[0014] A labyrinthine pathway formed from a plurality of superimposed and offset ribs 41 is interposed between each space 36 and the second channel 40. All of the ribs 41 and, in particular, the bottom rib, are located higher than the upper edge 34 of the side wall 28 at the region where the first channel 38 passes into the associated space 36.

[0015] The chamber 16 also has, at its top, an aperture 42 for supplying cold water and, at the bottom, a further aperture 44 for the discharge of excess water.

[0016] The device described above operates as follows.

[0017] Cold water is initially supplied to the chamber 16 via the aperture 42. The various plates 24 thus fill with water, starting at the uppermost plate and proceeding progressively downwards until it reaches the level determined by the upper edge 34 of the associated side wall 28. Any excess water is discharged through the aperture 44 in the base of the chamber 16.

[0018] Then, after a washing cycle of the dishwashing machine has finished, the fan 20 is activated to blow the steam-laden air from the vessel 10 and cause it to flow into the chamber 16 via the duct 12. Here, the air flows along the first channel 38 from which it becomes distributed in the various spaces 36 located substantially transversely with respect to the channel 38. On coming into contact with the cold surfaces constituted by the base wall 26 of the plates 24 and the surface of the water present in the sub-cavity 33, the air cools and the steam condenses.

[0019] In principle, as the spaces 36 become narrower, the cooling and condensing action becomes more efficient as the ratio between the heat-exchange surface and the volume of steam to cool increases. From a practical point of view, however, positioning the plates 24 very close to each other can be problematic from the point of view of the mounting tolerances, and it also reduces excessively the flow capacity and

increases the pressure drop and, consequently, the power consumed by the fan 20.

[0020] Therefore, taking into account these opposing requirements, the height of the spaces 36 is preferably less than the height of the side walls 28.

[0021] The dehumidified air is then channelled into the second channel 40 and output from the chamber 16 via the aperture 22, from which it is returned to the vessel 10 via the second duct 18 in which the fan 20 is located.

[0022] The pathway through the labyrinths formed by the ribs 41 avoids the water in the cavity 30 of the plates 24 mechanically dragging the air. Such drag is further prevented by the positioning of the ribs 41 of each labyrinth - and, in particular, by the lowermost one - higher than the edge 34 of the side wall 28, in correspondence with the region in which the air laden with moisture enters the associated space 36.

[0023] It is naturally understood that, with the principle of the invention remaining the same, the details of manufacture and the embodiments can be widely varied with respect to that described and illustrated in the drawings, without by this departing from the ambit of the invention. For example, the fan can be located either upstream or downstream of the chamber, and the dehumidified air leaving this latter can be discharged directly into the external environment, or can be returned into the washing vessel.

Claims

1. A device for cooling and condensing steam formed in the washing vessel (10) of a dishwashing machine, including:

   - a chamber (16) containing cold water which causes the condensation of the steam, and
   - a fan (20) which transfers steam-laden air from the washing vessel (10) to the said chamber (16),

   the said device being characterised in that a plurality of overlapping plates (24) is located in the said chamber (16), each of which includes a base part (26) and a side wall (28) to define a chamber (30) containing the said water, a space (36) being defined between the base wall (26) of at least one plate (24) and the upper edge (34) of the side wall (28) of the plate (24) immediately above it, through which space flows the said steam-laden air to be condensed.

2. A device according to Claim 1, characterised in that the said space (36) has a height less than the height of the side wall (28) of the underlying plate (24).

3. A device according to any preceding claim, characterised in that a plurality of dividing barriers (32) is located in the cavity (30) of each plate (24), which dividers extend substantially transversely with respect to the base wall (26) in order to subdivide the said cavity (30) into a plurality of sub-cavities (33).

4. A device according to any preceding claim, characterised in that the said chamber (16) has an inlet aperture (14) for the steam-laden air, a first, substantially vertical channel (38) which supplies the steam-laden air to the said at least one space (36) which extends substantially transversely with respect to the first channel (38), and a second, substantially vertical channel (40) for the discharge of the dehumidified air towards an outlet aperture (22) from the chamber (16).

5. A device according to Claim 4, characterised in that a labyrinthine pathway formed from a plurality of superimposed and offset ribs (41) is interposed between each space (36) and the second channel (40).

6. A device according to Claim 5, characterised in that the ribs (41) and, in particular, the lowermost rib, are situated at a height greater than the upper edge (34) of the side wall (28) of the plate (24), where the first channel (38) passes to the associated space (36).

7. A device according to any preceding claim, characterised in that the said fan (20) is located upstream of the said chamber (16).

8. A device according to any of Claims from 1 to 6, characterised in that the said fan (20) is located downstream of the said chamber (16).

9. A device according to any preceding claim, characterised in that the said chamber (16) has an aperture (42) for supplying the cold water, and a further aperture (44) for the discharge of any excess water.

FIG. 1

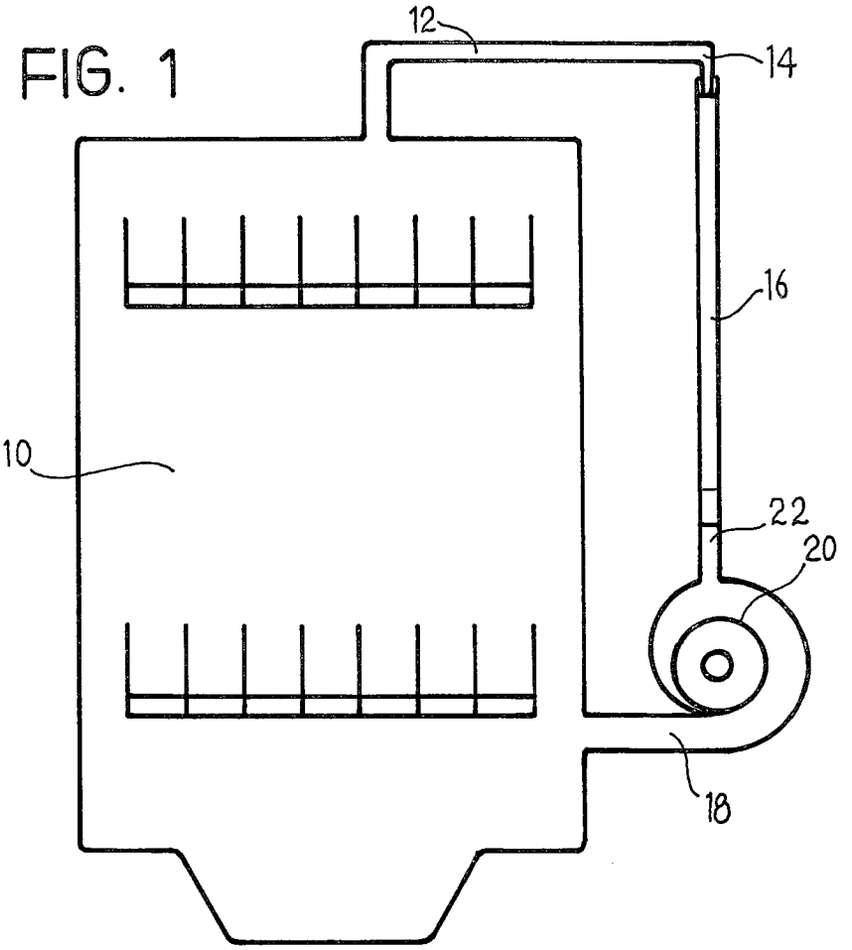


FIG. 4

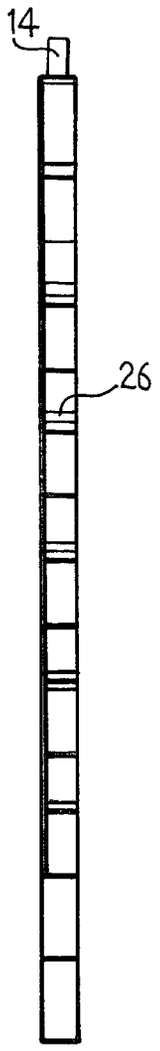


FIG. 3

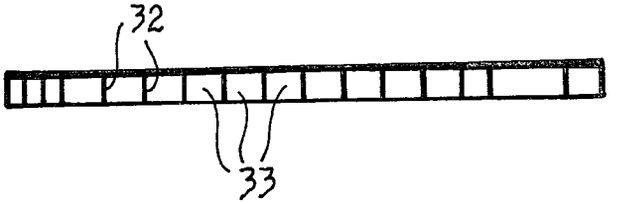
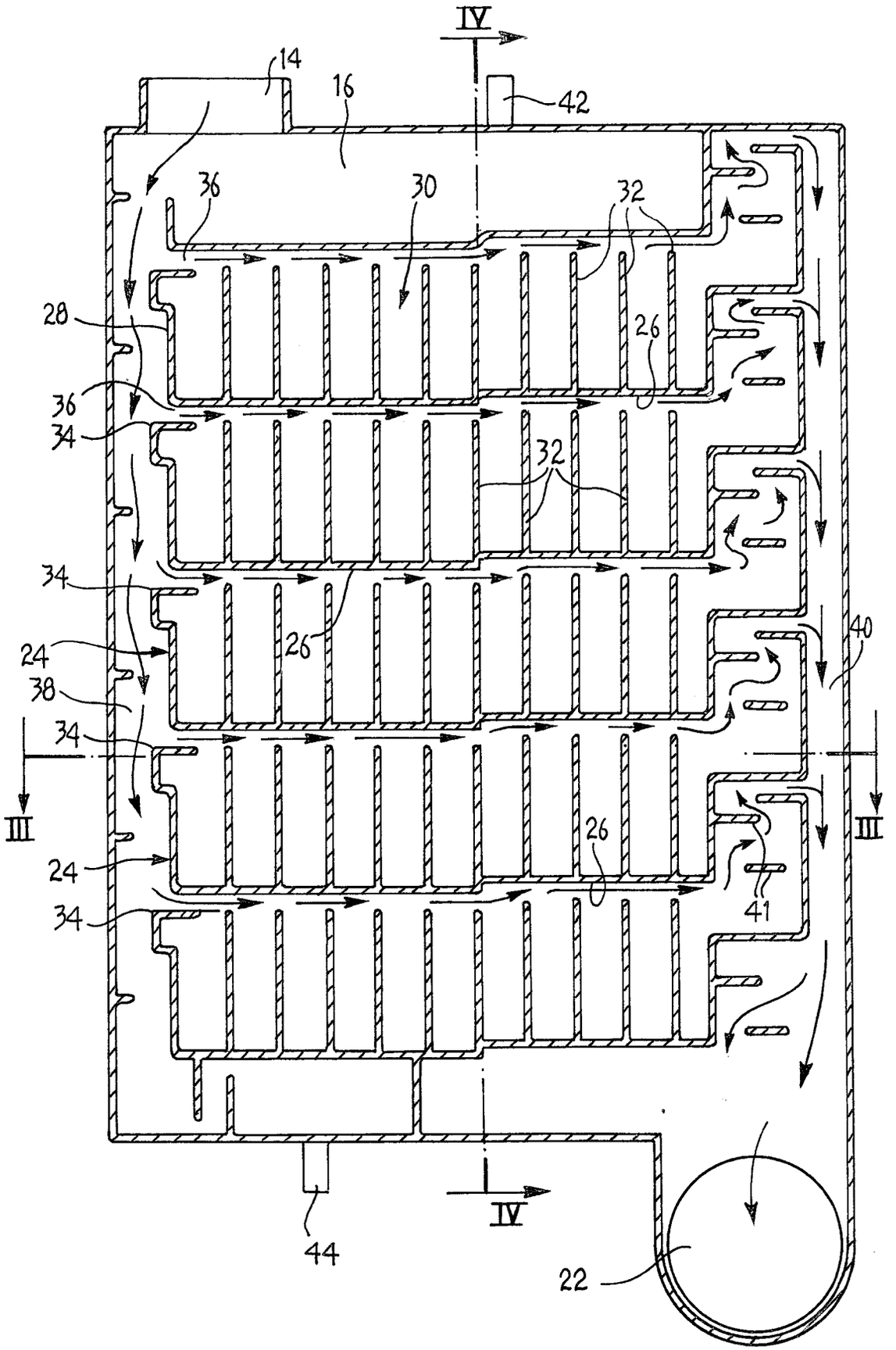


FIG. 2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