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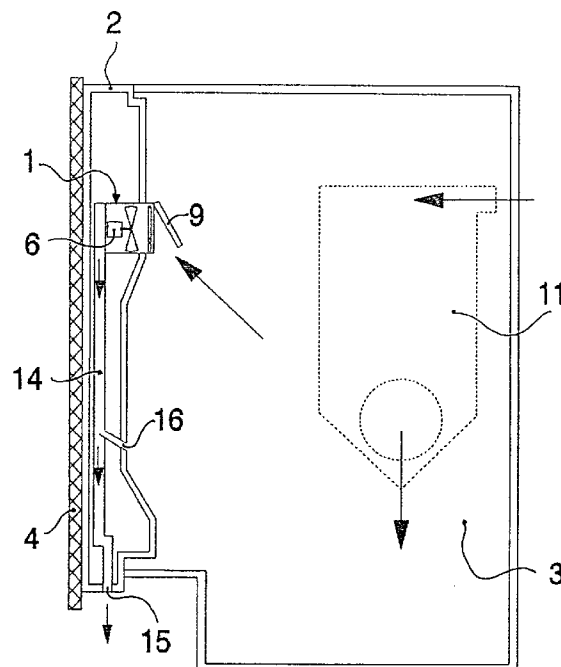
(71) Applicant : **MERLONI ELETTRODOMESTICI**
S.p.A.
Viale Aristide Merloni, 45
I-60044 Fabriano (AN) (IT)

(72) Inventor : **Schena, Giuseppe**
Via Martiri della Libertà 18
Bricherasio (TO) (IT)

(54) **Dishwashing machine with fan for the circulation of air.**

(57) A dish-washing machine is described, comprising a washing chamber, an access door to said washing chamber and a fan fixed to said door, for the forced circulation of air inside said chamber; the characterising principle of the described dish-washing machine consists in that said fan (6) for the forced circulation of air inside the washing chamber (3) is housed in an appropriate container, in particular enbloc (1,21), that is at least partially enclosed in the access door(2) to said washing chamber (3), in particular on the side that in the closed position of said door (2) it faces towards the interior of said washing chamber (3).

FIG. 3



The present invention relates to a dish-washing machine, comprising a washing chamber, an access door to said washing chamber and a fan fixed to said door, for the forced circulation of air inside said chamber.

As known some dish-washing machines are equipped with a fan, apt at causing a forced circulation of air inside the washing chamber; such fan being installed in several types of machine that provide, upon completing the wash, a final drying phase of the dishes and pans.

The action of such fan has the aim of improving the elimination of the steam created inside the washing chamber and therefore allowing a better drying than that obtained with the more traditional solutions; these in fact foresee that the dishes remain inside the machine for several minutes, during which the steam is partly eliminated due to a "condensing effect" carried out by the walls of the chamber, and partly by making the steam exit appropriate breather louvers present in the door of the machine.

In dish-washing machines of the type known the fan is generally arranged within the door, interposed between two series of louvers, the first being realised on the side of the door that faces the chamber and the second being realised on the external side of the door, i.e. towards the external surroundings.

For avoiding risks of infiltration maze-like passages can be provided within the door, in correspondence to the louvers.

Such known technique does however have several drawbacks.

For example, the fan, being fixed in the cavity of the door of the machine results in an awkward installation and can lead to problems for eventual technical interventions.

The manufacture of the door results in being complicated, due to the internal fixing of the fan, and to the numerous openings realised on the door (with a consequent increase in the risks of water losses), and as additional processing is required for the realisation of the eventual maze-like passages.

It is not to be overlooked that both the external and internal apertures of the machine must be aesthetically trimmed, or covered with appropriate masks. The presence of such louvers, that in practice place in communication the interior of the washing chamber with the exterior, also determining the undesired passage of noise during the functioning of the machine.

The aim of the present invention is that of overcoming these and other drawbacks of the dish-washing machines of the type known, and in particular to indicate a dish-washing machine equipped with a drying circuit being simple to realise and efficient, that allows for avoiding the risk of water loss and the passing of noise.

Such aim is achieved according to the present in-

vention by a dish-washing machine, comprising a washing chamber, an access door to said washing chamber and a fan fixed to said door, for the forced circulation of air inside said chamber, characterised in that said fan for the forced circulation of air inside the washing chamber is housed in an appropriate container, in particular enbloc, that is at least partially enclosed in the access door to said washing chamber, in particular on the side that in the closed position of said door it faces towards the interior of said washing chamber.

Further aims and advantages of the present invention will result in being clear from the following detailed description and annexed drawings, provided purely as an explanatory and non-limiting example, wherein:

- figure 1 represents a first partially sectioned schematic view of an enbloc device making up part of the dish-washing machine subject of the present invention;
- figure 2 represents a partial and schematic section of the door of the dish-washing machine subject of the present invention;
- figure 3 represents in a schematic manner the air circulation circuit of the dish-washing machine subject of the present invention;
- figures 4 and 5 schematically represent, with similar views as those of figures 1 and 3, a possible realisable variant of the invention.

Some components of the dish-washing machine subject of the present invention, that in the following will be mentioned, have not been represented in the figures in that they are relatively simple and known.

With reference to the mentioned figures, reference number 1 indicates as a whole a container, for instance realised in a single piece, fixed to the loading door 2 of a dish-washing machine; such container device 1 is partially enclosed in the door, on the side made up of stainless steel that, in the closed position of the actual door, faces the interior of a washing chamber 3 of the dish-washer. To the exterior of said door 2, i.e. towards the external surroundings, a decorative panel 4 is fixed, that entirely covers the door starting from the base of the dish-washing machine. A compartment is realised in the container 1 in which a fan for the forced circulation of air inside the chamber 3 is arranged; such fan, of the known type and functioning, is generally indicated with reference number 6.

The container 1, that is equipped with a cover flap 9, has an opening in its rear part, i.e. towards the interior of the door 2, so as to allow the passage of air. The cover flap 9 is realised in a plastic material, as is the box body of the container 1, and has seals for guaranteeing the necessary water/air tightness; said cover flap is hinged to the body of the container 1 at its superior part.

The opening of the cover flap 9 that covers the

fan 6 is realised by way of a counter-weight system.

As is noted in figure 2, such cover flap 9 has a counter-weight 10 to which it is integral; the aim of such counter-weight 10 is that of making the cover flap 9 close automatically when the door 2 of the machine is opened and found in a horizontal position (as in the case represented in part B of figure 2).

For the opening of the cover flap 9 at an opportune moment an electromagnetic system is provided; the cover flap 9 in fact has a metallic insert and in the compartment of the fan 6 a release device is present constituted by a fixed magnet and a demagnetising coil. At an opportune moment of the washing cycle, the timer of the machine sends to the coil of the compartment of the fan 6 an impulse: the magnet is demagnetised for several instants, so as that the cover flap 9 opens to approximately 30-40° due to the effect of the counter-weight 10, i.e. just enough for allowing a sufficient air passage (as in the illustrated in part A of figure 2); the timer activates at this point the fan 6 for a determined period; therefore under the action of the fan 6 an adequate circulation of air inside the washing chamber is created, for eliminating the steam has been created within.

In figure 3, that represents in an approximate schematic form the air circulation circuit of the dish-washing machine subject of the present invention, reference number 11 indicates a breather device normally provided in dish-washing machines; reference number 14 indicates a conduit of a relatively reduced section, for example in a plastic material, that places in communication the rear opening of the container 1 with an opening 15 present on the extremity of the lower edge of the door 2. The presence of the panel 4 does not interfere whatsoever with the opening 15.

The air circulation circuit, indicated by the arrows, is the following. Upon termination of the washing cycle, in itself known, the fan 6 begins to function on the command of the timer, after that the same timer has caused the release of the cover flap 9, in the above-mentioned manner; cold air is inhaled for depression in the chamber 3, through the breather device 11; still under the inhaling action of the fan 6 warm air loaded with steam, that naturally tends to ascend, is inhaled within the container 1.

The air consequently passes the container 1 and is pushed in the conduit 14 towards the bottom, inside the door 2, to the opening 15, from which it exits.

Upon completion of the cycle, and therefore the drying phase is also terminated, the door 2 of the machine is opened and the baskets extracted; due to the action of the counter-weight 10, during the opening movement of the door 2 a gradual closure of the cover flap 9 is determined, up until the latter returns under the action of the relative magnet and therefore results in being re-coupled (figure 2-B): therefore there are no risks of the eventual liquid residues dripping from the extracted baskets of the machine entering the

compartment of the fan 6.

As is noted, according to the proposed solution, the assembly of the fan results in being simplified, as in the stainless steel sheet that constitutes the surface of the door facing the chamber a simple opening is made in which the container 1 is partially (and obviously water-tightly) enclosed.

The fan 6, preassembled in the container 1, is in this way directly accessible, without having to intervene on the whole door; its installation, in the constructive phase, and interventions in the case of maintenance are thus very simple and rapid.

Just as simple is the installation of the conduit 14, that is predisposed in the cavity of the door 2 before the fixing of the door to the door lining, i.e. between the external portion of the door and the stainless steel shell that faces the washing chamber; the joining of the conduit 14 and the container 1 may be for example of the snap fit type.

Advantageously, the conduit 14 could be shaped so as to favour the natural condensation of the steam within the conduit itself; for such aims a small hole or breather can be provided (schematically represented with 16) in the door lining, eventually equipped with a membrane valve device, through which the water formed from the condensation may re-enter the washing chamber.

With reference to figures 4 and 5, in which a possible realisable variant of the present invention is schematically illustrated, reference number 21 indicates as a whole an enbloc device, fixed to the loading door 2 of a dish-washing machine; like container 1 figures 1-3, such enbloc device 21 is partially enclosed in the door, on the side constituted in stainless steel that, in the closed position of the door itself, faces the interior of the chamber 3 of the dish-washing machine.

The enbloc device is divided into three compartments:

- in the first compartment, to the left of figure 4, a distributor or dispenser is realised, for the rinsing additives, which is indicated with reference number 24;
- in the second compartment, that in the centre of figure 4, a distributor for the washing agent or detergents is realised, indicated with reference number 25;
- in the third compartment, to the right of figure 4, the fan for the circulation of the air within the chamber 3 is arranged, indicated with reference number 6.

The distributor 24 is a dispenser for liquid additives, realised with substantially known techniques, i.e. constituted by a tank that the user occasionally fills and the contents of which last for numerous washing cycles. Such distributor 24 is equipped with a cover flap 27, in a plastic material, that is opened by the user before the loading of the additives after

which it is then closed by the same user.

During the washing cycle, more precisely at the beginning of a rinsing phase, the programmer (timer) of the dish-washer commands a device within the distributor 24, that provides for opening a small passage through which the additives can drop into the washing chamber 3. Such type of dispensers are very common in the field of dish-washing machines.

The distributor 25 for the washing agents or detergents is a dispenser for liquid or powder additives; in practice a container in which the user, before the beginning of the washing cycle, loads the detergents through a cover flap 28; for the distributor 25, at an opportune moment, the timer provides for commanding a release device that causes the complete opening of the cover flap 28 and the consequent entry of the detergents within the washing chamber.

In the third compartment, also equipped with a cover flap indicated with 9, an electric fan is arranged, of a known type and functioning, having the aim of creating a forced circulation of air within the washing chamber of the dish-washing machine; the rear part of such compartment is opened towards the interior of the door 2, so as to allow the passage of the air.

Cover flaps 27, 28 and 9 are realised in a plastic material, as is the box body of the enbloc device 21, and has seals for guaranteeing the necessary watertightness; said cover flaps are hinged to the body of device 21 along their superior part; the cover flap 28 is further equipped with a spring that, at the moment of the release, causes the automatic opening.

Cover flap 9 of the fan 6 is not equipped with a spring, but with a counter-weight system being of a similar type and functioning as that described with reference to figure 2.

The release at an opportune moment during the performance of the washing cycle of the cover flaps 28 and 9 is commanded by the timer of the machine, by way of electromagnetic type release systems (cover flap 27 however is equipped with a mechanical release, that can only be operated by the user).

Cover flap 28 has a hook that is introduced to a hole realised in the body of the enbloc 21, in correspondence with such hole the distributor 25 is equipped with an electrically commanded device, in itself known, for releasing such hook. The release of cover flap 9 however takes place in the way described above.

At an appropriate moment of the cycle, the timer commands the release device of distributor 25, the hook is freed and the cover flap 28, under the action of the spring, automatically opens in a way that allows the entry of the detergents.

In a successive moment, the timer sends to the coil of the compartment of the fan 6 an impulse: the magnet becomes demagnetised for some moments, so as that the cover flap 9 opens to approximately 30-40° due to the adequate of the counter-weight, i.e.

just enough for allowing a sufficient passage for the air (as in the case illustrated in part A of figure 2); the timer at this point activates the fan 6 for a determined period; under the action of the fan 6 an efficient circulation of air within the washing chamber is consequently created, for eliminating the steam that has been created within.

Figure 5 schematically represents, by way of a section similar to that of figure 3, the air circulation circuit of the dish-washing machine subject of the present invention, in the case of the possible realisable variant in figures 4 and 5.

The air circulation circuit, indicated by the arrows, is the following.

Once the fan 6 has started to function, cold air is inhaled for depression in the chamber 3, through the breather device 11, still under the action of the fan 6 warm air loaded with steam is inhaled by the fan 6, the air passes through the enbloc device 21 (in correspondence with the compartment of the fan) and is forced in the conduit 14 towards the bottom, within the door 2, to the opening 15 from where it exits.

When the cycle is completed the door 2 is opened and the baskets extracted; thanks to a gradual action of the counter-weight 10 a gradual closure of the cover flap 9 is carried out, as described above, until it comes under the action of the relative magnet again and therefore results in being re-coupled (figure 2-B).

So as to guarantee a greater level of security, it is to be noted that according to the proposed variation, the cover flap 28 is laterally provided with a small projecting tooth 22, in the direction of the cover flap 9 of the fan 6.

Such small tooth 22 becomes engaged to a corresponding groove 23 actually obtained in the cover flap 9.

In this way, consequently, the cover flap 9 of the fan 6 is securely closed before the beginning of a washing cycle, and i.e. when the user necessarily closes the cover flap 28 of the distributor 25.

Such small tooth does not however cause any difficulties for the opening of the cover flap 9, in that during the washing phase the cover flap 28 opens, so as that when the machines reaches the drying phase, the cover flap 9 will no longer find any difficulties.

It is finally to be noted that the electromagnetic release system of the cover flaps is designed so as to allow the user to open in an autonomous and manual manner, for example with a simple traction, when desired, the cover flaps of the various compartments.

As is noted, according to the proposed variant, the assembly of the fan and of the dispensers results in being simplified, as that in the stainless steel sheet constituting the surface of the door facing the chamber only a single opening is realised.

The fan can thus be preassembled in the enbloc device 21, that in this way results in being directly accessible without having to intervene on the door as a

whole: its installation, in the manufacturing phase, and interventions in the case of maintenance are thus very simple and rapid.

From the given description the characteristics of the dish-washing machine subject of the present invention result in being clear, as do its advantages.

In particular they are represented by the fact that the realisation and assembly of the air circulation fan and of the door that houses the fan result in being simplified and secure, due to the presence of the container 1 or 21, constituting a compact group, being easy to assemble within the cover flap and easily accessible in the case of interventions. Furthermore the cover flap 9 of the drying fan is perfectly closed, in a water-tight manner, during the wash, avoiding the passing of noise and risks of water losses.

Other advantages, of an aesthetic and functional nature, are evident from the given description.

It is clear however that numerous variants can be made to the dish-washing machine subject of the present invention. For example, in the variant previously described reference had been made to a distributor of additives of the rinsing liquid, but it is clear that the same could be easily realised as distributor 5, so as to also enable the use of powder rinsing additives.

Moreover the release systems of the various cover flaps could be different from those described as for example; the cover flap 9 could be equipped with a release system similar to that of cover flap 28 of the central compartment.

It is however clear that numerous variants are possible to the dish-washing machine described as an example, without departing from the novelty principles inherent in the inventive idea, as it is also clear that in the practical actuation of the invention the materials and forms of the components could be different, and they could be substituted with elements being technically similar.

Claims

1. Dish-washing machine, comprising a washing chamber, an access door to said washing chamber and a fan fixed to said door, for the forced circulation of air inside said chamber, characterised in that said fan (6) for the forced circulation of air inside the washing chamber (3) is housed in an appropriate container, in particular enbloc (1,21), that is at least partially enclosed in the access door (2) to said washing chamber (3), in particular on the side that in the closed position of said door (2) it faces towards the interior of said washing chamber (3).
2. Dish-washing machine, according to claim 1, characterised in that said container (1,21) is subdivided in distinct compartments, within which

said fan (6), a washing agents distributor (25) and/or a rinsing additives distributor (24) are incorporated.

3. Dish-washing machine, according to claims 1 or 2, characterised in that said container (1,21) is equipped with at least one cover flap (27,28,9) hinged along its superior part to the body of said container (1,21).
4. Dish-washing machine, according to claims 1 or 2, characterised in that the body of said device (1,21) has at least one opening in the portion that results in being enclosed internally of said door (2), in particular in correspondence with the portion in which the said fan is incorporated.
5. Dish-washing machine, according to claim 3, characterised in that at least one of said cover flaps (27,28,9) has a release device that is activated by the programmer device of the machine at a determined instant during the washing cycle, or by the user of the machine before initiation of a washing cycle.
6. Dish-washing machine, according to the previous claim, characterised in that said release device is of the electromagnetic type and comprises in particular a magnetic element and a demagnetising coil arranged in the body of said container (1, 21), and a metallic insert arranged in the relative cover flap (9).
7. Dish-washing machine, according to at least one of the previous claims, characterised in that at least one of said cover flaps (9) has means (10) apt at causing an automatic closing movement of the cover flap (9) when the said access door (2) of the machine is opened, said automatic closing means comprising in particular a counter-weight (10) integrated to the cover flap (9).
8. Dish-washing machine, according to at least one of the previous claims, characterised in that security means (22,23) are provided apt at causing the closure of a first of said cover flaps (9) in relation to the closure by the user of the machine of a second of said cover flaps (28), said security means comprising in particular an appendix (22) protruding from said second cover flap (28) that co-operates with a corresponding seat (23) present in the said second cover flap (9).
9. Dish-washing machine, according to claim 8, characterised in that said first cover flap (9) is that of the compartment in which said fan (6) is incorporated and that said second cover flap is that of the compartment in which said washing

agents distributor (5) is incorporated.

10. Dish-washing machine, according to at least one of the previous claims, characterised in that said container (1,21) comprises mechanical means which, after the release of one of said cover flaps (27,28,9) has been effected, cause an automatic opening movement of the same cover flap, said mechanical means for the automatic opening of the cover flap (9) comprising in particular a counterweight (10).

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11. Dish-washing machine, according to claim 1, characterised in that said container (1,21) is arranged so as that said fan (6) inhales air inside said chamber (3) and it expels the air through an aperture (15) towards the external surroundings obtained in the lower part of said door (2), in particular in its lower edge.

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12. Dish-washing machine, according to claim 11, characterised in that during its functioning the said fan (6) inhales air inside said chamber (3), it pushes the air downwards along an internal conduit (14) of said door (2) and then expels it in the external surroundings through said aperture (15) realised in the lower part of the door (2).

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13. Dish-washing machine, according to the previous claim, characterised in that said internal conduit (14), in particular realised in a plastic material, places in direct communication the part of said container (1,21) that results in being enclosed in said door (2) with the said opening (15) towards the external surrounding.

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14. Dish-washing machine, according to at least one of the previous claims, characterised in that said conduit (14) works as a condenser of the steam that passes it and it is particularly shaped for favouring the condensation process of the steam and for collecting the water created by such condensation.

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15. Dish-washing machine, according to the previous claim, characterised in that said conduit (14) has a drainage or breather hole (16) in communication with the internal side of said door (2) through which said water re-enters said washing chamber (3), said drainage or breather hole (16) having in particular a membrane valve device.

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FIG. 1

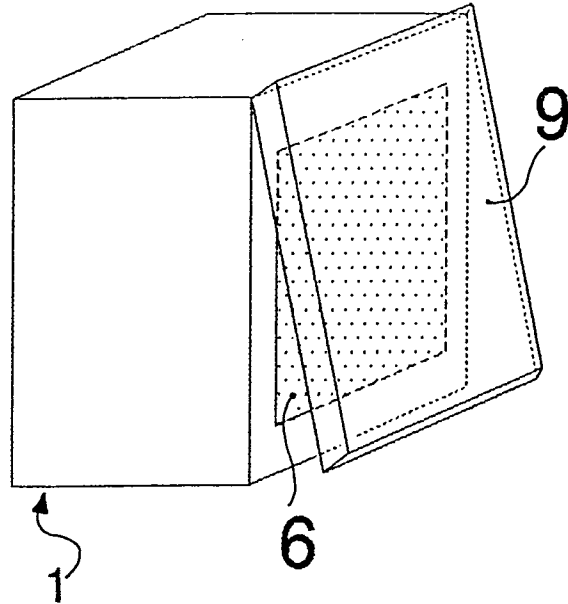


FIG. 2

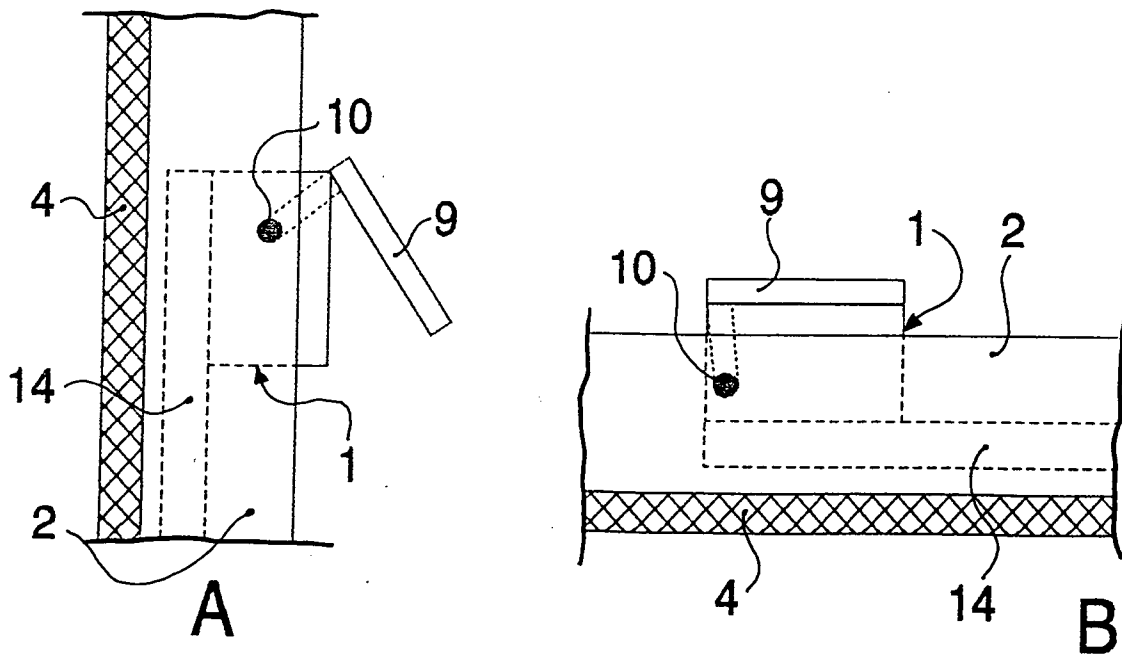


FIG. 3

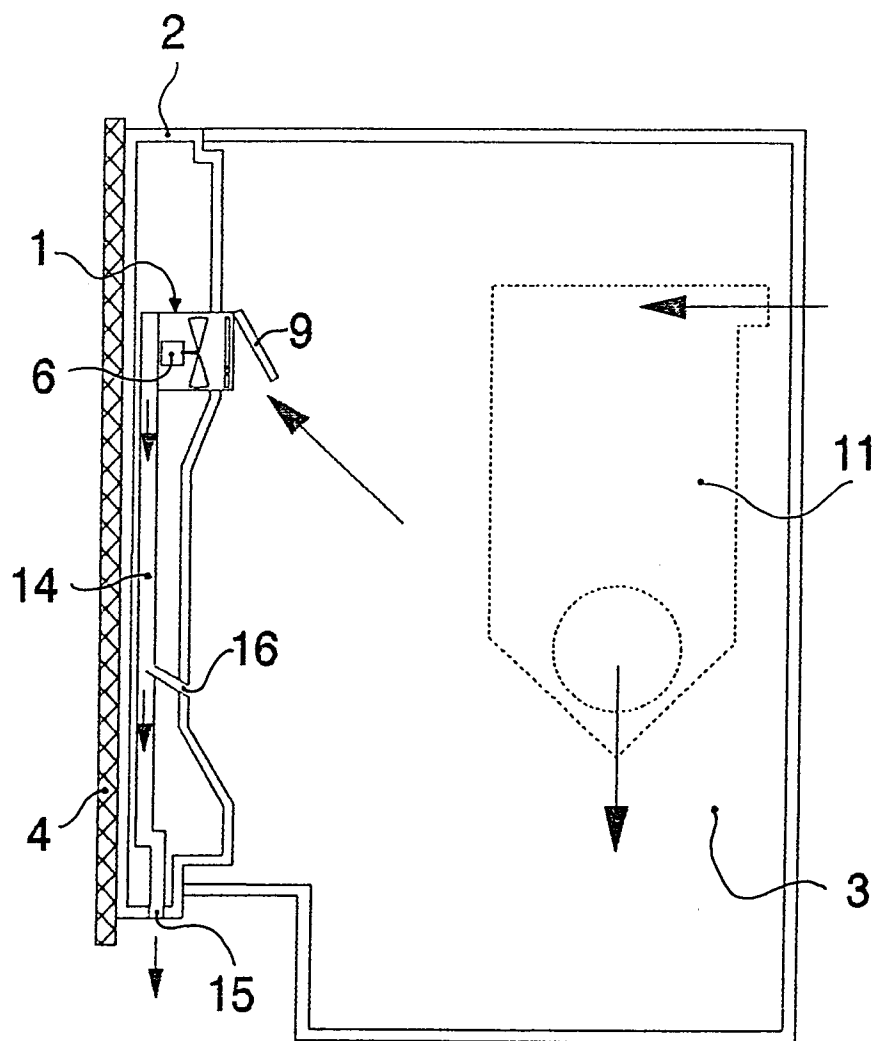


FIG. 4

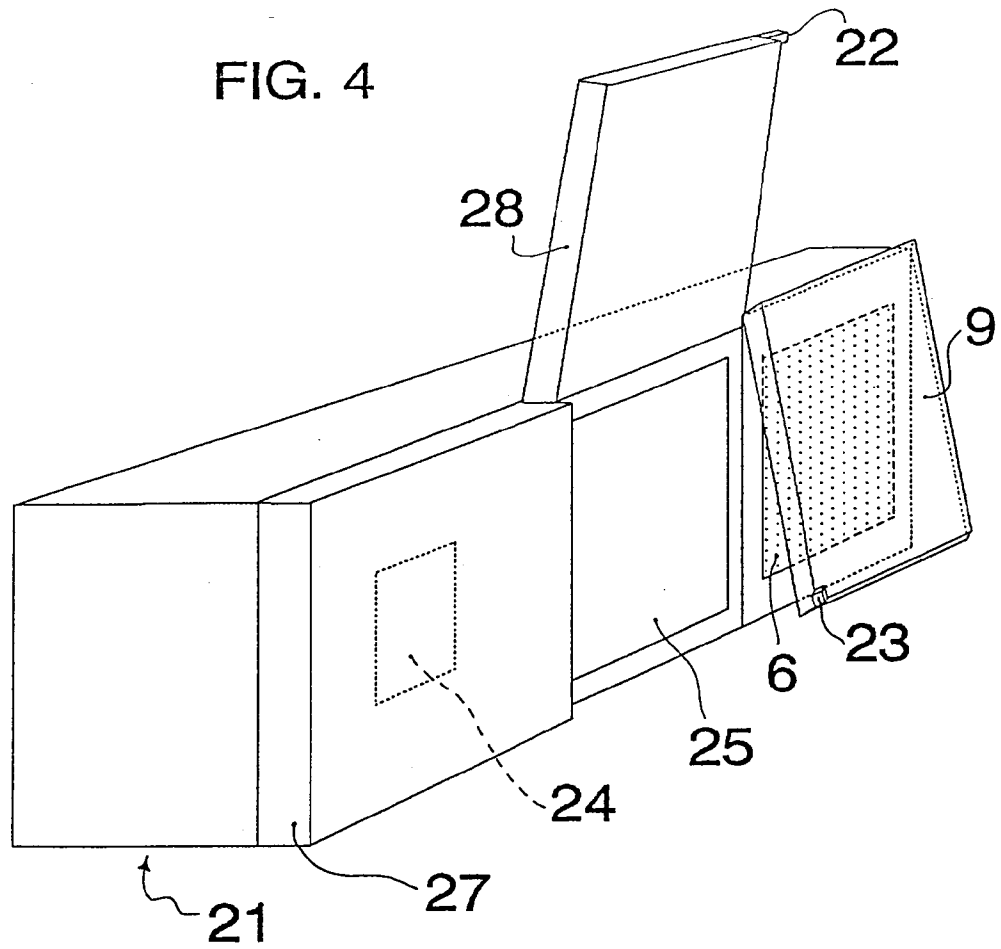
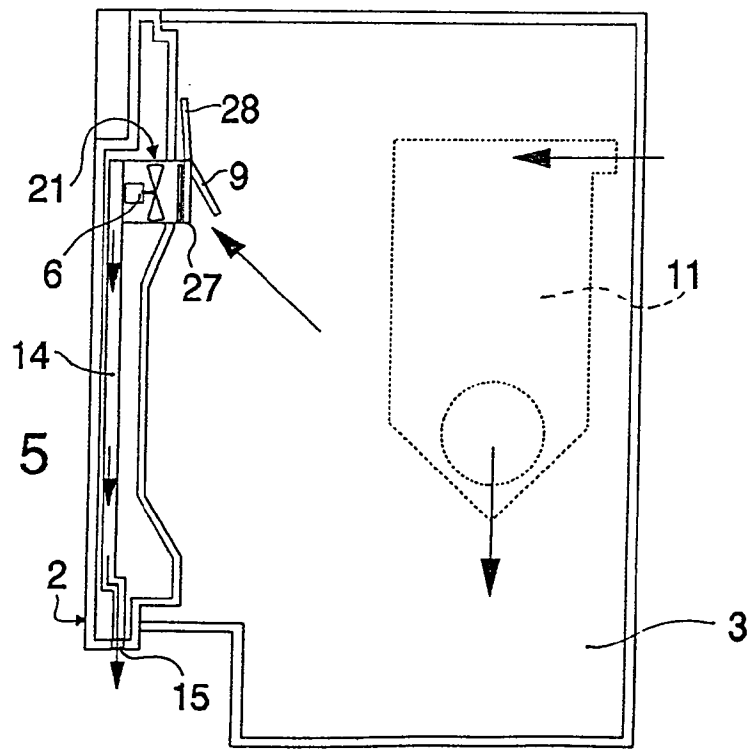


FIG. 5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 2395

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X A	DE-A-3 623 027 (MIELE & CIE GMBH & CO) * column 2, line 54 - column 3, line 1 * * column 4, line 7 - line 20 * * claim 8; figure 1 * ---	1-4 9,11,12	A47L15/48 A47L15/44
A	EP-A-0 457 137 (G. SANDRIN) * the whole document * ---	5,6,10	
A	DE-A-1 628 515 (ROBERT BOSCH HAUSGERÄTE GMBH) * page 3, line 6 - line 12 * ---	7	
A	DE-B-1 210 150 (BRAUN AKTIENGESELLSCHAFT) * figures 1,2 * ---	8	
A	EP-A-0 378 836 (LICENTIA PATENT - VERWALTUNGS - GMBH) * the whole document * -----	11,12, 14,15	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 MAY 1993	Examiner KELLNER M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			

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