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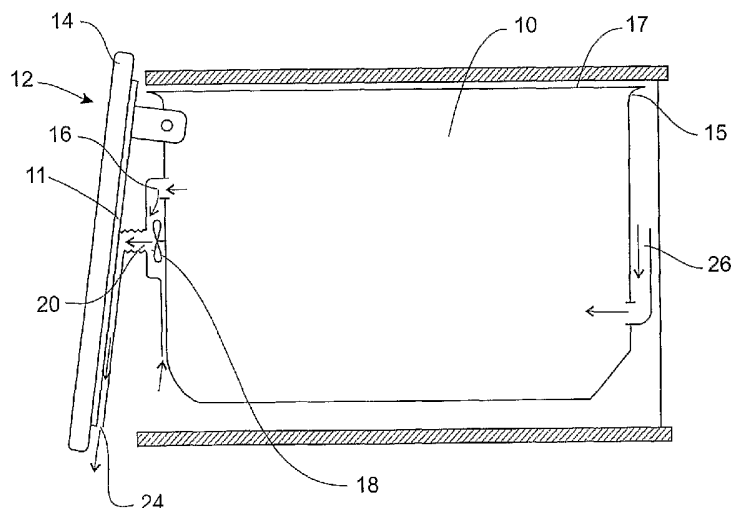
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(54) Title: VENTING SYSTEM FOR DISHWASHER



(57) Abstract: An appliance comprising a sealable chamber (10) and a door (12) for the sealable chamber (10), wherein in an opened position the door (12) allows access to the chamber (10); and a venting system for allowing air to escape from the sealable chamber (10) when the door (12) is in closed position, wherein the venting system includes a vent flap (11), the vent flap (11) moveable from a closed position sealing the vent system to an open position allowing air to escape. The venting system allows an appliance, such as dishwasher, to expel unwanted air or vapour in a controlled manner whilst the appliance remains closed.

WO 2006/123947 A1



— *with amended claims*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

VENTING SYSTEM FOR DISHWASHER

BACKGROUND TO THE INVENTION

Field of the Invention

The present invention relates to a system for venting appliances which require venting during their operation, such as dishwashers and in particular to appliances which are designed for installation in surrounding furniture or joinery structures.

Background to the Invention

Automatic dishwashers typically operate a washing cycle which include a number of discrete operating stages, just as washing, rinsing and drying. During the drying stage, moist air within the wash chamber, remaining after the washing and rinsing stages, must be replaced with dry air. In order to replace the moist air with dry air, the moist air must have a means of escape from the wash chamber. This is achieved through a venting system, connecting the wash chamber with the exterior of the appliance.

Venting systems typically comprise a venting conduit extending between the wash chamber and the outer wrapper of the dishwasher. The venting conduit often includes at least one valve which can be actively or passively operated to control venting.

Increasingly, there is demand for appliances such as dishwashers to match surrounding kitchen furniture. These dishwashers must fit within a tight cavity formed by kitchen joinery and have a front face panel attached which matches the surrounding kitchen furniture. So called "integrated" dishwashers presents particular problems for venting during the drying stage. The dishwasher is surrounded in all sides by kitchen joinery preventing easy escape of moist air and intake of dry air. Furthermore, the desired clearance between the joinery and the dishwasher is decreasing, making efficient venting even more difficult. In the US door fronts often overlap leaving no space for venting, and some models of dishwasher prevent access to the kickstrap. To compound this problem, venting moist air into the space between the dishwasher and the joinery can cause condensation on the joinery which can damage the joinery.

US2004/0163684 discloses a dishwasher with an automatically openable door. The door may be moved into an open position during a venting stage of the wash cycle. However, simply opening the door to provide venting removes control over the venting process. It is

desirable to have full control over the rate, volume and mixing ratio of the exhausting air during venting.

It would be desirable to provide a means for venting integrated automatic dishwashers that is efficient, controlled and does not damage surrounding joinery.

Accordingly, it is an object of the present invention to provide a venting system which will go at least somewhat towards meeting the above desideratum or which will at least provide the public with a useful choice.

SUMMARY OF THE INVENTION

According to a first aspect of the invention, an appliance comprises:

a sealable chamber;

a door for the sealable chamber, wherein in an opened position the door allows access to the chamber; and

a venting system for allowing air to escape from the sealable chamber when the door is in a closed position,

wherein the venting system includes a vent flap, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape.

Preferably, the vent flap forms at least part of the exterior surface of the appliance. Preferably, the vent flap forms part of the door. Preferably, in an open position the vent flap extends exteriorly of the door.

Preferably, the appliance is adapted for placement in joinery structure or kitchen furniture.

Preferably, the vent flap is tiltable between an open position and a closed position. Alternatively, the vent flap could undergo translational motion between an open position and a closed position.

Preferably, the appliance further includes an actuator for moving the vent flap between the closed position and the open position. The appliance may also include a biasing element connected to the vent flap, for biasing the vent flap into the closed position.

Preferably, the appliance includes a controller for controlling the operation of the appliance.

Preferably, the controller is connected to the actuator, in use the controller controlling the actuator in accordance with an operating cycle of the appliance.

Preferably, the venting system includes a mixing chamber for mixing air from the chamber with external air, in order to control the moisture content of the air exiting the

venting system. Preferably, the venting system includes a variable speed fan. The variable speed fan may be connected to the controller.

Preferably, the door is slideable between open position and a closed position and the sealable chamber is coupled to the door and is slideable with the door.

Preferably, the appliance is a dishwasher.

Preferably, the vent flap is actuated in accordance with the washing cycle of the dishwasher.

Preferably, the door is adapted to receive an exterior face panel coupled to the vent flap wherein the vent flap moves the exterior face panel.

According to a second aspect of the invention, a dishwasher comprises:

a sealable chamber;

a door for the sealable chamber, wherein in an opened position the door allows access to the chamber; and

a venting system for allowing air to escape from the sealable chamber when the door is in a closed position,

wherein the venting system includes a vent flap, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape.

Preferably, the dishwasher is a drawer type dishwasher.

According to a third aspect of the invention, there is provided a venting system for an appliance having a sealable chamber, wherein the venting system allows air to escape from the sealable chamber when the appliance is in a closed configuration, and

wherein the venting system includes a vent flap on an exterior surface of a door of the appliance, the vent flap moveable from a closed position sealing the vent system to an open position allowing the air to escape.

According to a fourth aspect of the invention, a method for venting an appliance comprises the step of moving a vent flap from a closed position to an open position, wherein the vent flap forms part of the exterior surface of the door of the appliance and wherein the door remains in a closed position.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are now described, by way of example only, with reference to the drawings in which:

Figure 1 is a schematic illustration of a dishwasher in accordance with the present invention.

Figure 2a shows the dishwasher of Figure 1 with the vent flap in an open position.

Figure 2b shows an alternative embodiment of a dishwasher with the vent flap in an open position.

Figure 3 shows a hinge for the vent flap in accordance with a first example of the present invention.

Figure 4 shows a linkage arrangement for the vent flap in accordance with a second example of the present invention.

Figure 5 shows a cam arrangement for the vent flap in accordance with a third example of the present invention.

Figure 6 shows detail of an actuator mechanism that for the vent flap in accordance with an example of the present invention.

Figure 7 is a flow chart illustrating the control of a venting system in accordance with the present invention.

Figure 8 shows an integrated drawer type dishwasher in various configurations in accordance with the present invention.

Figure 9 shows an integrated oven in accordance with the present invention.

DETAILED DESCRIPTION

The present invention provides a vent system for an appliance, such as an automatic domestic dishwasher. Figure 1 is a schematic cross section of a dishwasher. The dishwasher of Figure 1 is of the slideable drawer type disclosed in WO93/12706, the contents of which are incorporated herein by reference. The dishwasher may be of the "cabinetless" type, suitable for integrated installation, as described in WO01/26532, the contents of which are also incorporated herein by reference. Whilst the following description refers to a drawer type dishwasher, the present invention is applicable to conventional hinged door dishwashers and to other types of appliance, such as ovens, clothes driers and refrigerators.

The dishwasher comprises a wash chamber 10 and a door assembly 12. The door assembly may include electronics and a user interface to allow a user to programme the dishwasher but for clarity these are not shown. In a drawer type dishwasher as illustrated in Figure 1, the door assembly is fixed to the wash chamber and is slideable with the wash chamber to an open position in which the wash chamber can be accessed from above. The door includes a vent flap 11 which is moveable to an open position to provide for venting of the wash chamber, while the dishwasher remains in a closed position, so that the wash chamber remains substantially sealed.

Figure 2a shows the dishwasher of Figure 1 with the vent flap in an open position and the door assembly is in a closed position. The vent flap is connected to a front face panel 14 and preferably covers the entire door. This allows the dishwasher door to be simply covered with a unitary cabinet door to match surrounding kitchen furniture, while allowing the vent flap 11 to operate. However, it should be recognised that a front face panel is not necessary and the vent flap 11 can be made aesthetically pleasing itself.

Both Figure 1 and Figure 2a illustrate the basic features of a vent system in accordance with one example of the present invention. The dishwasher includes an exit conduit 16 for air in the wash chamber 10. The wash chamber consists of a tub 15 and a lid 17. Air in the wash chamber 10 is sucked out through the exit conduit 16 when fan 18 is operated. The fan 18 is located in a mixing chamber 20. Moist air from the wash chamber is mixed with dry air in the mixing chamber. The dry air enters the mixing chamber via chassis air inlet 22. Chassis air is ambient air that is present in the space surrounding the wash chamber. Air can enter the chassis space through various openings in the chassis of the dishwasher but principally will enter the chassis space when the vent flap 11 is in the open position. The mixture of moist wash chamber air and dry chassis air is driven through exhaust duct 24 by the fan 18 and out into the external space adjacent the dishwasher door. The exit conduit or exhaust duct may include one or more valves to prevent ingress or egress of air from and to the wash chamber during the wash cycle.

The air sucked out of the wash chamber 10 by fan 18 is replaced by dry chassis air. The dry chassis air enters the wash chamber through air inlet 26. The air inlet 24 may include a valve which can be actively or passively controlled or the air inlet may be of a labyrinthine configuration to prevent egress of air from the wash chamber via the inlet 26.

The exhaust duct 24 is shown in Figures 1 and 2a as moving with the vent flap, the end of the exhaust duct being obstructed by the door structure in a closed position. Alternatively, as shown in Figure 2b, the exhaust duct 28 may be stationary within the door structure, the end of the exhaust duct 28 being obstructed by the vent flap 11 when the vent flap is in a closed position and unobstructed when the vent flap is in an open position.

There are many possible mechanisms that can be used to attach the vent flap to the appliance. Figure 3 illustrates a simple hinge connecting the vent flap 11 to the body of the door assembly 12. Figure 3a shows the flap in a closed position and Figure 3b shows the flap in an open position. A pair of hinges 30 could be placed on opposite sides of the flap 11. The hinges could be placed on any edge of the vent flap to allow the vent flap to tilt between a closed position and an open position.

Figure 4 illustrates a link mechanism connecting the vent flap 11 to the rest of the door assembly 12 as an alternative. The link mechanism comprises a pair of link members 40 of unequal length. Figure 4a shows the vent flap in a closed position and Figure 4b shows the flap in an open position. Pushing the vent flap outwardly causes the vent flap to pivot out and down and pulling the vent flap inwardly causes the flap to pivot up and in.

Figure 5 illustrates a further alternative, a camming arrangement, for opening the vent flap.

Figure 5a shows the flap in a closed position and Figure 5b shows the flap in an open position. Two channels 50 are provided in each side of the body of the door assembly 12. Corresponding cams 51 attached to the vent flap 11 are located in the channels 50. A pair of hinges 52 is provided at the top of the vent flap 11. Pushing the vent flap 11 outward or pulling it inward causes the cams 51 to slide in the channels 50. The channels can be shaped to provide for a desired motion of the vent flap.

An alternative connection for the vent flap 11 is to mount it on a pair of sliders. The vent flap is translatable on sliders from a closed position to an open position and back to a closed position.

Figure 6 shows detail of an actuator mechanism that is used to operate the opening and closing of the vent flap. Figure 6a shows the vent flap 14 in an open position. An actuator mechanism 60, 62 is mounted centrally at the base of the door assembly 12. The actuator mechanism comprises a DC motor 60 and an actuator rod 62. A DC motor is used in this example, but it will be appreciated that there are a number of alternatives, such as an AC motor, a solenoid and a wax actuator. It is also possible to use more than one actuating means, for example two symmetrically mounted DC motors.

The DC motor is used to drive the actuator rod using a rack and pinion type coupling. The actuator rod 62 contacts the vent flap 14 and when driven towards the exterior of the appliance causes the vent flap to move to an open position. The vent flap is connected to the appliance door by a simple hinge 30 in this example. Figure 6b shows the vent flap in a closed position. The actuator rod is withdrawn into the body of the appliance, underneath the wash chamber 10. Figure 6c shows biasing means 64, 66 for biasing the vent flap in a closed position. Figure 6c shows the rear side of the door 12. The DC motor is mounted centrally at the base of the door. The vent flap is attached to a pair of tension springs 66 via wires 64 passing through the door. When the vent flap is moved to an open position via the action of the actuator rod 62, the springs are extended and under tension. As the actuator rod 62 is withdrawn the action of the springs 66 forces the vent flap 12 to remain in contact with the

actuator rod 62 until the closed position is reached as shown in Figure 6b. The DC motor is connected to and controlled by a controller or microprocessor 68 which controls the operation of the dishwasher

The rate of venting of the wash chamber can be controlled by altering the speed of the fan 18. The inlets 16, 22 to the mixing chamber 20 may be provided with movable parts, such as controllable valves, in order to control the moisture content of the air exiting the venting system via exhaust duct 24.

Venting is carried out during a drying stage of the dishwasher cycle. The dishwasher door remains in a closed position during the venting stage and the wash chamber remains substantially sealed. The venting flap is in a closed position when the dishwasher is not operating and during various stages of the dishwasher cycle. The vent flap is automatically opened at the appropriate stage in the wash cycle. The dishwasher cycle is electronically controlled by a programmed microcomputer. The microcomputer is connected to the vent flap opening mechanism and controls the opening and closing of the vent flap.

Figure 7 is a flow diagram showing the operation of the venting system during the operation cycle of a drawer type dishwasher. The operation cycle starts at step 700. After the wash cycle stages of pre-wash, wash and rinse, a drain step 705 takes place. After the wash chamber has been drained, the vent flap is pushed out by the actuator at step 710. The drying cycle then starts with the fan turned on to suck air out of the wash chamber at step 715.

It may be possible to stop or pause the operation of the dishwasher during the drying cycle. This can be achieved by pressing a stop/power button or pause button respectively. The option for pressing the stop button is shown in box 720 and the option for the pause button in box 725. If neither the stop/power button nor the pause button is pressed, then the drying cycle completes after a predetermined time and the fan is switched off, indicated by step 730. After the drying cycle is completed, the actuator is pulled in and the vent flap returns to the closed position at step 735. Following retraction of the vent flap at step 740 the lid of the wash chamber is raised to allow the chamber to be withdrawn from the surrounding cabinetry. The operation cycle is then at an end, at indicated at step 745.

If the stop/power button is pressed during the drying cycle the fan is switched off, as indicated at step 750. The vent flap is then returned to the closed position at step 755, the lid of the wash chamber raised at step 760 and the wash cycle is then at an end at step 765. As soon as the lid is raised the wash chamber can be withdrawn to provide access to its contents.

If the pause button is pressed during the drying cycle then the fan is stopped, as indicated in step 770. The vent flap is then moved to the closed position at step 775, the wash

chamber lid is raised at step 780 and the wash chamber can be withdrawn. Until the drying cycle is restarted by depression of the pause button nothing further happens, as indicated at step 790. If the drying cycle is restarted at step 785 then, if the wash chamber is fully retracted, the lid is closed to seal the wash chamber at step 795. The vent flap is pushed out at step 800 and the drying cycle is then resumed, with the fan switched in, at step 805. The time remaining for the drying cycle is calculated using a timer in the controller.

Figure 8 shows an integrated dishwasher of the type described with reference to Figures 1 and 2. Figure 8a shows a set of kitchen cabinets. The dishwasher is placed in the centre of the top row. In a closed position, with the vent flap 14 closed, as shown in Figure 8a, the front face panel of the dishwasher matches and is flush with the surrounding cabinetry 80. In a drying stage of the cycle of operation the vent flap 14 is tilted out to an open position, as shown in Figure 8b. In order to load and unload the dishwasher the door is pulled out with the wash chamber to provide access to the wash chamber from above, as shown in Figure 8c.

Figure 9 shows an integrated oven in accordance with the present invention. Two types of oven are illustrated, a conventional hinged door oven and a drawer type oven. Figure 9a shows the oven door and vent flap in a closed position. The front face panel of the oven 93 matches the surrounding cabinetry. Figure 9b shows the vent flap in an open position. The vent flap is connected to the front face panel and is provided with an exhaust outlet 94 analogous to the exhaust duct of the dishwasher previously described. Figure 9c shows a conventional type oven with the door 91 in an open position. The vent flap 92 and the door 91 move together to allow for access to the oven chamber. Figure 9d shows a drawer type oven in an open position. Again the vent flap 92 and the door 91 move in unison to allow for access to the oven chamber. The same type of actuation can be used for the vent flap for the oven as for a dishwasher.

The venting system of the present invention allows for controlled venting during the operation of an integrated appliance, such as a dishwasher, oven, refrigerator or clothes drier, without relying on there being sufficient space between the appliance and the surrounding furniture. The invention therefore allows appliances to fit tightly into cavities in furniture without compromising performance and without damaging the furniture during operation. It is particularly suited to drawer type dishwashers in which venting cannot be performed via a kickstrap near to the floor. Furthermore, the venting system of the present invention allows the front of the appliance to match surrounding furniture and in operation is elegant and unobtrusive.

CLAIMS:

1. An appliance comprising:
 - a sealable chamber;
 - a door for the sealable chamber, wherein in an opened position the door allows access to the chamber; and,
 - a venting system for allowing air to escape from the sealable chamber when the door is in a closed position,
 - wherein the venting system includes a vent flap, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape.
2. An appliance according to claim 1, wherein the vent flap forms at least part of the exterior surface of the appliance.
3. An appliance according to claim 1 or claim 2, wherein the vent flap forms part of the door.
4. An appliance according to claim 3 wherein in an open position the vent flap extends exteriorly of the door.
5. An appliance according to any one of the preceding claims, wherein the appliance is adapted for placement in a joinery structure or kitchen furniture.
6. An appliance according to any one of the preceding claims, wherein the vent flap is tiltable between an open position and a closed position.
7. An appliance according to any one of the preceding claims, further comprising an actuator for moving the vent flap between the closed position and the open position.
8. An appliance according to any one of the preceding claims, further including a biasing element connected to the vent flap, for biasing the vent flap into the closed position.
9. An appliance according to any one of the preceding claims, further comprising a controller for controlling the operation of the appliance.

10. An appliance according to claim 9, wherein the controller is connected to the actuator, in use the controller controlling the actuator in accordance with an operating cycle of the appliance.
11. An appliance according to any one of the preceding claims, wherein the venting system includes a mixing chamber for mixing air from the chamber with external air, in order to control the moisture content of the air exiting the venting system.
12. An appliance according to any one of the preceding claims wherein the venting system includes a variable speed fan.
13. An appliance according to claim 12, wherein the variable speed fan is connected to the controller.
14. An appliance according to any one of the preceding claims, wherein the door is slideable between open position and a closed position and the sealable chamber is coupled to the door and is slideable with the door.
15. An appliance according to any one of the preceding claims, wherein the appliance is a dishwasher.
16. An appliance according to claim 15, wherein the vent flap is actuated in accordance with the washing cycle of the dishwasher.
17. An appliance according to any one of the preceding claims, wherein the door is adapted to receive an exterior face panel coupled to the vent flap wherein the vent flap moves the exterior face panel.
18. A dishwasher comprising:
 - a sealable chamber;
 - a door for the sealable chamber, wherein in an opened position the door allows access to the chamber; and

a venting system for allowing air to escape from the sealable chamber when the door is in a closed position,

wherein the venting system includes a vent flap, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape.

19. A dishwasher according to claim 18, wherein the dishwasher is a drawer type dishwasher.

20. A venting system for an appliance having a sealable chamber, wherein the venting system allows air to escape from a sealable chamber when the appliance is in a closed configuration, and

wherein the venting system includes a vent flap on an exterior surface of a door of the appliance, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape.

21. A method for venting an appliance, comprising the step of moving a vent flap from a closed position to an open position, wherein the vent flap forms part of the exterior surface of a door of the appliance and wherein the door remains in a closed position.

AMENDED CLAIMS**received by the International Bureau on 22 September 2006 (22.09.06)**

1. An appliance comprising:
a sealable chamber;
a door for the sealable chamber, wherein in an opened position the door allows access to the chamber; and,
a venting system for allowing air to escape from the sealable chamber when the door is in a closed position,
wherein the venting system includes a vent flap, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape wherein the vent flap forms part of the door and wherein in an open position the vent flap extends exteriorly of the door..
2. An appliance according to claim 1, wherein the vent flap forms at least part of the exterior surface of the appliance.
3. An appliance according to any one of the preceding claims, wherein the appliance is adapted for placement in a joinery structure or kitchen furniture.
4. An appliance according to any one of the preceding claims, wherein the vent flap is tiltable between an open position and a closed position.
5. An appliance according to any one of the preceding claims, further comprising an actuator for moving the vent flap between the closed position and the open position.
6. An appliance according to any one of the preceding claims, further including a biasing element connected to the vent flap, for biasing the vent flap into the closed position.
7. An appliance according to any one of the preceding claims, further comprising a controller for controlling the operation of the appliance.
8. An appliance according to claim 7, wherein the controller is connected to the actuator, in use the controller controlling the actuator in accordance with an operating cycle of the appliance.

9. An appliance according to any one of the preceding claims, wherein the venting system includes a mixing chamber for mixing air from the chamber with external air, in order to control the moisture content of the air exiting the venting system.
10. An appliance according to any one of the preceding claims wherein the venting system includes a variable speed fan.
11. An appliance according to claim 10, wherein the variable speed fan is connected to the controller.
12. An appliance according to any one of the preceding claims, wherein the door is slideable between open position and a closed position and the sealable chamber is coupled to the door and is slideable with the door.
13. An appliance according to any one of the preceding claims, wherein the appliance is a dishwasher.
14. An appliance according to claim 13, wherein the vent flap is actuated in accordance with the washing cycle of the dishwasher.
15. An appliance according to any one of the preceding claims, wherein the door is adapted to receive an exterior face panel coupled to the vent flap wherein the vent flap moves the exterior face panel.
16. A dishwasher comprising:
a sealable chamber;
a door for the sealable chamber, wherein in an opened position the door allows access to the chamber; and
a venting system for allowing air to escape from the sealable chamber when the door is in a closed position,
wherein the venting system includes a vent flap, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape, wherein the

vent flap forms part of the door and wherein in an open position the vent flap extends exteriorly of the door.

17. A dishwasher according to claim 16, wherein the dishwasher is a drawer type dishwasher.

18. A venting system for an appliance having a sealable chamber, wherein the venting system allows air to escape from a sealable chamber when the appliance is in a closed configuration, and

wherein the venting system includes a vent flap on an exterior surface of a door of the appliance, the vent flap moveable from a closed position sealing the vent system to an open position allowing air to escape, wherein in an open position the vent flap extends exteriorly of the door.

19. An appliance comprising:

a sealable chamber;

a door for the sealable chamber, wherein in an opened position the door allows access to the chamber, and

a venting system for allowing air to escape from the sealable chamber when the door is in a closed position;

wherein the venting system includes an exhaust duct and a vent flap, the vent flap moveable from a closed position in which the exhaust duct is obstructed to an open position in which the exhaust duct is unobstructed, and wherein the vent flap forms part of the door and extends exteriorly of the door when in an open position.

20. A method for venting an appliance, comprising the step of moving a vent flap from a closed position to an open position, wherein the vent flap extends exteriorly of the door of the appliance where in an open position, wherein the vent flap forms part of the exterior surface of a door of the appliance, wherein the vent flap extends exteriorly of the door of the appliance wherein in an open position, and wherein the door remains in a closed position.

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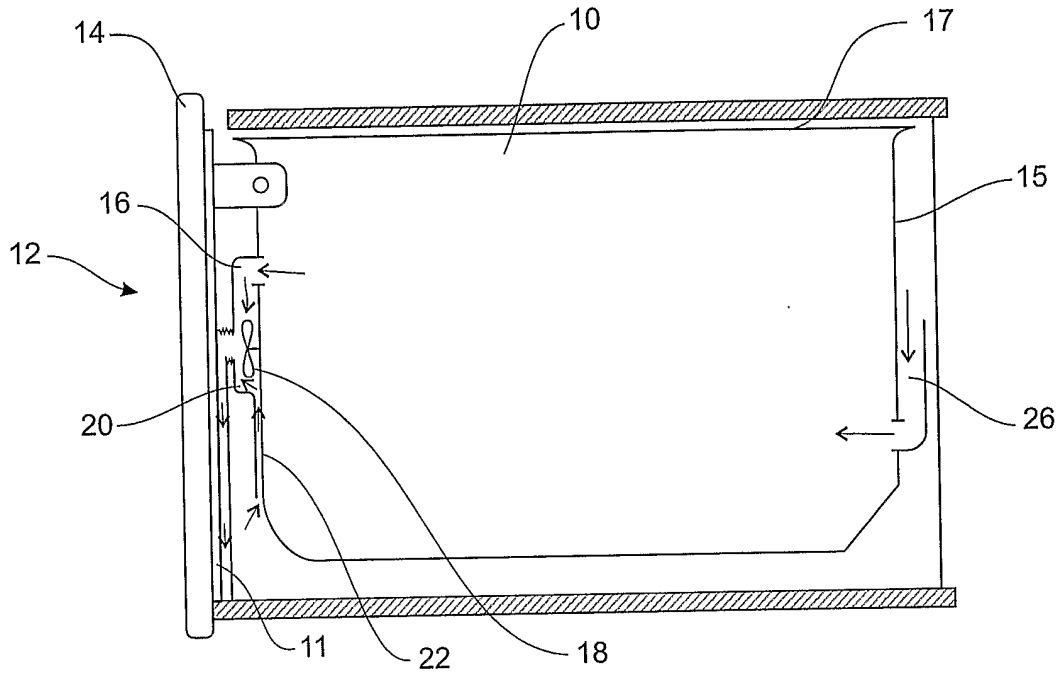


FIGURE 1

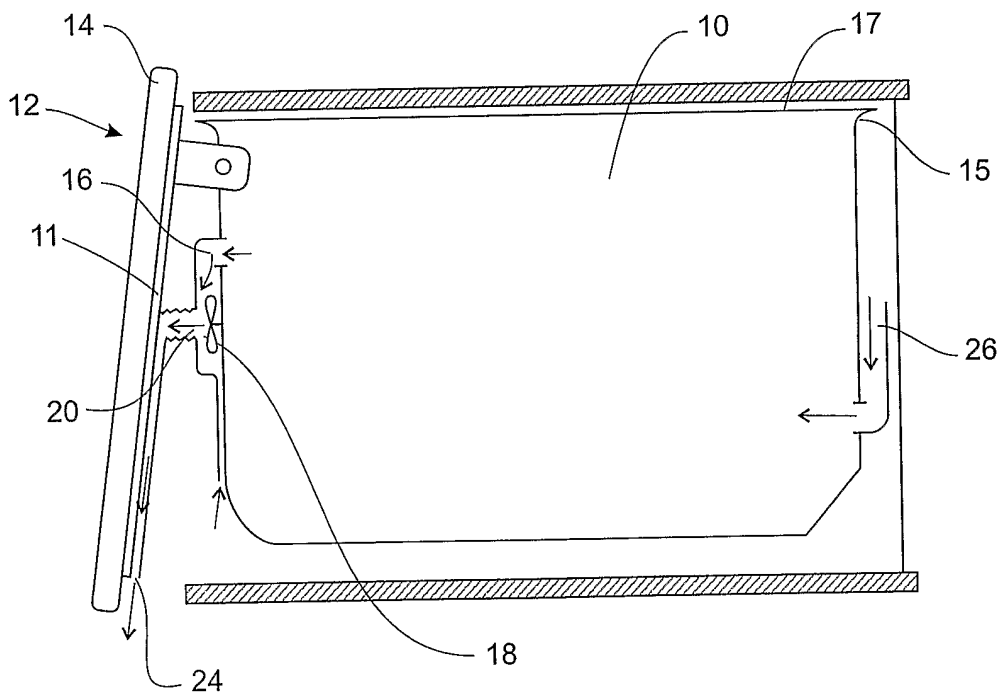


FIGURE 2a

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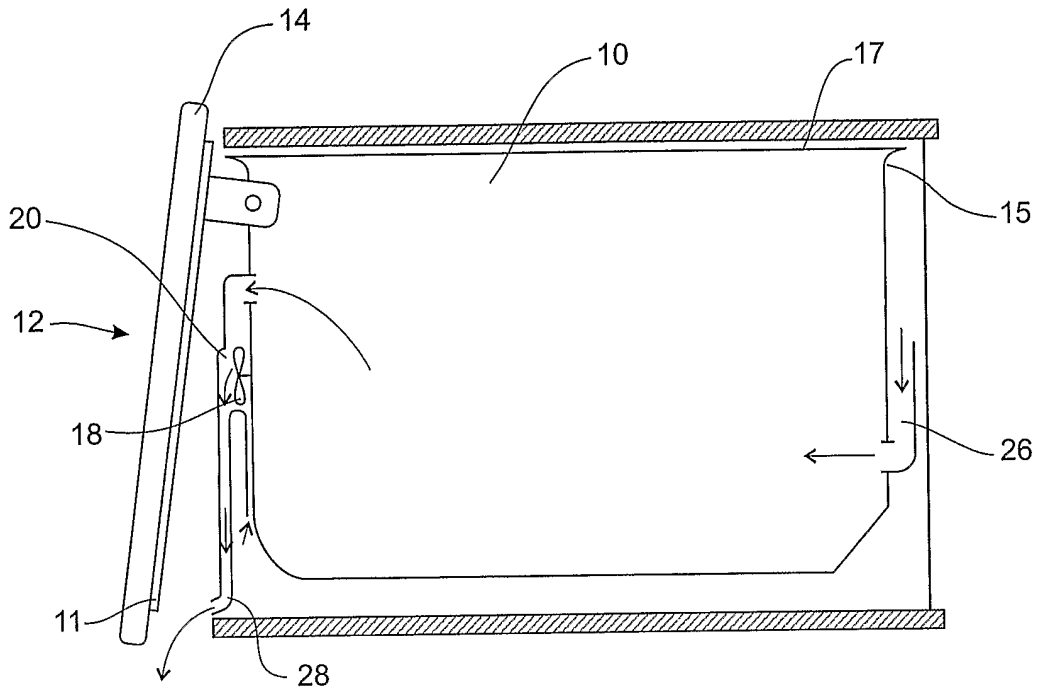


FIGURE 2b

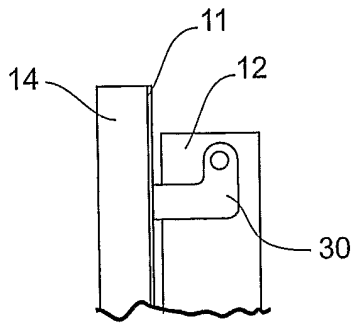


FIGURE 3a

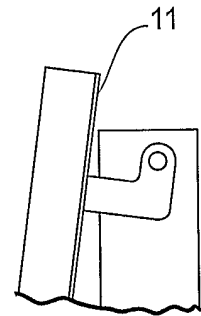


FIGURE 3b

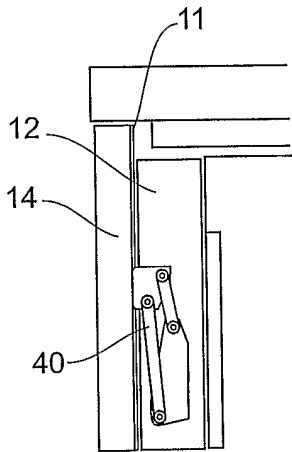


FIGURE 4a

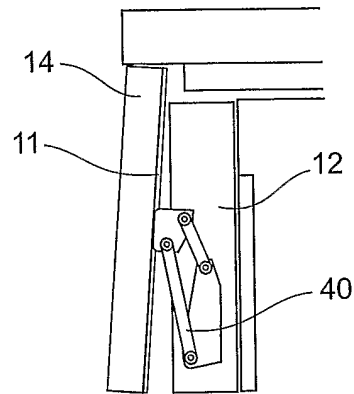


FIGURE 4b

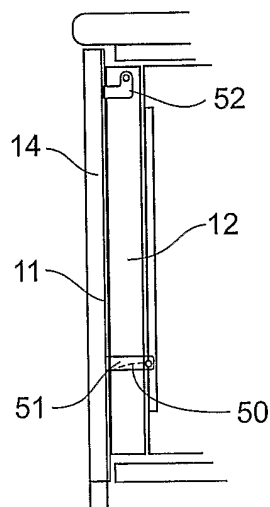


FIGURE 5a

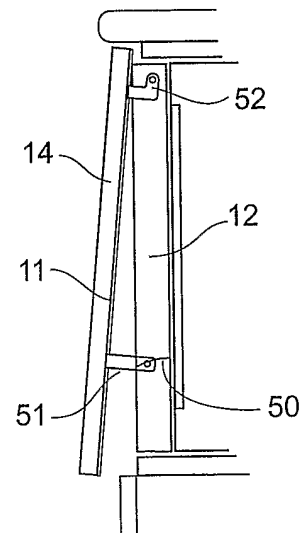


FIGURE 5b

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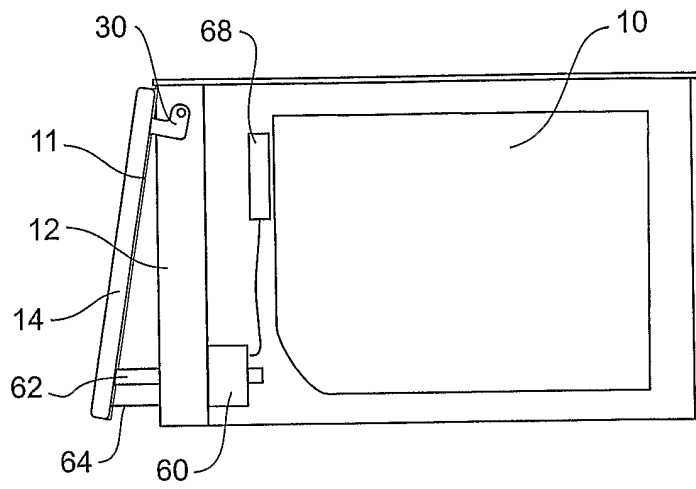


FIGURE 6a

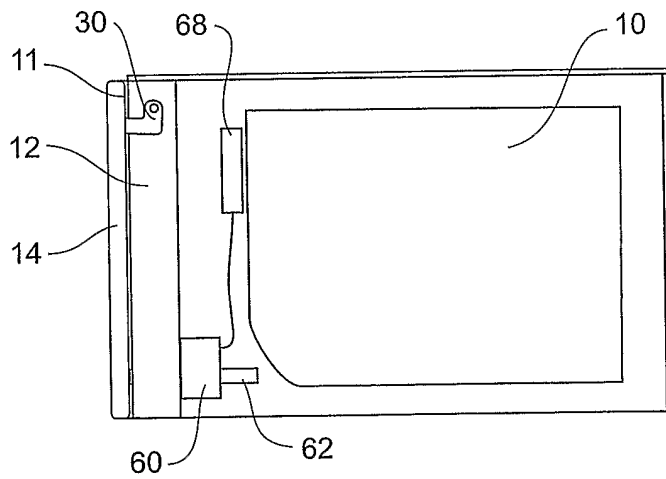


FIGURE 6b

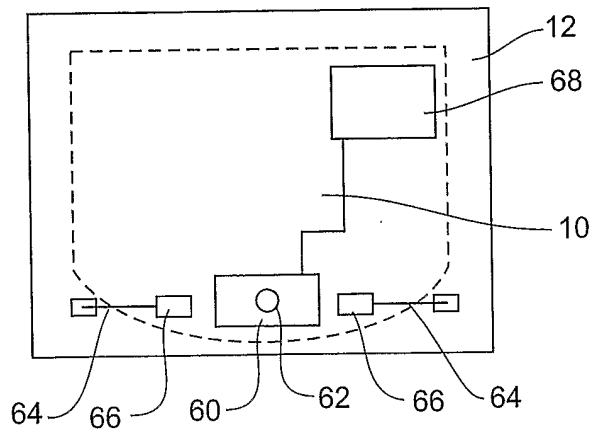


FIGURE 6c

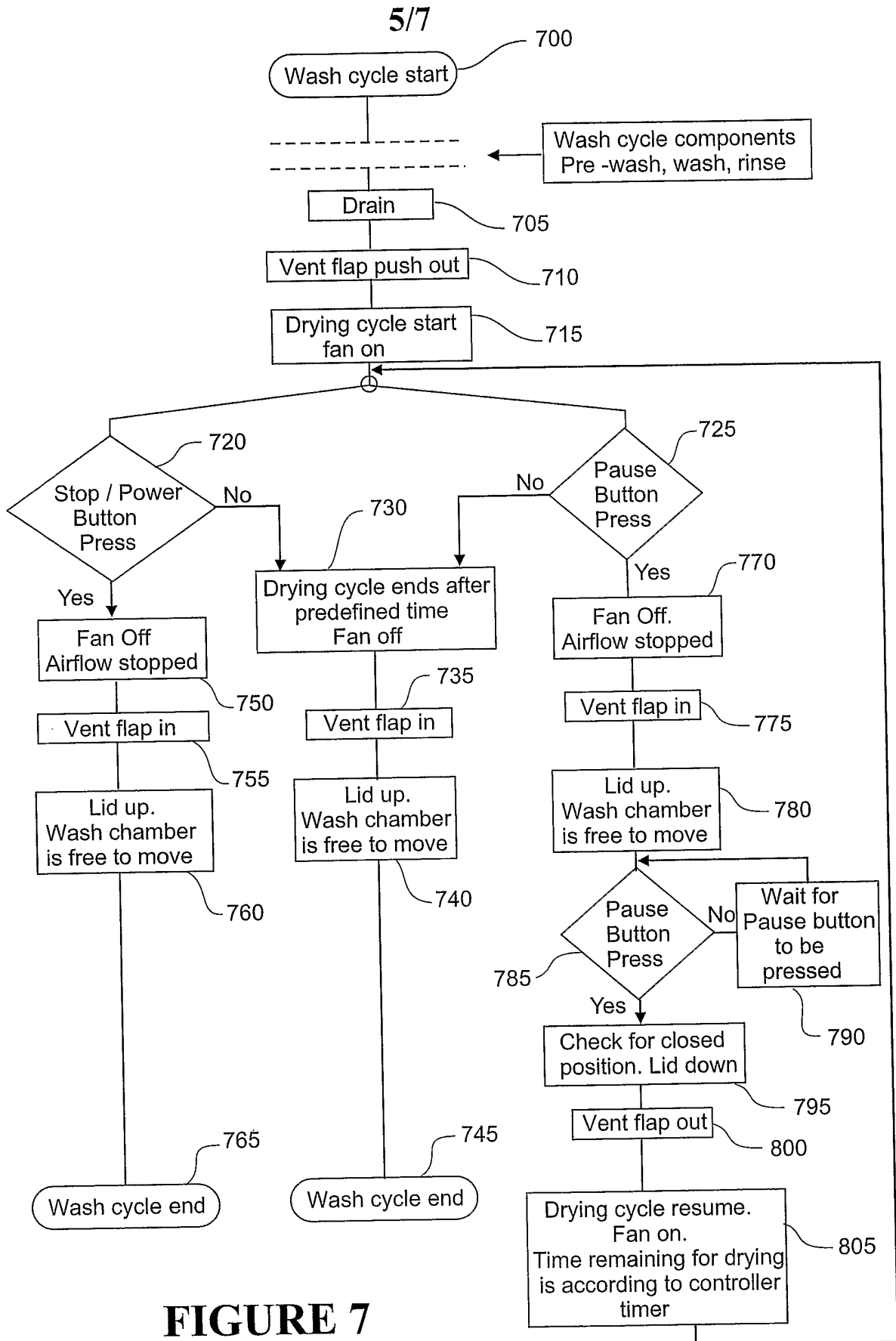


FIGURE 7

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FIGURE 8a

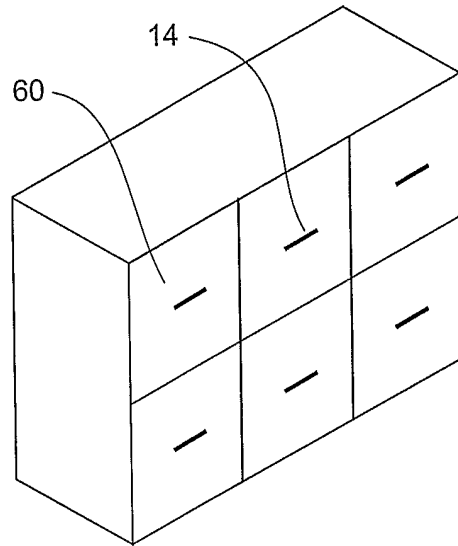


FIGURE 8b

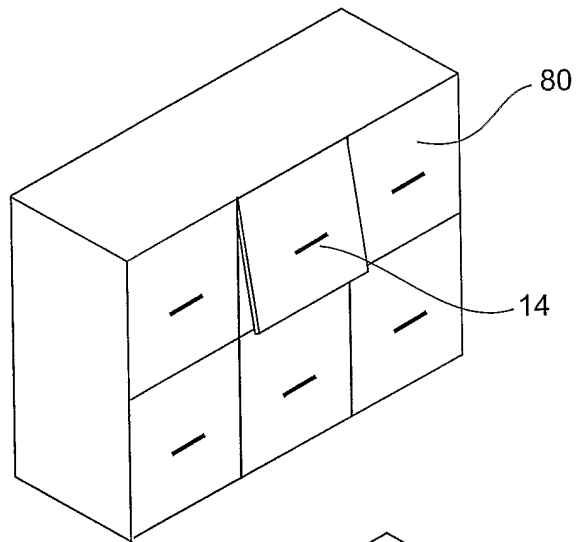
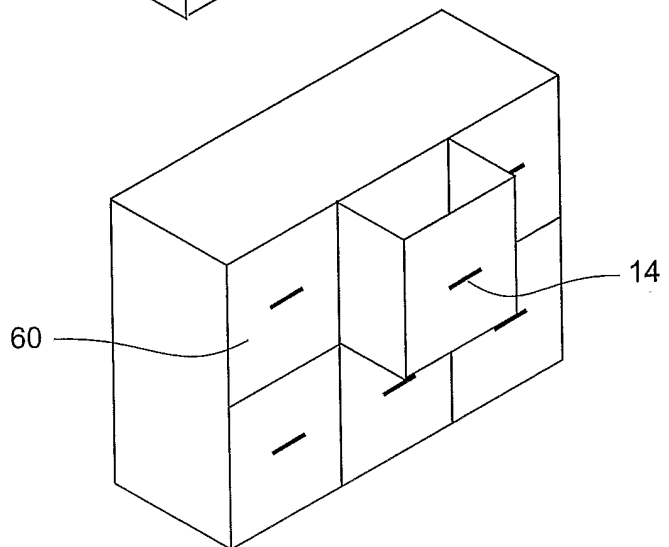


FIGURE 8c



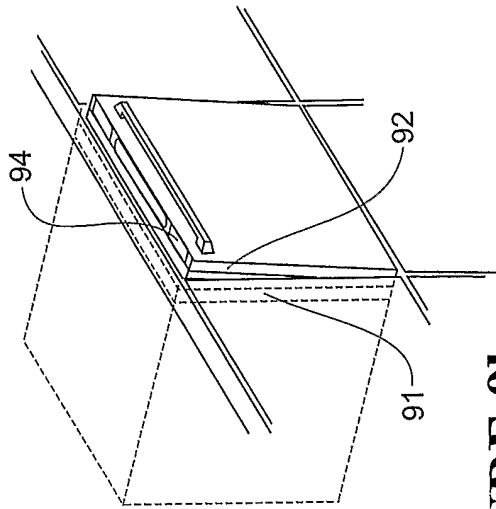


FIGURE 9b

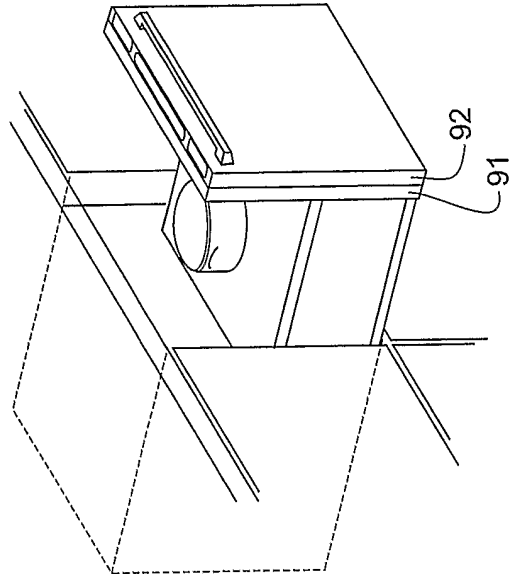


FIGURE 9d

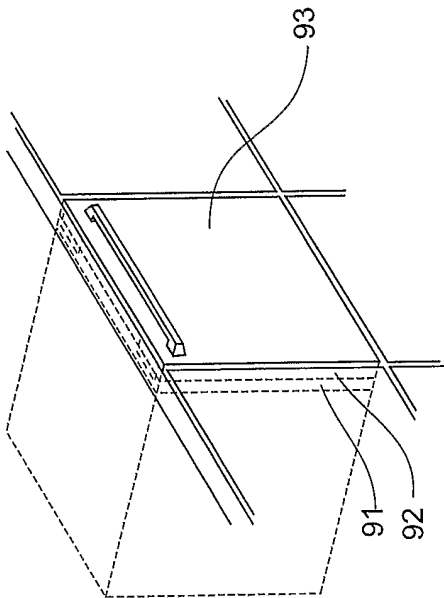


FIGURE 9a

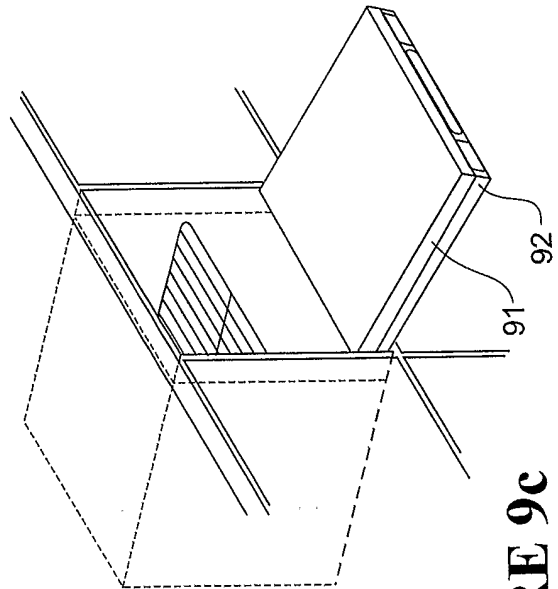


FIGURE 9c

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ2006/000114

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

A47L 15/42 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI IPC A47L 15/- & keywords: vent, exhaust, escape or similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5660195 A (TAYLOR, Jr et al) 26 August 1997 Column 3 line 54 to column 5 line 24	1 - 21
X	US 5836324 A (JOHNSON et al) 17 November 1998 Whole document	1 - 21
X	US 2004/0163684 A1 (HAPKE) 26 August 2004 Whole document	1 - 21
X	US 3908681 A (SCHIMKE) 30 September 1975 Whole document	1 - 21
X	US 4247158 A (QUAYLE) 27 January 1981 Whole document	1 - 21

 Further documents are listed in the continuation of Box C See patent family annex

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
02 August 2006Date of mailing of the international search report
- 4 AUG 2006Name and mailing address of the ISA/AU
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Telephone No : (02) 6283 2306

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ2006/000114

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4951693 A (ARCHAMBAULT) 28 August 1990 Whole document	1 - 21
X	US 5881746 A (BUSER et al) 16 March 1999 Whole document	1 - 21
X	US 6293289 B1 (HAPKE et al) 25 September 2001 Whole document	1 - 21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NZ2006/000114

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
US	5660195	CA	2199095	EP	0793940
US	5836324	CA	2242168		
US	2004/0163684	NONE			
US	3908681	NONE			
US	4247158	NONE			
US	4951693	NONE			
US	5881746	DE	4443849	EP	0711528
US	6293289	NONE			

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX