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Remarks:

Amended claims in accordance with Rule 137(2) EPC.

(54) **Laundry drier with circuit to limit internal condensation**

(57) Laundry drying machine comprising a drum (5) to contain the laundry which is to be dried, means (8,9) for passing heating air (100) capable of drying the laundry within the said drum (5), an inlet (11) for cold air (200) originating from the exterior of the machine, heat exchanger means (6) through which the air (100) originating from the drum (5) passes and is cooled by the said cold air (200) originating from the exterior, at least one tank (10) for collecting condensation water produced by the said heat exchanger means (6), and at least one outlet

(13,16) for said cold air (200). The machine comprises duct means (20,21) capable of providing a path for conducting the said cold air (200) away from the said heat exchanger means (6) after having passed through the same and delivering it to the said outlet (13,16). After having passed through the heat exchanger means (6), some of the said cold air (200) is delivered to the upper part of the cabinet (1) of the machine in the area occupied by the electrical and/or electronic components (305) controlling the machine.

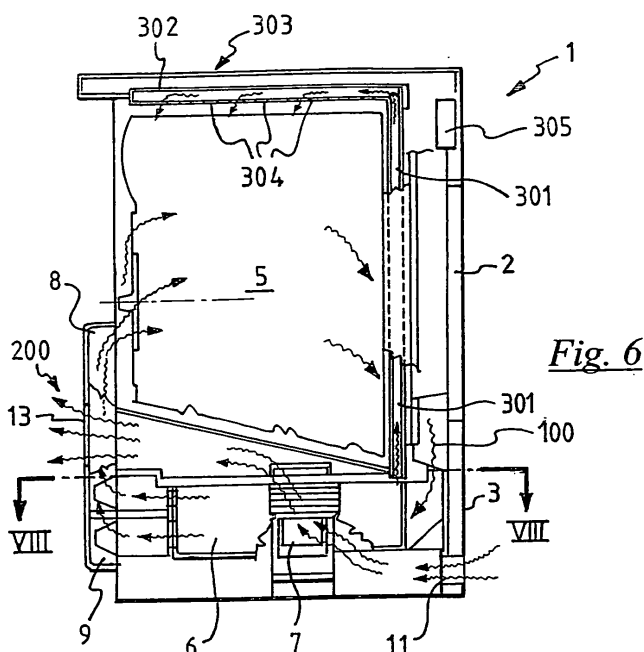


Fig. 6

Description

[0001] This invention relates to a machine for drying laundry.

[0002] Laundry drying machines of the condensation type, in which the moist air leaving the drum in which the laundry being dried is contained is caused to pass through heat exchanger devices which cool the said hot moist air with cold air from the exterior producing condensation water.

[0003] The said machines are provided with tanks for the collection of condensation water generally located beneath the heat exchanger; the said tanks may be of the fixed or removable type.

[0004] After having passed through the heat exchanger the moist air leaving the drying drum is passed to heating resistances to be heated and passed to the drying drum while the cold air is discharged outside the machine.

[0005] In present laundry drying machines there is the disadvantage that after passing through the heat exchanger the flow of cold air, which is not ducted, can flow towards the hot drying air ducts removing further heat from these and thus reducing the efficiency of the drier. In addition to this it may encourage the formation of condensation within the cabinet of the machine with possible damage or overheating of electrical and electronic devices in the machine.

[0006] In view of the state of the art described above, the object of this invention is to provide a laundry drying machine which overcomes the abovementioned disadvantages.

[0007] According to this invention, this object is accomplished through a drying machine according to claim 1 below.

[0008] Features and advantages of this invention will be apparent from the following detailed description of a practical embodiment thereof illustrated by way of a non-restrictive example in the appended drawings in which:

- Figure 1 is a diagrammatical frontal view of a laundry drying machine, in partial cross-section, according to a first embodiment of the invention,
- Figure 2 is a diagrammatical side view of the machine in Figure 1, in partial cross-section,
- Figure 3 is a diagrammatical view of a detail of the machine in Figure 1 in cross-section,
- Figure 4 is a diagrammatical view of the detail in Figure 3 in cross-section rotated through 90°,
- Figure 5 is a diagrammatical view of a modified embodiment of the detail in Figure 4 in cross-section,
- Figure 6 is a diagrammatical side view, in partial cross-section, of a laundry drying machine according to a second embodiment of the invention,
- Figure 7 is a diagrammatical view from above of the machine in Figure 6 from which the upper covering panel has been removed,
- Figure 8 is a diagrammatical view in cross-section along the line VIII-VIII in Figure 6.

[0009] With reference to Figures 1 to 4, it will be seen that the laundry drying machine is provided with a cabinet 1 having an opening 2 on the front 3 for loading the laundry which has to be dried. The machine also comprises a door 2a closing opening 2 in cabinet 1 and a drum 5 to contain the laundry which is to be dried. Door 2a is hinged to the front wall 3 of body 1 in a conventional way. Drum 5 may be of the fixed type or of the rotating type driven by an electric motor and suitable conventional mechanisms. Drum 5 also includes an opening 5a aligned with opening 2 in cabinet 1 for loading the laundry which has to be dried.

[0010] The laundry drying machine comprises a heat exchanger 6 through which the flow of hot moist air 100 originating from drum 5 flows in a conventional way. The moist air passing through device 6 is cooled by a flow 200 of cold air obtained from outside the machine through an opening 11, by a fan 7 driven by a motor and passed to device 6 through a duct 12.

[0011] After the flow of moist air has been cooled, condensation water is produced and is collected in a tank 10 located beneath heat exchanger 6. Any droplets of condensation water which might run along the outside wall of duct 12 are collected in a tray indicated by 10a.

[0012] Cooled air 100 from device 6 is passed to a duct 8 where it is heated by electrical resistances present within duct 8, which are not shown.

[0013] Heated air 100 is driven towards drum 5 by a fan 9 in order to dry the laundry.

[0014] Heat exchanger 6 is preferably located beneath drum 5, as can be seen in Figures 1 and 2. Tank 10 for collecting the condensation water originating from that device 6 is located beneath device 6.

[0015] The laundry drier comprises a duct 20 which discharges the flow of cold air 200 used to cool the air of hot moist air 100 originating from drum 5 in heat exchanger 6 outside the machine through an opening 13.

[0016] Opening 13 is preferably located in the back wall 3a of the machine. Ducts 12 and 20 therefore create a ducted route for the flow of air 200 drawn in from the exterior through opening 11, which remains isolated from duct 8 and the other components of the laundry drying machine.

[0017] In this way the said air flow 200 is prevented from lowering the temperature of air flow 100 while the latter is in a position to dry the laundry, preserving optimum performance from the machine.

[0018] Figures 3 and 4 show the structure of connection 19 between duct 20 and heat exchanger device 6 in greater detail; the said connecting structure is provided on a part of device 6 which is different from that to which duct 8 is connected in such a way as to prevent any mixing hot air flow 200 and cold air flow 100 which cross in their respective ducts in air/air heat exchanger 6.

[0019] Figure 5 illustrates a modified embodiment of connecting structure 19 with heat exchanger 6 in Figure 4.

[0020] As will be seen, connection 19 comprises a duct

21 which conveys cold air flow 200 either towards opening 13 or towards another outlet opening 16.

[0021] Outlet openings 13 and 16 are respectively located in back wall 3a and front wall 3 of cabinet 1. Pressure in the condensation circuit is thus reduced through a greater flow of cooling air 200.

[0022] In addition to this the temperature of air flow 200 achieved during the operation of heat exchanging device 6 is reduced.

[0023] One of two openings 13 and 16 may be provided with a cover, not shown in the drawings, to block the flow of air to the exterior.

[0024] Figures 6 to 8 show a diagrammatical view of a laundry drying machine according to a second embodiment of the invention.

[0025] The said machine comprises a circuit for the partial diffusion of air flow 200 within cabinet 1 of the laundry drier after the said flow has passed through heat exchanger 6.

[0026] The said circuit comprises ducts 301 and 302 which are hydraulically connected together; duct 301, which extends vertically and parallel to front wall 3 of the machine, is connected to connecting structure 19 discharging cold air 200 to the exterior.

[0027] Duct 302 is located in the upper part of the laundry drier, parallel to a covering panel 303 and in the embodiment illustrated in Figures 6 and 7 is therefore perpendicular to duct 301 with which it is connected for the passage of the flow of air.

[0028] Duct 302 is provided with nozzles 304 in order to diffuse cold air 200 within the cabinet of the laundry drying machine, preferably in the direction of the electrical and/or electronic components, indicated diagrammatically by 305, involving control of the machine in such a way as to prevent the formation of condensation upon them or in their vicinity and to prevent them from overheating.

[0029] As an alternative vertical duct 301 may also be provided with air diffusing nozzles 304 located along its axial length.

[0030] The flow from nozzles 304 may be gauged in relation to the size of the electronic and electrical controls and the size of the part of the machine to which the flow is directed in order to prevent condensation phenomena.

[0031] Preferably duct 302 may adopt positions which are angularly displaced in a plane parallel to covering panel 303 of the machine according to requirements, as indicated by dashed lines in Figure 7.

[0032] For this purpose vertical duct 301 will be mounted on the machine in such a way as to be angularly movable about its own longitudinal axis.

[0033] Further modifications and variants may be made to the machines and devices illustrated above without thereby going beyond the scope of the invention as claimed below.

Claims

1. Laundry drying machine comprising a drum (5) to contain the laundry requiring drying, means (8, 9) for delivering heated air (100) capable of drying the laundry within the said drum (5), an inlet (11) for cold air (200) originating from outside the machine, heat exchanger means (6) through which air (100) originating from the drum (5) passes and is cooled by the said cold air (200) originating from the exterior, at least one tank (10) for the collection of condensation water produced by the said heat exchanger means (6), and at least one outlet (13, 16) for cold air, **characterised in that** it comprises duct means (20, 21) to provide a path for drawing the said cold air (200) away from the said heat exchanger means (6) after having passed through the same and deliver it to the said outlet (13, 16).
2. Machine according to claim 1, **characterised in that** the said duct means (20, 21) comprise a duct (20) connected between the said heat exchanger means (6) and an outlet opening (13) in the machine.
3. Machine according to claim 1, **characterised in that** it comprises two outlets (13, 16) for the said cold air (200) one located within the front wall (3) and the other located in the back wall (3a) of the machine, the said duct means comprising a duct (21) connecting between the said heat exchanger means (6) and the said two outlets (13, 16).
4. Machine according to claim 1, **characterised in that** it comprises a circuit for diffusing part of the flow of cold air (200) after this has passed through the said heat exchanger means (6), at least in the upper internal part of the body (1) of the machine in the vicinity of the electrical and/or electronic components designed to control the machine.
5. Machine according to claim 4, **characterised in that** the said circuit for diffusing part of the cold air flow within the cabinet (1) comprises at least a first duct (301) which extends vertically in parallel to the front wall of the machine, the said duct being hydraulically connected to the connecting structure (19) of the discharge of the cold air flow (200) to the exterior, and at least one second duct (302) connected hydraulically to the former located parallel to the upper cover panel (303) of the cabinet (1) of the machine in the vicinity thereof.
6. Machine according to any one of claims 4 and 5, **characterised in that** the said ducts (301, 302) are provided with air diffusing nozzles (304).
7. Machine according to any one of claims 4 and 5, **characterised in that** the second duct (302) parallel

to the said upper closure panel (303) of the cabinet (1) of the machine can be moved angularly about the longitudinal axis of the said first duct (301) in a plane parallel to the said panel (303).

Amended claims in accordance with Rule 137(2) EPC.

1. Laundry drying machine comprising a drum (5) to contain the laundry requiring drying, duct means (8, 9) for delivering heated air (100) capable of drying the laundry within the said drum (5), and conveying air originating from the drum (5) to heat exchanger means (6) through which said air (100) originating from the drum (5) passes and is cooled by the cold air (200) originating from the exterior, at least one tank (10) for the collection of condensation water produced by the said heat exchanger means (6), an inlet (11) for cold air originating from the exterior and at least one outlet (13, 16) for the cold air, **characterised in that** it comprises first duct means (12) to provide a path for the said cold air (200) between said inlet (11) and said heat exchanger means (6), second duct means (20, 21) to provide or path between the said heat exchanger means (6) and the said outlet (13, 16), said first and second duct means being isolated from said duct means (8, 9) delivering heated air (100), and a motor driven form (7) for moving said cold air (200) along the path from the inlet (11) to the outlet (13, 16) through said heat exchanger means (6).

2. Machine according to claim 1, **characterised in that** it comprises two outlets (13, 16) for the said cold air (200) one located within the front wall (3) and the other located in the back wall (3a) of the machine.

3. Machine according to claim 1, **characterised in that** it comprises a circuit for diffusing part of the flow of cold air (200) after this has passed through the said heat exchanger means (6), at least in the upper internal part of the body (1) of the machine in the vicinity of the electrical and/or electronic components designed to control the machine.

4. Machine according to claim 3, **characterised in that** the said circuit for diffusing part of the cold air flow within the cabinet (1) comprises at least a first duct (301) which extends vertically in parallel to the front wall of the machine, the said duct being hydraulically connected to the connecting structure (19) of the discharge of the cold air flow (200) to the exterior, and at least one second duct (302) connected hydraulically to the former located parallel to the upper cover panel (303) of the cabinet (1) of the machine in the vicinity thereof.

5. Machine according to any one of claims 3 and 4, **characterised in that** the said ducts (301, 302) are provided with air diffusing nozzles (304).

6. Machine according to any one of claims 3 and 4, **characterised in that** the second duct (302) parallel to the said upper closure panel (303) of the cabinet (1) of the machine can be moved angularly about the longitudinal axis of the said first duct (301) in a plane parallel to the said panel (303).

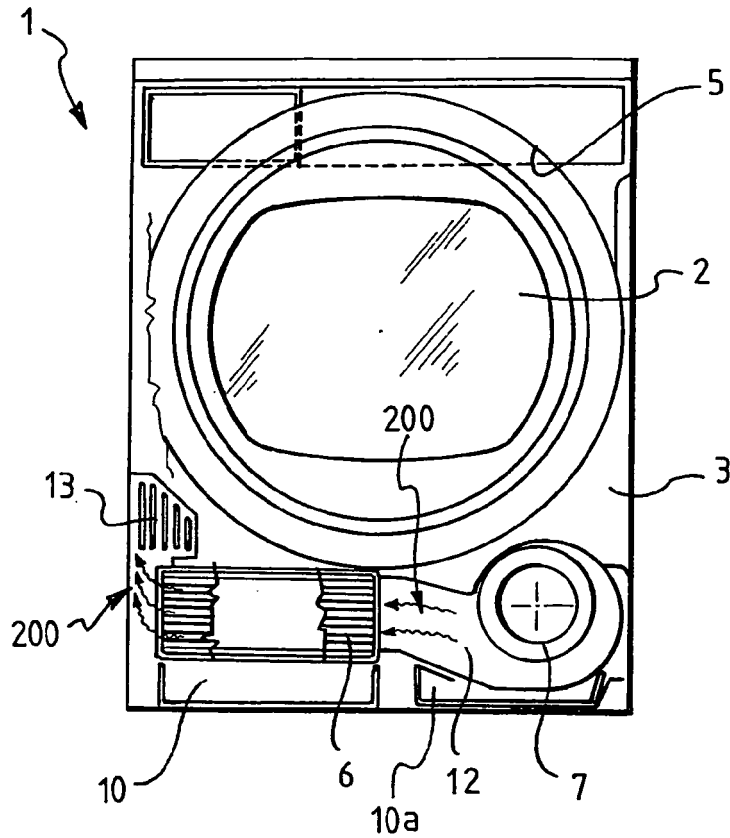
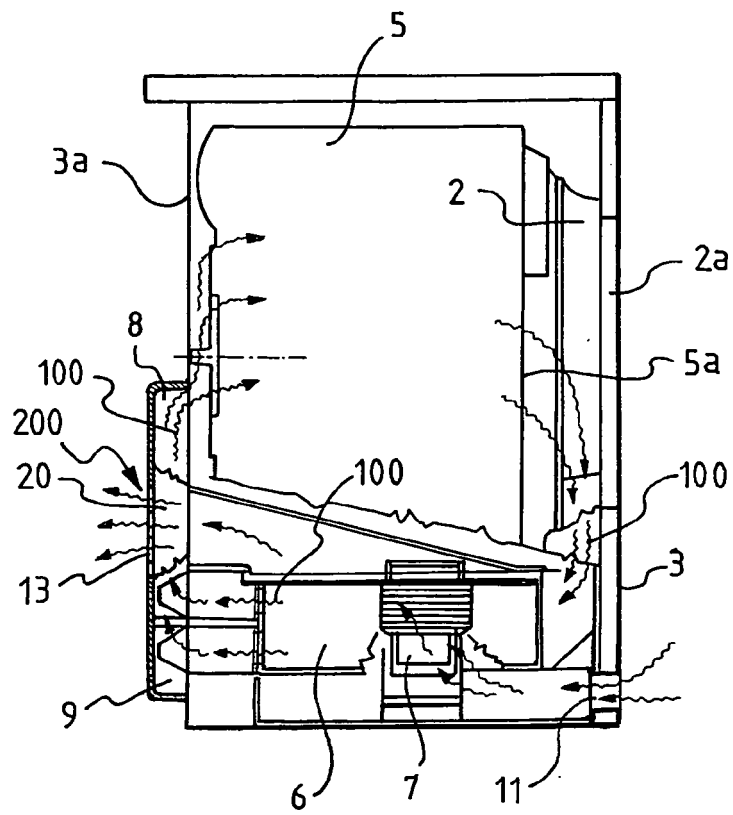


Fig. 1

Fig. 2



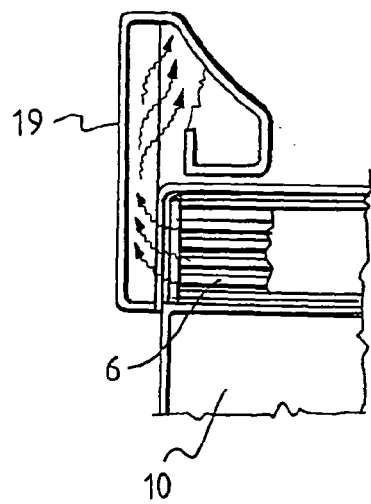


Fig. 3

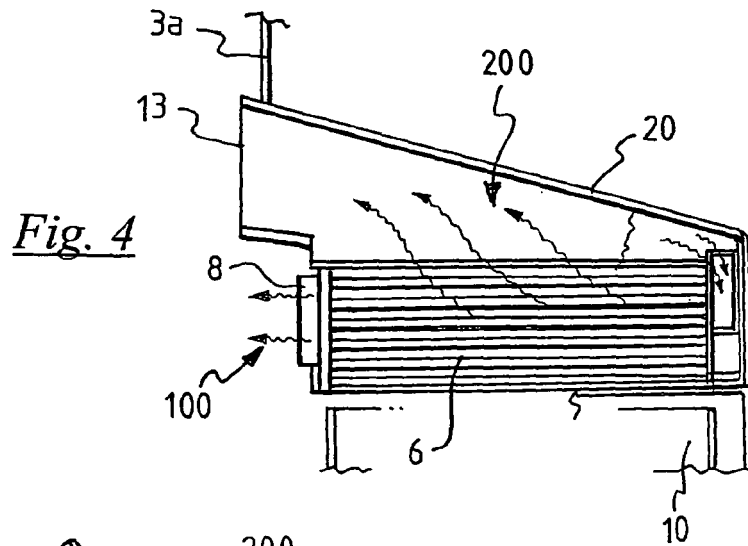


Fig. 4

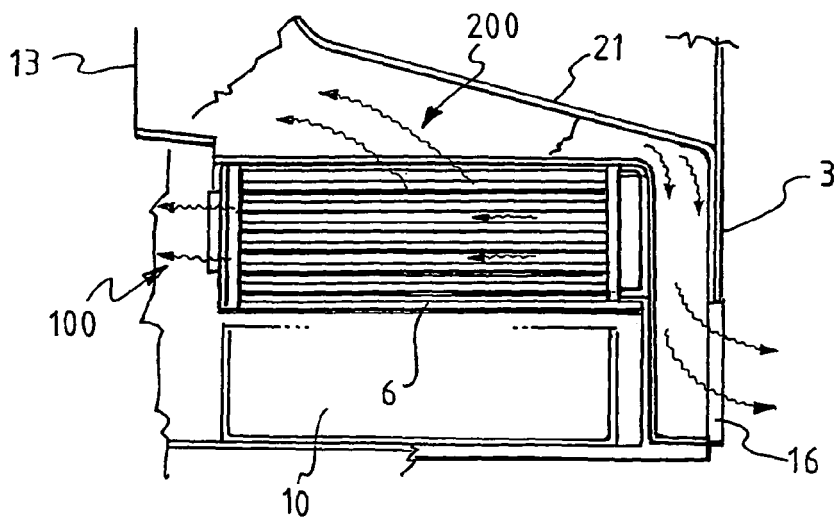


Fig. 5

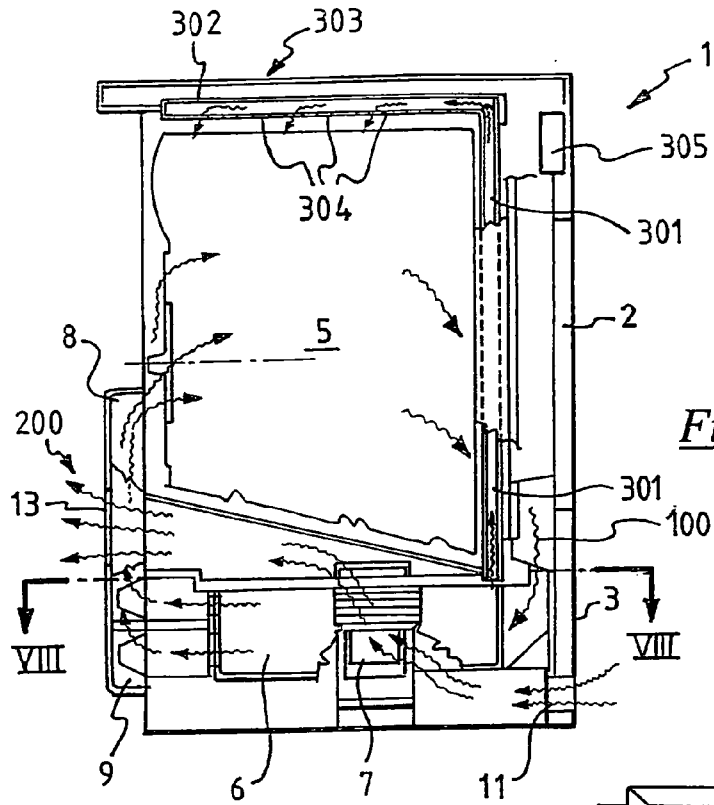


Fig. 6

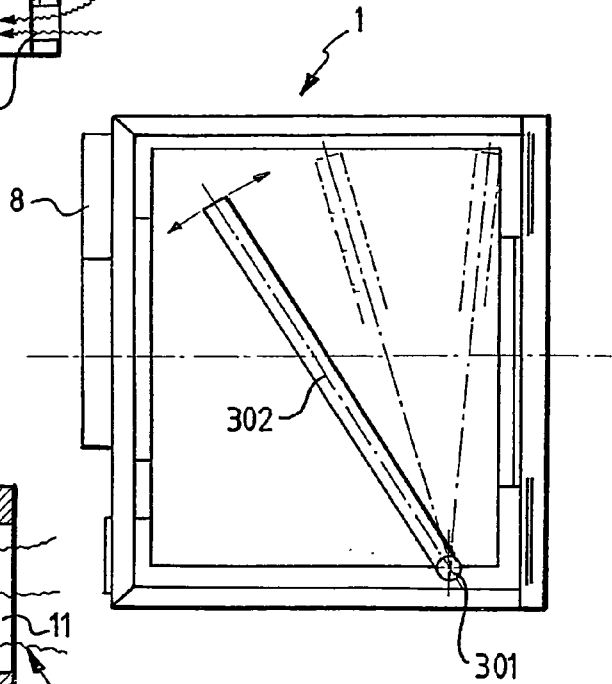


Fig. 7

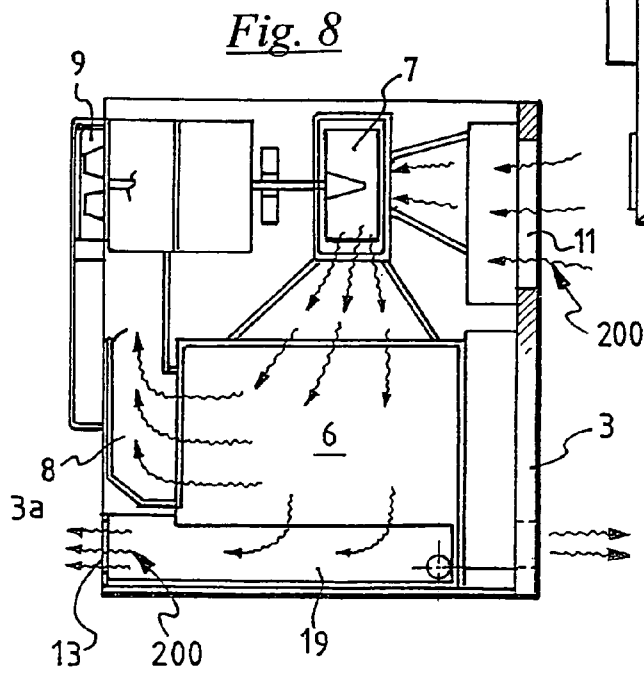


Fig. 8



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5796

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 May 2007	Examiner Clivio, Eugenio
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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