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(54) An improved washing/drying machine for laundry

(57) A washing-drying machine for laundry comprising a tank (1) containing the laundry to be dried, a first pipe (6,4,2) for circulating, condensing and heating the air taken from a first area (6) of the tank and forced into a discharge area (4) within the tank, the first pipe comprising a first motorized fan (10), at least one resistor (3) for heating the air circulating within the first pipe and a first device (5) for condensing the moisture, wherein a second air circulating pipe (9,7,2) is disposed which is adapted to take the air from inside the drum and to penetrate in the first pipe in a position upstream of the heating resistor (3), the second pipe containing a second device (8) for condensing the air moisture and a second air circulating fan (11), the second condensing device and the second air circulating fan in the second pipe being adapted to be selectively deactivated; the second fan (11) is selectively drivable by the same motor (15) as the first fan (10) via a motion transmission means (17).

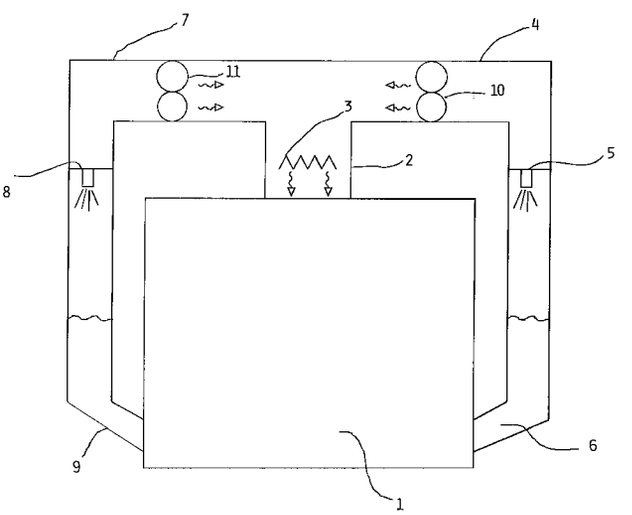

FIG. 1

EP 0 699 795 A1

Description

This invention relates to a type of improved combined machine for washing and drying laundry wherein the drying process is performed by condensation of the moisture contained in the hot air blown through laundry, provided with a device that makes the use thereof particularly fast.

Washer-dryers are known that function by condensation of a hot air current forced within the drum and removing the moisture contained in the laundry.

They are known to be realized by installing a ventilation system, normally a ventilator constituted by a fan and corresponding electric motor, that circulates the air in a closed circuit through a pipe, heats it and blows it in the drum containing the laundry to be dried.

The pipe contains a heating element which, when expediently activated, heats the air touching it forced by the ventilator, so that the air admitted to the drum is hot enough to cause evaporation of moisture contained in the laundry.

The hot air thus permeated with moisture is then sucked outside the drum and passed through a condenser generally constituted by a jet of fresh water taken from the mains that creates a cold barrier against which the hot moist air is forced.

Due to the temperature difference the moisture present in the circulating air is condensed, and the condensate is emitted to the bottom of the tank from where it is easily eliminated.

All this is well-known in the art and is recalled for the sole purpose of facilitating comprehension of the peculiarities of the present patent.

Laundry drying machines are quite simple, economical and safely working machines but have the well-known disadvantage that their drying cycle is rather slow since it lasts from about 2 hours to about 2.5 hours, depending on the load.

Furthermore they are quite noisy due to the air current forced at a considerable flow rate within the suction and discharge pipes.

Consequently, the utilization of these machines is normally limited to certain periods of the day, which makes their use less interesting for average users.

To reduce drying time it would be necessary to increase the characteristics of all the heating, ventilating and condensing means; this is naturally possible without any great difficulty when it comes to the heating resistor and ventilator; but the condensing device can normally not be readapted by increasing its section, as would be necessary for maintaining the same suction pressure, since the condenser already has a considerable horizontal section and is placed in the only space actually available, namely in correspondence with a back vertical edge inside the cabinet of the machine.

On the other hand one cannot avoid suitably increasing the section of the condenser in accordance with the greater flow rate of the ventilator, since if the condensation section was not correspondingly increased there would be such a high speed of air in suction that the film of condensed moisture, instead of dropping to the bottom of the condenser and from there into the tank, would be sucked in again by the ventilator and put back into circulation.

Moreover, a possible increase in speed and thus in air flow rate would increase the noise.

To reduce this noise it would be necessary to reduce the air flow rate, but this would require the drive motor for the fan to be able to turn at different speeds, particularly at reduced speed.

This is naturally possible but in this case one would have to use multispeed motors, which can be realized either by mechanical means or by suitable motors but at the price of greater constructional and functional complexity and with a substantial increase in cost; but the greatest disadvantage of this solution lies in the fact that if the machine is operated at reduced speed this slows down operation again, thereby worsening the service of the machine.

It would therefore be desirable, and is the object of the present invention, to realize a machine for washing and drying laundry that is able to offer substantially faster drying performance without any need to redesign the entire structure of the machine and while maintaining the capacity of the drum and the tank and keeping the outer dimensions of the machine within standard values.

These objects are achieved with the invention which will be better understood from the following description, intended only by way of a nonrestrictive example, and as described in the adjoined claims and with reference to the following drawings in which:

Fig. 1 shows a symbolic diagram of the ventilating, condensing and drying pipes of a machine according to the invention,

Fig. 2 shows a front vertical projection of the inside components of a machine according to the invention,

Fig. 3 shows symbolically a vertical side projection of a machine according to the invention,

Fig. 4 shows a horizontal plan drawing of the upper portion of a machine according to an improvement of the invention.

The devised solution is based on the finding that, all things being equal, the drying time depends substantially on the flow rate of hot air.

To increase this flow rate one would have to expediently oversize and recalibrate the components constituting the drying circuit, in particular the power of the ventilator, the power of the heating resistor and the condenser.

For the first two components there are no special problems while, as mentioned above, readapting the condenser means redimensioning it with a greater section in order to avoid the effect of condensed moisture being sucked in due to the greater speed of the air in the condensation section.

However it is normally impossible to redimension the condenser for lack of space.

The invention consists in having the condensation function performed not by one condenser, as is normally the case, but by a pair of condensers which are substantially alike and disposed within the cabinet of the machine in such a way that the sum of the particular condensation sections is adapted to a greater total flow rate, the condensers having outside dimensions and a shape such that they can be positioned within the machine in two distinct and expedient positions.

With reference to the figures one can see the inside of a machine according to the invention: it comprises tank 1, admission pipe 2, heating resistor 3 for the air passing in pipe 2, two distinct branches for condensation and readmission of air inside the tank which meet in the entrance mouth of pipe 2, the first branch being composed of discharge pipe 4, condenser 5 and suction pipe 6, while the second branch is composed of corresponding discharge pipe 7, condenser 8 and suction pipe 9.

Discharge pipe 4 houses motorized ventilator 10 in its interior, while discharge pipe 7 houses corresponding motorized ventilator 11.

In each branch the fan of the ventilator is normally enclosed in a container known as a "snail" whose shape is such as to utilize the air forced by the fan to direct it with the least loss of efficiency in the pipe leading to the drum.

It can be easily seen from Fig. 3 that, on the normally true assumption that the tank is disposed in a symmetric position on the horizontal plane with respect to the cabinet of the washer-dryer, the area of the total condensation section is the sum of single condensation sections A and B relative to the two distinct condensers. The invention thus in fact proposes a virtual condenser having twice the horizontal dimensions of the original condenser but in reality subdivided into two distinct condensers and corresponding ventilation circuits which are disposed in different positions within the machine and therefore do not have the dimensional and housing constraints of the virtual condenser.

The result of the invention is exemplified by the following table which illustrates the drying results of a laundry drying machine from current production, model G13 WD 1400W, and of the same machine provided with a device according to the invention and identified as BITURBO 2300W, naturally with all other conditions being equal, in particular the load, constituted by a load of cotton. The table indicates the significant reduction, from 15 to 35 minutes, in the drying cycle time depending on the various load conditions, and also the reduction in the average temperature of the air in the drum which demonstrates that the reduction in drying time is not obtained with an increase in working temperature, which would be undesirable for various reasons well known to the expert, but in fact with a reduction in it.

	BITURBO 2300W				G13 WD 1400W			
	3 kg 1 sheet	2.75 kg	3.5 kg	4 kg	3 kg 1 sheet	2.75 kg	3.5 kg	4 kg
Time	60′	55′	85′	100′	80′	70′	115′	135′
T°C Air drum	137°	131°	149°	168°	160°	160°	171°	173°

An advantageous improvement is shown in Fig. 4, where one avoids installing a drive motor for first fan 14; this result can be obtained by utilizing motor 15 of second fan 16 and driving first fan 14 by means of belt 17 and corresponding pulleys that transmit the motion from motor 15 of the second fan to first fan 14.

Claims

1. A combined washing-drying machine for laundry comprising a tank (1) containing the laundry to be dried, a first pipe (2) for circulating, condensing and heating the air taken from a first suction area (3) disposed on the wall of the tank and forced into a discharge area (4) within the tank, the first pipe (2) comprising a first motorized fan (5), at least one resistor (6) for heating the air circulating within the first pipe and a first device (7) for condensing the moisture of the air circulating in the first pipe (2), **characterized in that** a second air circulating pipe (8) is provided

which is adapted to take the air from inside the drum from a second suction area (9) disposed on the wall of the tank and to penetrate in the first pipe (2) in a position upstream of the heating resistor, the second pipe containing a second device (10) for condensing the air moisture and a second fan (11) for circulating the air in the second pipe.

2. The machine of claim 1, **characterized in that** the second condensing device (10) and the second air circulating fan (11) in the second pipe can be selectively deactivated.

3. The machine of claim 2, **characterized in that** when the second condensing device and the second circulating fan are deactivated the electric power dissipated by the heating resistor (6) is automatically reduced to approximately one half its value with both fans switched on.

4. The machine of any of the above claims, **characterized in that** the second fan is selectively drivable by the same motor as the first fan via a motion transmission means (17).

5. The machine of any of the above claims and of the front-loading type, **characterized in that** the first (7) and second (10) condensing devices are respectively disposed along the two back vertical edges of the cabinet of the machine.

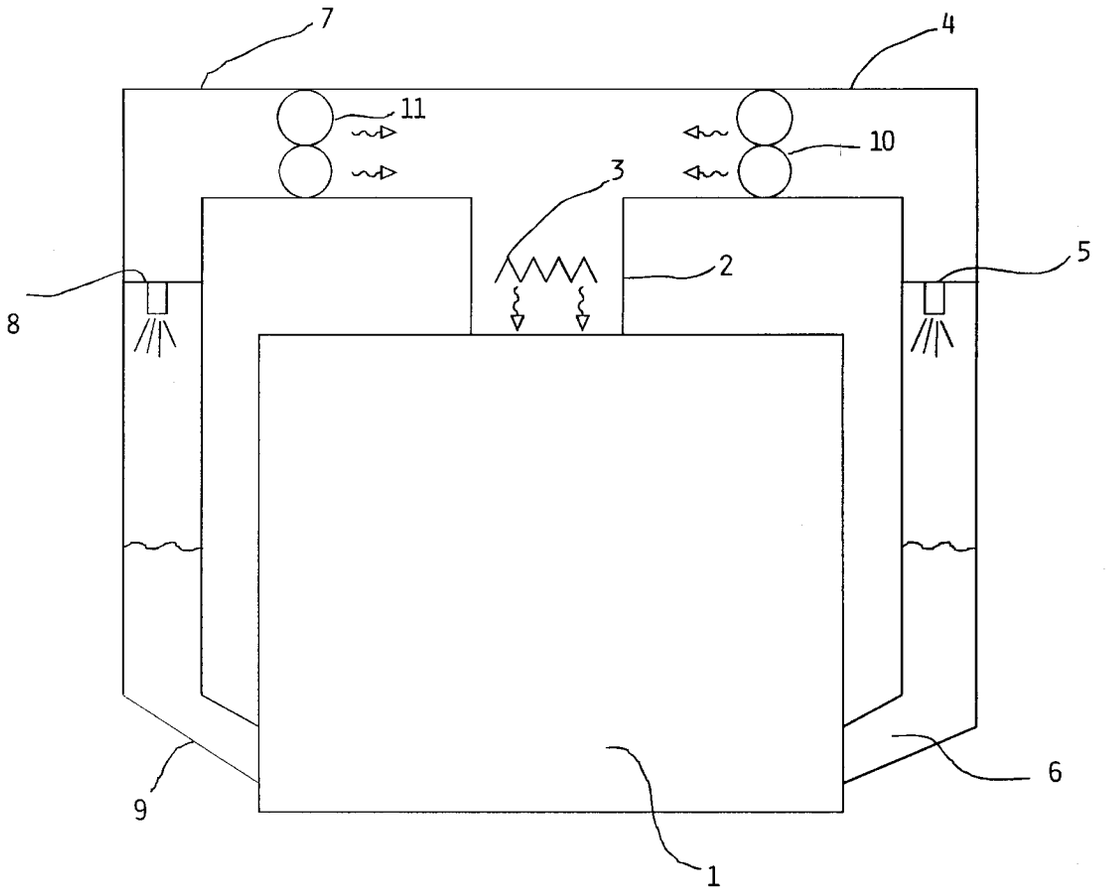

FIG. 1

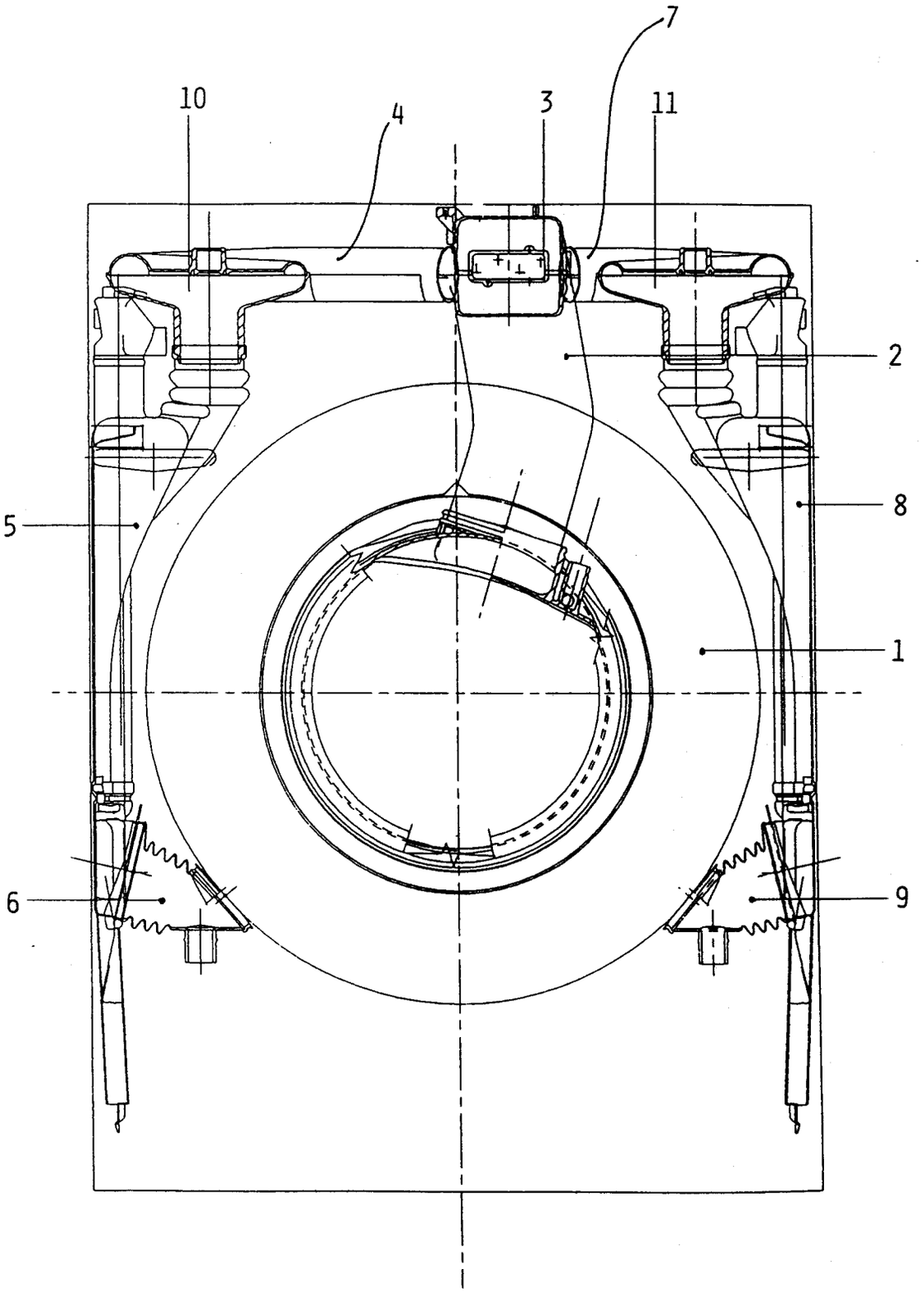

FIG. 2

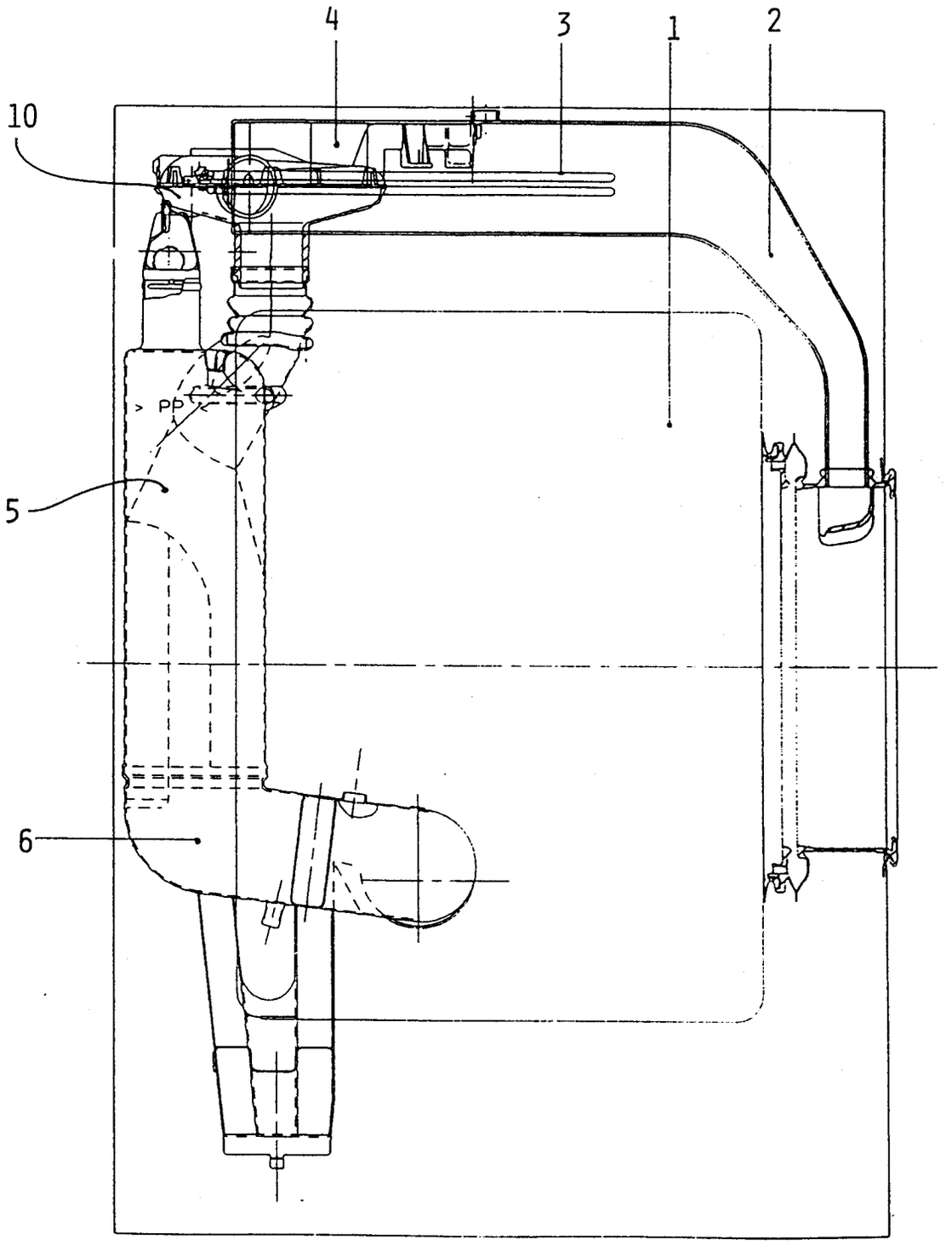

FIG. 3

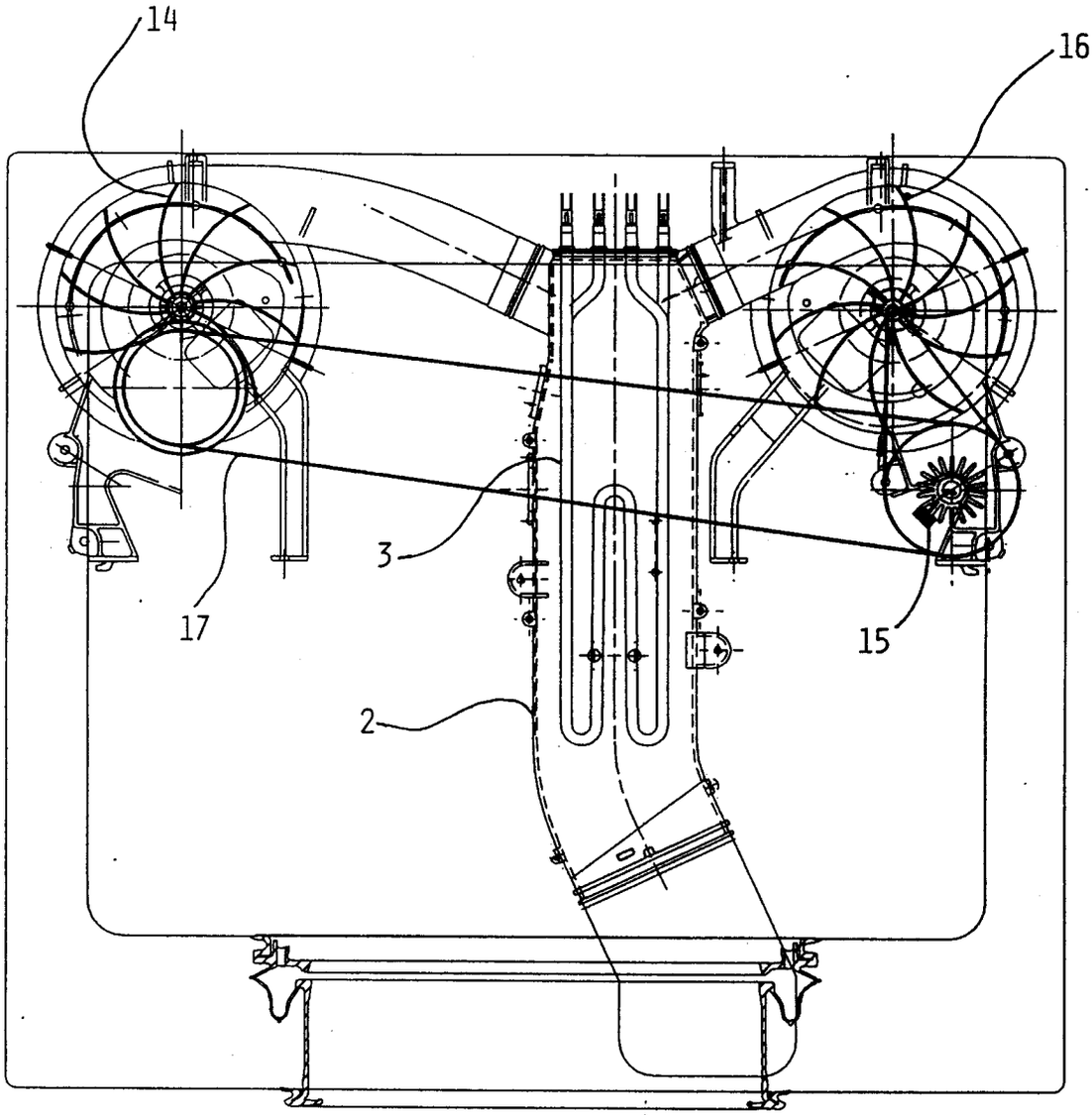

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 95 11 3567

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.6)
X	FR-A-2 264 908 (H.W. GESCHKA & W. OBERHOFF)	1,5	D06F58/24 D06F25/00
A	* the whole document *	3	
A	DE-A-25 03 569 (H.W. GESCHKA & W. OBERHOFF) * page 4, line 1 - line 16 * * page 5, line 9 - line 12; figures *	1,4,5	
A	GB-A-2 248 920 (ZANUSSI ELETTRODOMESTICI S.P.A.) * claims; figures *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 December 1995	Courrier, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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