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(54) **Laundry drying machine and control method thereof**

(57) Laundry drying machine (1) comprising a rotatable laundry drum (3), an electric motor (9) for rotating said rotatable laundry drum (3) about its axis of rotation (6), hot air generator means (11) configured to supply a drying airflow to the drum (3) during a drying cycle, an electronic control system (16) configured to: provide a signal (S) indicative of torque (TE) that said electric motor (9) provides to the rotatable laundry drum (3), sense the inside-temperature (T_W) of the drying airflow inside the drum (3), sense the output-temperature (T_{OUT}) of the airflow which flows out from the rotatable drum 3, determine a comparison threshold (THC) based on the sensed signal (S), determine a temperature-difference (ΔT) between the sensed output-temperature (T_{OUT}) and the sensed inside-temperature (T_W), compare the determined temperature-difference (ΔT) with the determined comparison threshold (THC) and stop the drying cycle according to the result of the comparison.

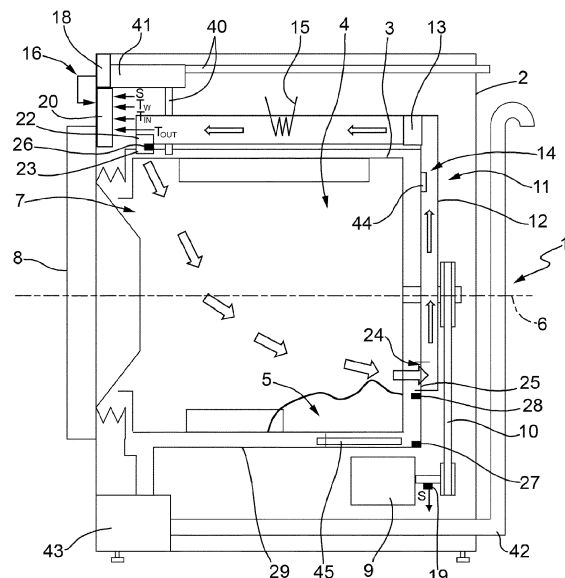


FIG. 1

Description

[0001] The present invention relates to a laundry drying machine and a method for controlling said machine.

[0002] The present invention further relates to a domestic rotatable drum laundry drying machine which may be embodied as a dryer able to dry clothes, or as a washer-dryer operable to wash and/or dry clothes.

[0003] Methods for controlling rotatable-drum laundry driers are known, in which: hot air is supplied into the rotating drum so as to flow over the laundry inside the drum; the impedance of the laundry is measured by measuring electrodes positioned inside the drum for contacting the laundry; the moisture of the laundry is determined on the basis of the impedance measurement; and the drying cycle is stopped when the impedance measurement reaches a time-constant comparison threshold associated to a predetermined final moisture.

[0004] Though effective and accurate, the above methods are not suitable to be used in rotatable drum washer-dryers, because the measuring sensors/electrodes cannot be arranged in the drum for contacting the laundry, due to specific architecture of the washer-dryers, and to the fact that the drum is used also for washing operations.

[0005] For such reasons, nowadays, control methods implemented in the washer-dryers are configured to determine the laundry moisture based on control signals available in the washer-dryer, for example temperatures of the airflow measured in some specific positions of the drying circuit, i.e. at the drum inlet and/or the condenser-input, etc.

[0006] Such control methods continuously measure air-temperatures and stops drying cycles when the air-temperature measurement reaches a threshold temperature associated to a predetermined final moisture.

[0007] If the above described control methods are, on the one hand, able to assure acceptable results in terms of drying level of the laundry, on the other hand, they are not enough accurate when a specific drying cycle needs to be performed, such as for example, a so called "iron drying cycle" requiring a high moisture precision because, at the end of the cycle, laundry should be sufficiently humid to facilitate a subsequent ironing.

[0008] In depth research has been carried out by the Applicant to provide a simple and inexpensive solution suitable to be used in a rotatable-drum washer-dryer, and/or a dryer, that will enable guaranteeing the user to achieve a final, accurate moisture value.

[0009] It is therefore an object of the present invention to provide a solution designed to achieve the above goal.

[0010] According to the present invention, there is provided a laundry drying machine as claimed in Claim 1 and preferably, though not necessarily, in any one of the Claims depending directly or indirectly on Claim 1.

[0011] A second aspect of the present invention provides a method to control a laundry drying machine as claimed in Claim 6 and preferably, though not necessarily, in any one of the Claims depending directly or indi-

rectly on Claim 6.

[0012] A third aspect of the present invention provides an electronic control system configured to control a laundry drying machine as claimed in Claim 11 and preferably, though not necessarily, in any one of the Claims depending directly or indirectly on Claim 11.

[0013] A non limiting embodiment of the present invention will be now described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of a laundry drying machine embodied as a washer/drier, comprising an electronic control system made according to the present invention;

Figure 2 is an example of a side-view of the rear tub shell of the laundry washing/drying machine shown in figure 1;

Figure 3 shows four graphs relating, respectively, to temperature-changes, torque-changes, temperature-difference changes and moisture-changes, determined during a drying cycle test performed through the laundry drying machine shown in Figure 1; whereas

Figure 4 is as flow chart of the operating-phases performed by the control method for controlling the laundry washing/drying machine shown in Figure 1.

[0014] With reference to Figure 1, referral number 1 indicates as a whole a laundry drying machine which may be embodied as a rotatable-drum laundry dryer, or as a rotatable drum laundry washer-dryer, to which the following description refers purely by way of example without implying any loss of generality.

[0015] According to the preferred embodiment shown in Figure 1, rotatable-drum laundry drying machine 1 comprises an outer casing 2 that preferably rests on the floor on a number of feet. Casing 2 supports a tub 29 that houses a rotatable laundry drum 3. Drum 3 defines a washing/ drying chamber 4 for accommodating laundry 5 and rotates about a preferably, though not necessarily, horizontal axis of rotation 6. In an alternative embodiment not shown, axis of rotation 6 may be vertical or inclined. Washing/drying chamber 4 has a front access opening 7 closable by a door 8 preferably hinged to casing 2. A conduit 40 is provided for supplying water to a detergent dispenser unit 41 so as to form a washing liquor that is supplied to the chamber 4. A draining conduit 42 is further provided for draining liquid from tub 29 by means of a pump 43.

[0016] Rotatable-drum 3 may be rotated about the axis of rotation 6 by an electric motor 9 (shown schematically in Figure 1) which is mechanically connected to the rotatable drum 3 through a drive member 10 for transmitting the motion for driving the rotatable-drum 3 in rotation about its axis 6.

[0017] Referring to Figure 1, rotatable drum laundry drying machine 1 also comprises a hot-air generator 11 housed inside the casing 2, and designed to circulate

through the rotatable-drum 3 a stream of hot air having a low moisture level, and which flows over and dries the laundry 5 inside the rotatable-drum drying chamber 4.

[0018] During the drying cycle, hot air generator 11 provides for gradually drawing air from rotatable-drum 3; extracting moisture from the air drawn from rotatable drum 3; heating the dehumidified air to a predetermined temperature based on the selected drying cycle; and supplying the heated, dehumidified air cyclically back into rotatable drum 3, where it flows over the laundry 5 inside the rotatable drum 3 to dry it.

[0019] Referring to a preferred embodiment shown in Figure 1, hot air generator 11 is operable for continually dehumidifying and heating the air circulating inside rotatable drum 3 to dry the laundry 5 inside the drum 3/chamber 4, and substantially comprises:

- an air recirculating conduit 12 presenting the two opposite ends connected to the revolving laundry drum 3;
- a fan 13 located along recirculating conduit 12 to produce inside the latter an airflow which flows into rotatable drum 3 and over the laundry 5 inside the rotatable drum 3;
- preferably, a condensing device 14, which is able to cool the airflow coming out from rotatable drum 3 for condensing the moisture in the airflow; and
- a heating device 15, which is able to heat the airflow returning back into rotatable drum 3, so that the airflow entering into the revolving drum 3 is heated to a temperature higher than or equal to that of the same air flowing out of the drum 3.

[0020] With regard to heating device 15, it may advantageously comprise a number of electric heating components, such as electric resistors located inside the air recirculating conduit 12 to dissipate electric power by Joule effect so as to heat the air supplied to rotatable-drum 3.

[0021] Regarding the condensing device 14, it may comprise a water spraying nozzle 44 designed to condense the moisture in the airflow through the air recirculating conduit 12. It should be pointed out that condensing device 14 applies, purely by way of example, to one possible embodiment of the present invention, and may be omitted in the case of a vented type rotatable drum laundry drier 1 (i.e. a dryer in which the hot and moisture-laden drying air from the rotatable-drum 3 is expelled directly out of rotatable-drum laundry drier 1).

[0022] According to one possible embodiment of the present invention, heating device 15 and condensing device 14 may be replaced with two heat exchangers, i.e. a refrigerant fluid condenser and a refrigerant fluid evaporator respectively, comprised within a heat pump assembly (not shown). As a further embodiment, not shown in the drawings, the condensing device 14 may be an air/air heat exchanger, where drying air and ambient air taken from the machine outside are passed therethrough.

[0023] With reference to a preferred embodiment shown in Figures 1 and 2, the air recirculating conduit 12 presents a first end 22 connected to the tub 29, through a first opening forming an input air-duct 23 of the tub 29.

The second end 24 of the air recirculating conduit 12 is connected to the tub 29, through a second opening forming an output air duct 25 of the tub 29. In actual use, fan 13 blows a stream of drying air heated by heating device 15, to the input air-duct 23 of the tub 29. After contacting laundry 5 inside drum 3, the moisture-laden drying air flows out from rotatable drum 3 and tub 29, through the output air duct 25, and it is preferably directed to the condensing device 14, which cools the drying air to condense the moisture inside it.

[0024] Rotatable-drum laundry drying machine 1 further comprises an electronic control system 16 configured to control rotatable drum laundry drier 1 preferably on the basis of a drying cycle selected by a user through the control interface 18, according to the control method which will be hereinafter disclosed in detail.

[0025] According to the preferred embodiment of the present invention, the electronic control system 16 comprises a temperature sensing system which is configured to sense along the air recirculating conduit 12: the input-temperature T_{IN} of the heated airflow which is supplied to the input air duct 23 of the tub 29; the inside-temperature T_W of the heated airflow inside drum 3; and the output-temperature T_{OUT} of the heated airflow which flows out of rotatable-drum 3 through the output air-duct 25 of the rotatable drum 3.

[0026] According to a preferred embodiment shown in Figure 1, the temperature sensing system comprises a temperature sensor 26 arranged on input air duct 23 to sense the input-temperature T_{IN} of the airflow which is supplied to rotatable drum 3; a temperature sensor 27 arranged inside the tub 29 to sense the inside temperature T_W of the heated airflow inside the rotatable drum 3; and a temperature sensor 28 arranged on the output air-duct 25 to measure the output-temperature T_{OUT} of the airflow which flows out from the rotatable drum 3 and the tub 29. The position of the temperature sensor 27 is chosen so as to place the sensor in a stationary part of the machine, such part being sufficiently close to the rotatable drum 3 such that the temperature T_W sensed by sensor 27 can be considered equal to that of the drying airflow inside the drum. In a washer/dryer machine the temperature sensor 27 may be the same sensor that, during a washing process, senses the temperature of the washing liquor which is heated by a heating device 45 provided at the bottom of the tub 29.

[0027] The electronic control system 16 further comprises a sensing device 19 designed to output a signal S which is indicative of the torque value TE provided to the rotatable drum 3 by the electric motor 9, i.e. a signal which is indicative of the strength developed by the drum motor 9 to rotate the drum 3 itself during a laundry drying process. Such signal S may be the motor torque TE itself or, for example, an electrical parameter such as the cur-

rent (I) through the electric motor, the voltage (V) of the motor, the magnetic flux (Φ) in the electric motor and the like. The electronic control system 16 further comprises an electronic control unit 20, which is configured for: controlling the hot air generator 11 based on drying airflow input-temperature T_{IN} sensed by temperature sensor 26, to cause the temperature of airflow which is supplied to rotatable drum 3 to correspond, time after time, to prefixed temperature values of the selected drying cycle; determining a comparison threshold THC based on the sensed signal S which is indicative of the torque value TE provided to the rotatable drum 3 by the electric motor 9; determining a temperature-difference ΔT between the drying airflow output-temperature T_{OUT} as sensed by the temperature sensor 28 and the inside-temperature T_W of the airflow inside the rotatable drum 3 as sensed by temperature sensor 27 ($\Delta T = T_{OUT} - T_W$); comparing such temperature-difference ΔT with the determined comparison threshold THC; and determining the end of the drying cycle based on the result of the comparison.

[0028] To this end, it should be pointed out that in-depth research carried out by the Applicant has demonstrated that during the drying cycle, the laundry moisture affects, to one hand, the torque value TE, or a signal indicative of such torque, that the electric motor 9 provides to the drum 3, and on the other hand, the temperature-difference ΔT between the sensed drying airflow output-temperature T_{OUT} and the sensed inside-temperature T_W of the airflow inside the rotatable drum 3.

[0029] In detail, with reference to temperature-graph 30, torque-graph 31 and moisture-graph 32 shown in Figure 3, during the drying cycle, the laundry moisture decreases gradually to reduce step by step the total weight of the wet clothes. Consequently, the loss in weight of the wet clothes affects directly the torque that electric motor 9 has to provide to the drum 3 to maintain a prefixed drum speed. During the drying cycle, the sensed drying airflow output-temperature T_{OUT} is substantially equal to the sensed inside-temperature T_W of the drying airflow inside the drum 3, but when moisture of the clothes becomes smaller of a threshold value, the temperature-difference ΔT between the output-temperature T_{OUT} and inside-temperature T_W start to gradually increase. In other words, the instant in which temperature-difference ΔT starts to increase is indicative of the fact that laundry-moisture has reached a determined value.

[0030] Therefore, Applicant found out that it is possible to improve accuracy of determining a given laundry moisture associated to a final drying condition and determining end of drying cycle, by using and comparing to each other the information about sensed torque and the information related to temperature-difference ΔT between the measured output-temperature T_{OUT} and the measured inside-temperature T_W . It should also be pointed out that even if in Figure 3 it has been represented the drum motor torque on drying process time, other parameters indicative of the torque supplied by the drum motor, such as the current (I) through the electric motor, the voltage (V)

of the motor, or the magnetic flux (Φ) in the electric motor, could be sensed by the sensing device 19 to obtain a graph similar to that of the torque shown in Figure 3. Therefore the considerations above, other than with the torque signal, are still applicable with a signal S indicative of the torque supplied by the drum motor 9, such as the current (I) through the electric motor, the voltage (V) of the motor, the magnetic flux (Φ) in the electric motor and the like.

[0031] For this purpose, as will be described hereinafter, the sensed signal S is transformed by a mathematical function $F(S)$, preferably, although not necessarily, a linear function, in the comparison threshold THC, which is used to determine the temperature-difference ΔT related to a desired laundry moisture at the end of a drying process.

[0032] In order to clarify the meaning of the comparison threshold THC obtained on the basis of the sensed signal S indicative of the drum motor torque, Figure 3 shows, as an example, some experimental data measured by Applicant during experimental test, wherein it is shown: how output-temperature T_{OUT} and inside-temperature T_W increase during the drying cycle and start diverging to each other when the residual laundry moisture within laundry is lower than 10% (temperature-graph 30); how torque TE provided by the electric motor 9 to the drum 3 decreases during drying cycles (torque-graph 31); how comparison threshold THC determined by linear function and associated to the measured torque TE, decreases and crosses the temperature-difference ΔT in a crossing point associated to the predetermined moisture value, i.e. less than 10% (threshold-graph 33).

[0033] Therefore comparison threshold THC is a function of the torque, and, more generally, of a signal S indicative of the drum motor torque, $THC = F(S)$ and according to a preferred embodiment of the present invention, is the following linear function:

$$a) \quad THC = A * S + B$$

wherein A and B are experimental values, i.e. linear parameters, associated to: the drying cycle selected by the user, and/or final required moisture, and/or the kind of laundry loaded in the rotatable drum.

[0034] In detail, experimental values A and B may be determined by performing several drying tests based on drying cycle implementable by a laundry drying machine, in which during each test, torque, or, more generally, a signal S indicative of the drum motor torque, temperature-difference ΔT , and moisture of the laundry are measured. Values A and B are determined/dimensioned so that the crossing point between comparison threshold THC curve and the temperature-difference ΔT curve occurs at a predetermined laundry moisture.

[0035] It should be pointed out that values A and B may be determined and stored in a database contained in the

electronic control system 16 and vary according to the selected drying cycle and/or several drying parameters such as: kind of laundry, and/or weight/quantity of laundry, and/or required laundry moisture at the end of a drying process.

[0036] Figure 4 shows a flow chart of the operating-phases performed by the electronic control system 16 when carries out a control method according to a preferred embodiment of the present invention.

[0037] At the beginning of the method, electronic control unit 20 starts the drying cycle (Block 100) based on the cycle selection made by a user through the user control interface 18.

[0038] After the drying cycle has been selected and started, the electronic control unit 20 controls the electric motor 9 to cause the drum 3 to rotate at pre-set rotation speeds about the axis of rotation 6 according to the drying cycle and switches-on the hot-air generator 11 to start dehumidifying and heating the air circulating inside rotatable-drum 3 to dry the laundry 5 inside the drum 3/chamber 4 (Block 110).

[0039] The electronic control unit 20 acquires the input-temperature T_{IN} sensed by means of temperature sensor 26, and controls the heating device 15 and/or the fan 13 to supply drying air into the rotatable-drum 3 (Block 120) so that the airflow temperature supplied to the rotatable-drum 3 is controlled according to the difference between the measured input-temperature T_{IN} and a reference temperature associated to the performed drying cycle.

[0040] According to a preferred embodiment of the present invention, the electronic control unit 20 controls the heating device 15 and the fan 13 so that the input-temperature T_{IN} is maintained substantially equal to a predetermined value associated to the performed drying cycle.

[0041] It should be pointed out that, method to control the airflow temperature performed by the electronic control unit 20 may correspond to any known temperature control method, and being not the object of the present invention, it will not be further disclosed.

[0042] During the drying cycle, electronic control unit 20 receives a signal S indicative of the drum motor torque TE from the sensing device 19 (Block 130).

[0043] Electronic control unit 20 acquires the inside-temperature T_W and the output-temperature T_{OUT} as sensed by the temperature sensors 27 and 28 respectively (Block 140) and determine the comparison threshold THC preferably, though not necessarily, by means of function a) according to the signal S indicative of the torque TE supplied by the motor 9 to the drum 3;

$$a) \text{ THC} = A * S + B.$$

[0044] It should be pointed out that the electronic control unit 20 retrieves linear parameters A and B from a

database contained in the electronic control system 16 based on: selected drying cycle and/or several drying parameters such as kind of laundry, and/or weight/quantity of laundry, and/or required laundry moisture at the end of the drying cycle.

[0045] Electronic control unit 20 determines the temperature-difference ΔT between the sensed output-temperature T_{OUT} and sensed inside-temperature T_W (Block 160), and compares temperature-difference ΔT with the comparison threshold THC associated to the signal S (Block 170).

[0046] Electronic control unit 20 checks instant by instant, (for example, every a second), whether the temperature-difference ΔT is greater than the comparison threshold THC associated to a required laundry moisture at the end of the drying cycle (Block 170), and if not (NO output from Block 170), it performs next step of computation (Block 180) and repeats operating-phases disclosed from Block 130 to Block 170, so as to acquire the signal S from the sensing device 19; acquire the inside-temperature T_W and the output-temperature T_{OUT} ; determine the comparison threshold THC based on sensed, and compare temperature-difference ΔT with the comparison threshold THC.

[0047] Instead, if the temperature-difference ΔT is greater than the comparison threshold THC (YES output from Block 170), the electronic control unit 20 determines that laundry moisture has reached the desired final moisture that has been linked to the threshold value THC, stops the drying cycle (Block 190), and preferably, though not necessarily, starts a laundry cooling stage (Block 200).

[0048] Stopping the drying cycle may preferably comprise turning off heating device 15. The purpose of the cooling stage is to lower the high temperature (e.g. 70°C) of the laundry 5 to a predetermined low temperature (e.g. 50°C) at which laundry 5 can be handled by the user. At the cooling stage, rotatable-drum 3 may be kept turning, and non-heated air supplied into rotatable drum 3.

[0049] Rotatable-drum laundry drier 1 has the major advantages of ensuring a accurate desired laundry moisture at the end of a drying cycle for a wide range of drying cycles and ensuring the drying of different load quantity.

[0050] Clearly, changes may be made to the rotatable-drum laundry drier or to the control method as described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. A laundry drying machine (1) comprising a rotatable laundry drum (3) designed to rotate about an axis (6), an electric motor (9) which is mechanically connected with the rotatable laundry drum (3) for rotating said rotatable laundry drum (3) about its axis (6); hot air generator means (11) configured to supply a drying airflow to the drum (3) during a drying cycle;

the laundry drying machine (1) being **characterized by** comprising an electronic control system (16) configured to:

- provide a signal (S) indicative of a torque (TE) that said electric motor (9) provides to the rotatable laundry drum (3) during a drying cycle;
- sense the inside-temperature (T_W) of the drying airflow inside the drum (3);
- sense the output-temperature (T_{OUT}) of the drying airflow which flows out of the rotatable drum 3;
- determine a comparison threshold (THC) based on the sensed signal (S);
- determine a temperature-difference (ΔT) between the sensed output-temperature (T_{OUT}) and the sensed inside-temperature (T_W);
- compare the determined temperature-difference (ΔT) with the determined comparison threshold (THC);
- stop the drying cycle according to the result of the comparison.

2. Laundry drying machine according to Claim 1, wherein the electronic control system (16) is further configured to determine a comparison threshold (THC) based on the sensed signal (S) by performing the flowing function:

$$THC=A*S+B$$

wherein A and B are experimental values associated to: the drying cycle selected by the user, and/or required moisture at the end of a drying cycle, and/or the kind of laundry loaded in the rotatable drum.

3. Laundry drying machine according to Claims 1 or 2, wherein the electronic control system (16) is further configured to stop the drying cycle when temperature-difference (ΔT) is greater than the comparison threshold (THC).
4. Laundry drying machine according to any of previous Claims, wherein electronic control system (16) comprises a temperature sensor (27) designed to sense the inside-temperature (T_W) of the drying airflow inside drum 3; and a temperature sensor (28) designed to sense the output-temperature (T_{OUT}) of the drying airflow which flows out from the rotatable drum (3).
5. Laundry drying machine according to any claim 1 to 4 wherein said signal (S) is the current (I) through the electric motor (9) or the voltage (V) of the electric motor (9), or the magnetic flux (Φ) in the motor (9), or the torque (TE) developed by the electric motor (9).

6. Method to control a laundry drying machine (1) according to any Claim 1 to 5 the method being **characterized by**:

- providing a signal (S) indicative of a torque (TE) that said electric motor (9) provides to the rotatable laundry drum (3) during a drying cycle;
- sensing the inside-temperature (T_W) of the drying airflow inside the drum (3);
- sensing the output-temperature (T_{OUT}) of the drying airflow which flows out of the rotatable drum (3);
- determining a comparison threshold (THC) based on the sensed signal (S);
- determining a temperature-difference (ΔT) between the sensed output-temperature (T_{OUT}) and the sensed inside-temperature (T_W);
- comparing the determined temperature-difference (ΔT) and the determined comparison threshold (THC);
- stopping the drying cycle according to the result of the comparison.

7. Method according to Claim 5, further comprising:

- determining a comparison threshold (THC) based on the sensed signal (S) by performing the flowing function:

$$THC=A*S+B$$

wherein A and B are experimental values associated to: the drying cycle selected by the user, and/or required moisture at the end of a drying cycle, and/or the kind of laundry loaded in the rotatable drum.

8. Method according to Claims 6 or 7, comprising: stopping the drying cycle when temperature-difference (ΔT) is greater than the comparison threshold (THC).
9. Method according to any of previous Claims from 7 to 8, comprising:
- measuring the inside-temperature (T_W) of the drying airflow inside drum 3; measuring the output-temperature (T_{OUT}) of the drying airflow which flows out of the rotatable drum (3).
10. Method according to any claim 6 to 9 wherein said signal (S) is the current (I) through the electric motor (9) or the voltage (V) of the electric motor (9), or the magnetic flux (Φ) in the motor (9), or the torque (TE) developed by the electric motor (9).
11. Electronic control system (16) configured to control a laundry drying machine (1) according to any claim

1 to 5, **characterized by** comprising a sensing device (19) adapted to provide a signal (S) indicative of a torque (TE) that said electric motor (9) provides to the rotatable laundry drum (3) during a drying cycle, and a temperature sensing system that is configured to:

- sense the inside-temperature (T_W) of the drying airflow inside the drum (3);
- sense the output-temperature (T_{OUT}) of the drying airflow which flows out of the rotatable drum 3;

and an electronic control unit (20) that is configured to:

- determine a comparison threshold (THC) based on the sensed signal (S);
- determine a temperature-difference (ΔT) between the sensed output-temperature (T_{OUT}) and the sensed inside-temperature (T_W);
- compare the determined temperature-difference (ΔT) with the determined comparison threshold (THC);
- stop the drying cycle according to the result of the comparison.

12. Electronic control system according to Claim 11, configured to determine a comparison threshold (THC) based on the sensed signal (S) by performing the flowing function:

$$THC = A * S + B$$

wherein A and B are experimental values associated to: the drying cycle selected by the user, and/or required moisture at the end of a drying cycle, and/or the kind of laundry loaded in the rotatable drum.

13. Electronic control system according to Claims 11 or 12, configured to stop the drying cycle when temperature-difference (ΔT) is greater than the comparison threshold (THC).
14. Electronic control system according to any of previous Claims from 11 to 13, comprising a temperature sensor (27) designed to sense the inside-temperature (T_W) of the drying airflow inside drum (3); and a temperature sensor (28) designed to sense the output-temperature (T_{OUT}) of the drying airflow which flows out from the rotatable drum (3).
15. Electronic control system according to any claim 11 to 14 wherein said signal (S) is the current (I) through the electric motor (9) or the voltage (V) of the electric motor (9), or the magnetic flux (Φ) in the motor (9),

or the torque (TE) developed by the electric motor (9)

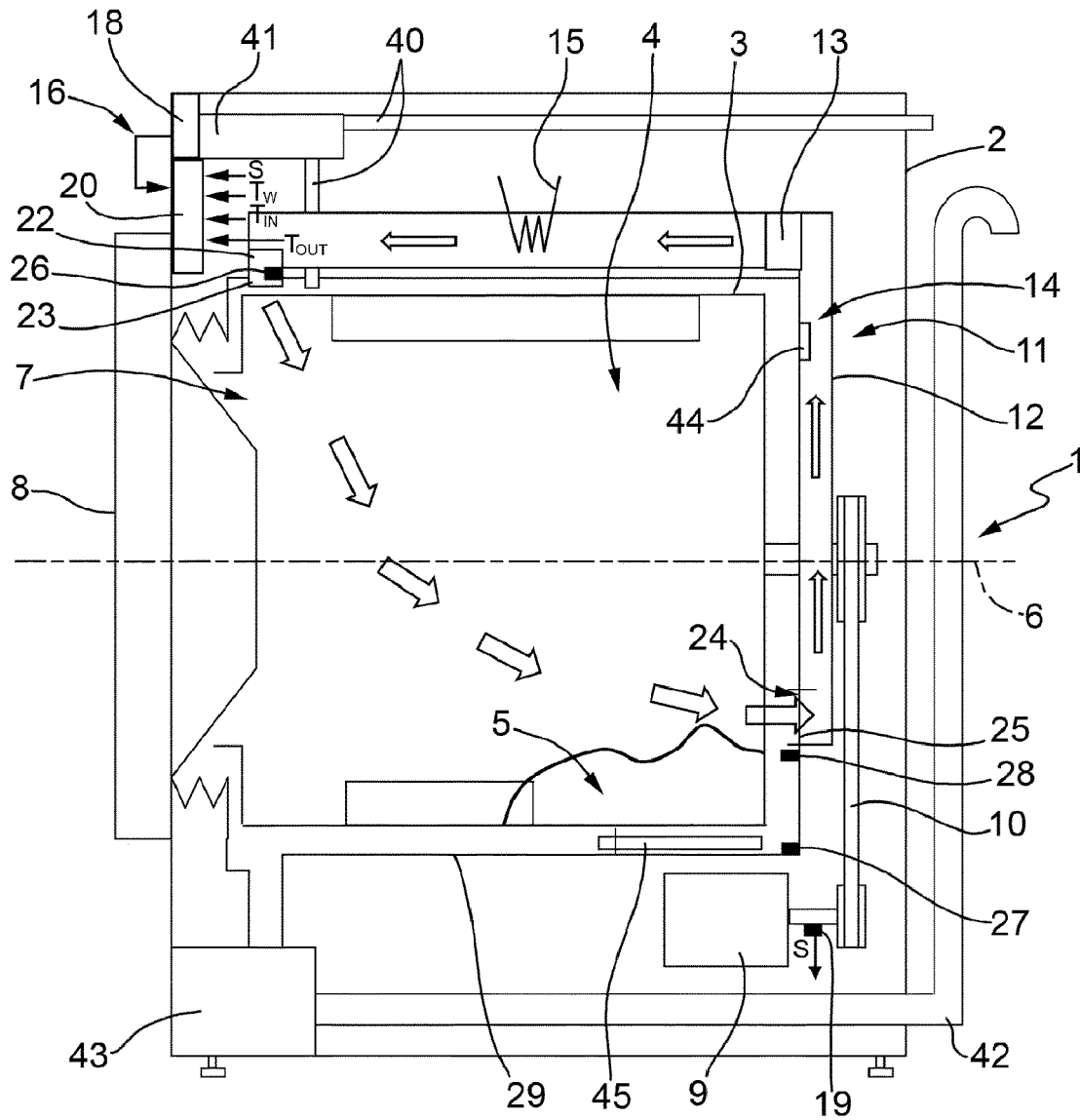


FIG.1

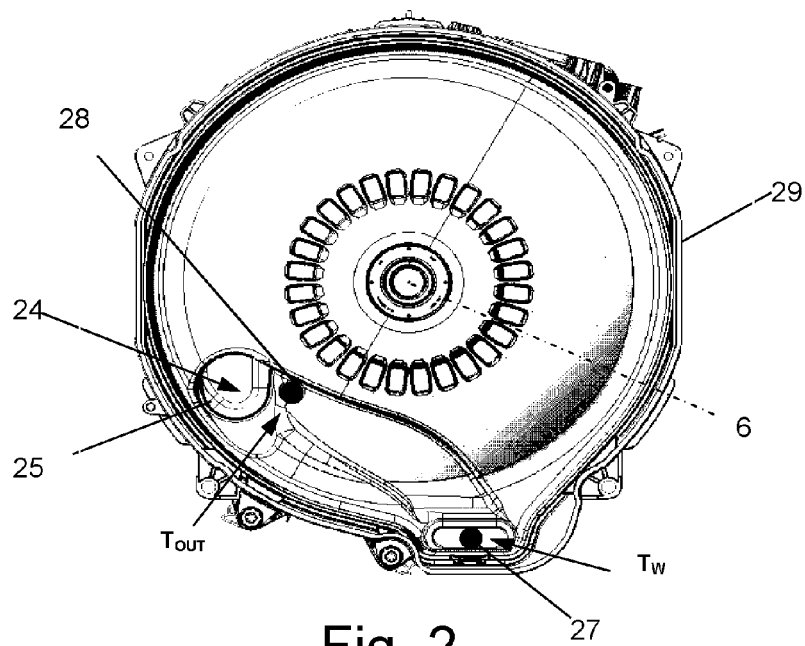


Fig. 2

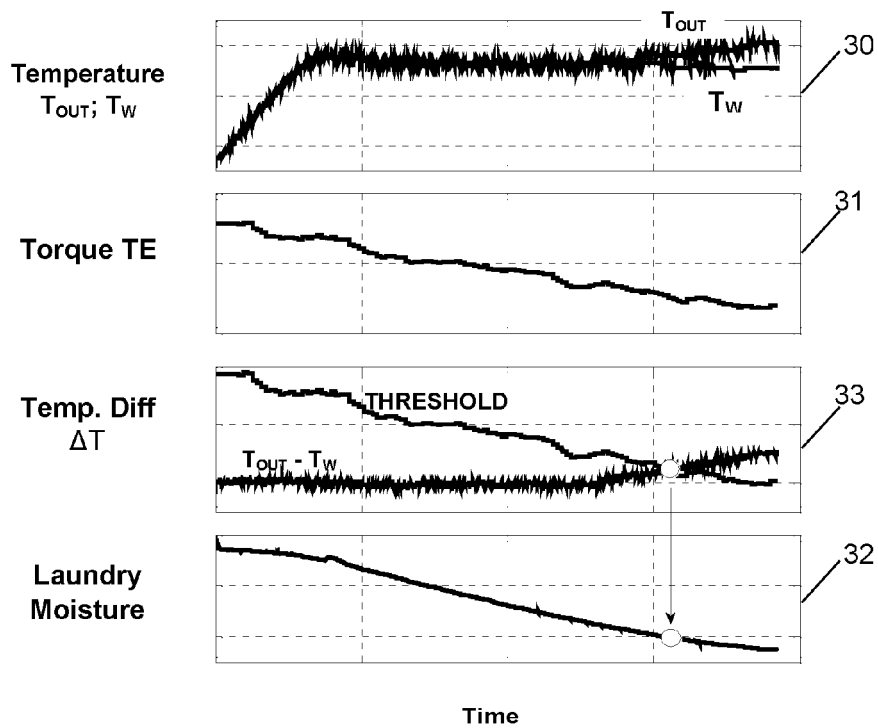


Fig. 3

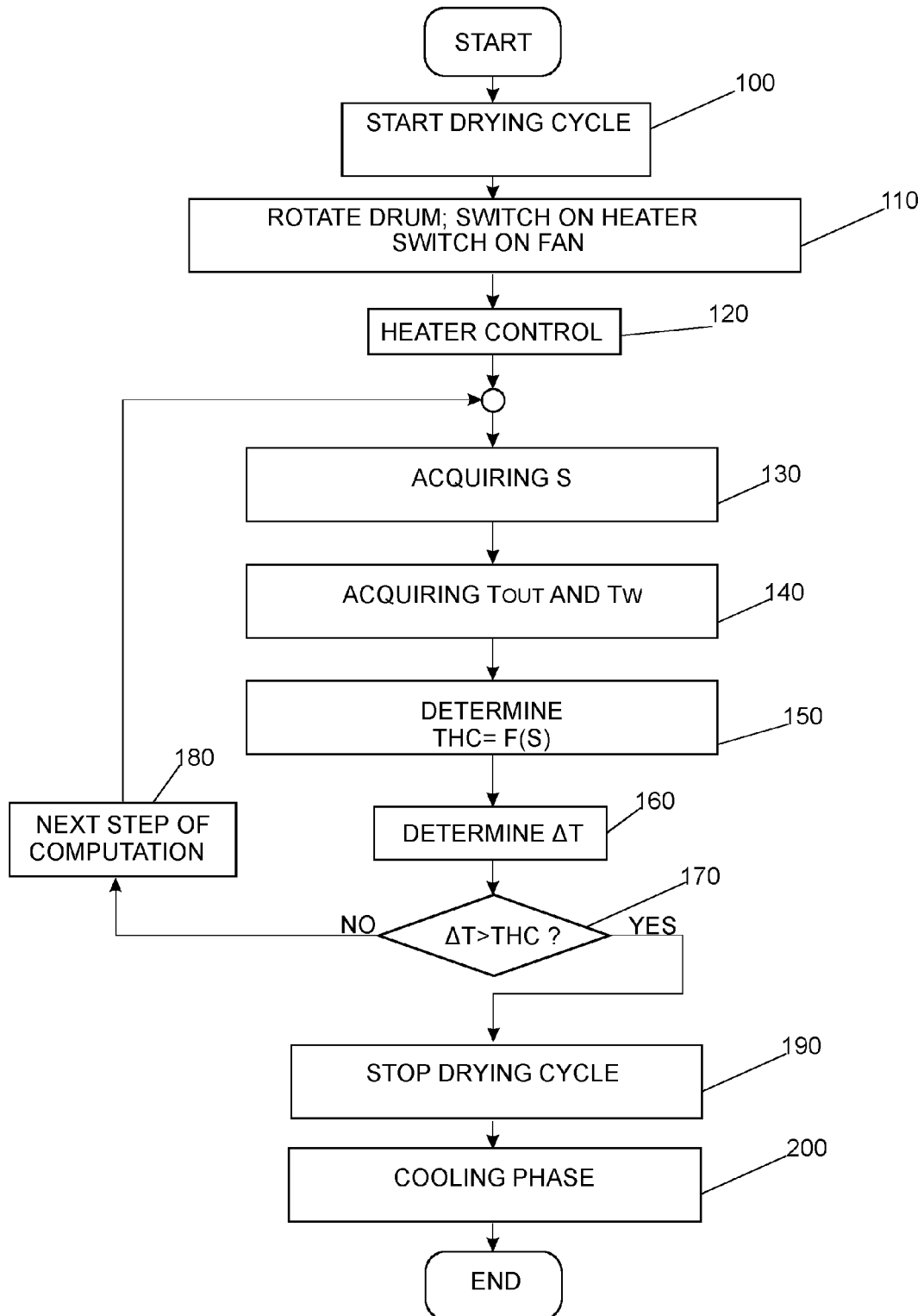


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 11 19 5787

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2011/045915 A1 (PANASONIC CORP [JP]; NAKAMOTO SHIGEHARU; OZEKI YUJI; NAKAI KOUJI; FUJI) 21 April 2011 (2011-04-21) * the whole document * & US 2012/167636 A1 (NAKAMOTO SHIGEHARU [JP] ET AL) 5 July 2012 (2012-07-05) * paragraphs [0039] - [0042], [0061], [0080] - [0085]; figures 1,3 *	1,6,11	INV. D06F33/02 D06F58/28
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			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 September 2012	Examiner Kising, Axel
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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**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. The members are as contained in the European Patent Office EDP file on
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