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(54) Method of drying articles of washing in a drum washing drier

(57) The invention relates to a method of drying articles of washing in a drum washing drier, in which the articles of washing are circulated by rotary movements of the drum, the drum being driven in common with a process air blower in the same or alternating directions of rotation, and having heated process air flowing therethrough, the air output of the process air blower being increased in the forward direction of rotation and being reduced in the reverse direction of rotation, the drying procedure including three phases - start phase, main drying phase and final phase - and the temperature in the circuit of process air being detected, and the process air blower and a drum being permanently driven in the forward direction of rotation during the start phase. By means of appropriate selection of the forward direction of rotation or alternating directions of rotation in the phases of the drying procedure, reverse operation and thus the frequency of switching of the control contacts can be minimised, shortening the drying procedure.

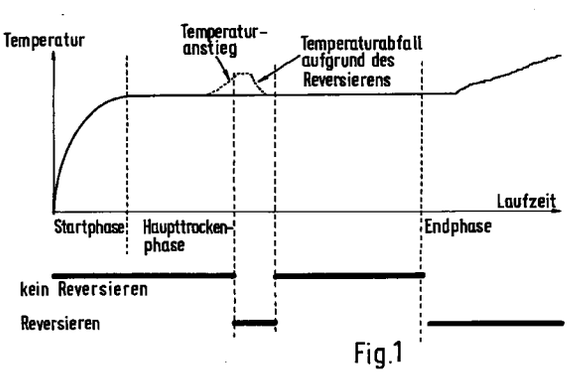

Fig.1

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Description

The invention relates to a method of drying articles of washing in a drum washing drier, in which the articles of washing are circulated by rotary movements of the drum, the drum being driven in common with a process air blower in the same or alternating directions of rotation, and having heated process air flowing therethrough, the air output of the process air blower being increased in the forward direction of rotation and being reduced in the reverse direction of rotation, the drying procedure including three phases - start phase, main drying phase and final phase - the temperature in the circuit of process air being detected, and the process air blower and a drum being permanently driven in the forward direction of rotation during the start phase.

A method of this type is known from EP 0 358 849 B1. In this known method the main drying phase begins only when a temperature approaching the predetermined drying temperature (e.g. 60°C) is reached, operation then being basically with alternating directions of rotation or, by means of selection by the person operating, it is determined whether operation is to be exclusively in the forward direction of rotation or with alternating directions of rotation.

As the main drying phase as a rule takes up the major proportion of the drying time, there results in the drying procedure a considerable period during which the machine operates with alternating directions of rotation. Long periods of reverse operation however involve an increase in the drying time and of the frequency of switching of the switch contacts, leading to a reduction in the life-expectancy of the drum washing drier.

The object of the invention is to provide a method of the type already mentioned in which the time spent in reverse operation during the drying procedure is reduced to a minimum and thus the drying time of the drying procedure is shortened, and the life-expectancy of the drum washing drier is increased.

This object is achieved according to the invention in that, during the main drying phase, operation is switched over for a period from the forward direction of rotation to alternating directions of rotation (reversing) only when a predetermined maximum temperature is reached, the period of time being predetermined or terminated when a predetermined minimum temperature is reached, and in that, in the final phase, operation is with alternating directions of rotation, or in that, when there is a condenser in the process air circuit, the temperature differential is measured at the condenser, in that, during the main drying phase, the drum and the process air blower are switched over for a period from the forward direction of rotation to alternating directions of rotation when a maximum temperature differential is reached, the alternating directions of rotation being terminated when a predetermined minimum temperature differential is reached, and in that, in the final phase, operation is optionally in the forward direction of rotation or with alternating directions of rotation.

In this method, operation during the main drying phase is substantially only in the forward direction. The predetermined maximum temperature or temperature differential is only reached if the drum is improperly loaded, which for example can be caused by overloading or the introduction of a plurality of large towelling articles. Proper loading according to DIN or IEC therefore leads as a rule to no reverse operation during the main drying phase, so that a frequency of switching of the control contacts occurs only in exceptional cases.

The times for the start phase, the main drying phase and the final phase, depending on the embodiment, can be constantly predetermined or also adjustable.

If the temperature in the process air circuit is measured, this is preferably effected after it has passed through the drum, in the air duct of the process air circuit.

The invention will now be explained in more detail with reference to embodiments given by way of example and illustrated in the drawings, which show:

Fig.1: a diagram of the drying procedure on the basis of a temperature measurement in the process air circuit, and

Fig.2: a diagram of the drying procedure on the basis of a temperature differential at the condenser of a process air circuit.

The diagram in Fig. 1 gives the temperature curve of a drying procedure in dependence on the running time of the drum washing drier, the extended curve showing the normal situation. As the operating state of drum and process air blower, given under the diagram, shows, no reversing takes place during the start and main drying phases, i.e. drum and process air blower are operated in the forward direction of rotation, i.e. the direction of rotation with the increased air output can increase the temperature during the main drying phase and reach or exceed a predetermined maximum value. Operation is then switched to reverse, in fact only for a predetermined period, as Fig.1 shows, or this period continues until, due to reverse operation, the temperature has dropped to a predetermined maximum value, or falls below it. For the remaining time in the main drying phase operation is switched back to the forward direction of rotation. In the final phase which, like the start phase, is considerably shorter than the main drying phase, operation is switched to reverse.

The diagram in Fig.2 shows the drying procedure in which the temperature differential is detected at the condenser of a process air circuit. During the main drying phase, monitoring is undertaken to see whether the temperature differential reaches or exceeds a predetermined maximum value. Then operation is switched to reverse, until the temperature differential has again dropped to a predetermined minimum value. Thereafter operation continues in the forward direction with high air output. In the final phase operation is optionally in the

forward direction of rotation or in reverse with alternating directions of rotation. In this respect reverse operation can proceed with a strictly predetermined switching cycle. The choice of operation in the final phase may be effected by the person operating or by measurement of a predetermined parameter which indicates the degree of drying.

Claims

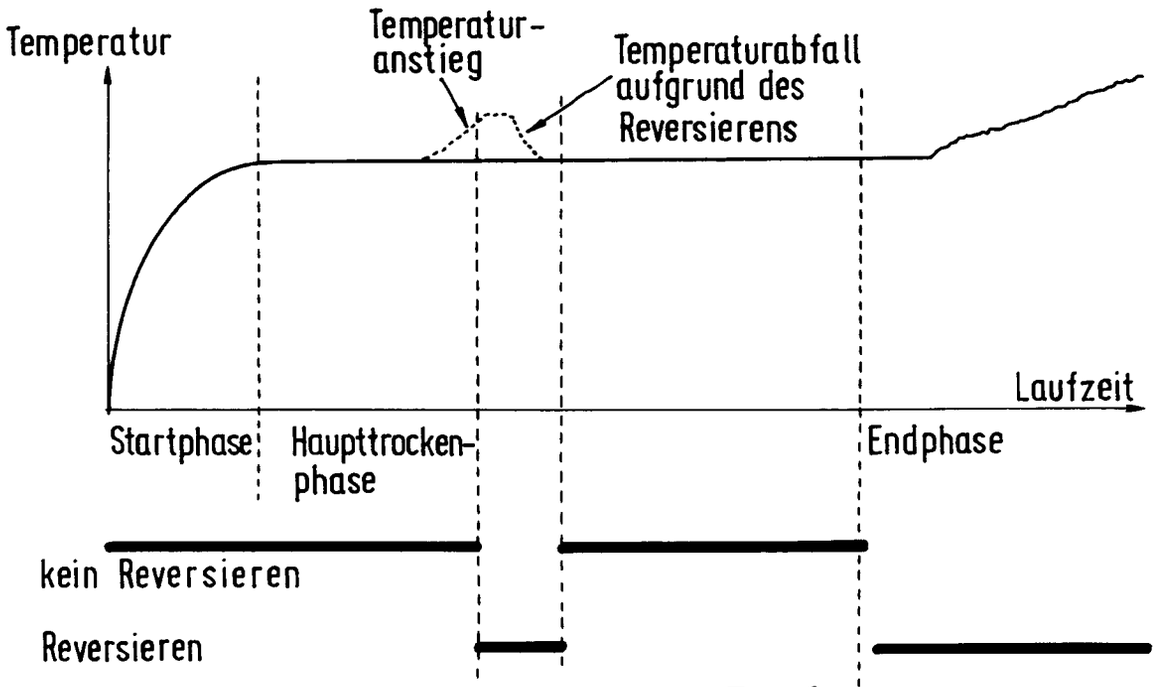
1. Method of drying articles of washing in a drum washing drier, in which the articles of washing are circulated by rotary movements of the drum, the drum being driven in common with a process air blower in the same or alternating directions of rotation, and having heated process air flowing therethrough, the air output of the process air blower being increased in the forward direction of rotation and being reduced in the reverse direction of rotation, the drying procedure including three phases - start phase, main drying phase and final phase - and the temperature in the circuit of process air being detected, and the process air blower and a drum being permanently driven in the forward direction of rotation during the start phase,
characterised in that,
during the main drying phase, operation is switched over for a period from the forward direction of rotation to alternating directions of rotation (reversing) only when a predetermined maximum temperature is reached, the period of time being predetermined or terminated when a predetermined minimum temperature is reached,
and in that, in the final phase, operation is with alternating directions of rotation.

2. Method according to claim 1,
characterised in that,
when there is a condenser in the process air circuit, the temperature differential is measured at the condenser,
in that , during the main drying phase, the drum and the process air blower are switched over for a period from the forward direction of rotation to alternating directions of rotation when a maximum temperature differential is reached, the alternating directions of rotation being terminated when a predetermined minimum temperature differential is reached, and in that, in the final phase, operation is optionally in the forward direction of rotation or with alternating directions of rotation.

3. Method according to claim 1 or 2,
characterised in that
the times for the start phase, the main drying phase and the final phase are constant and predetermined.

4. Method according to claim 1 or 2,
characterised in that
the times for the start phase, the main drying phase and the final phase are adjustable for the drying procedure.

5. Method according to one of claims 1, 3 or 4,
characterised in that
the temperature in the process air circuit is measured after the drum.


Temperatur
Temperatur-
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Temperaturabfall
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Reversierens
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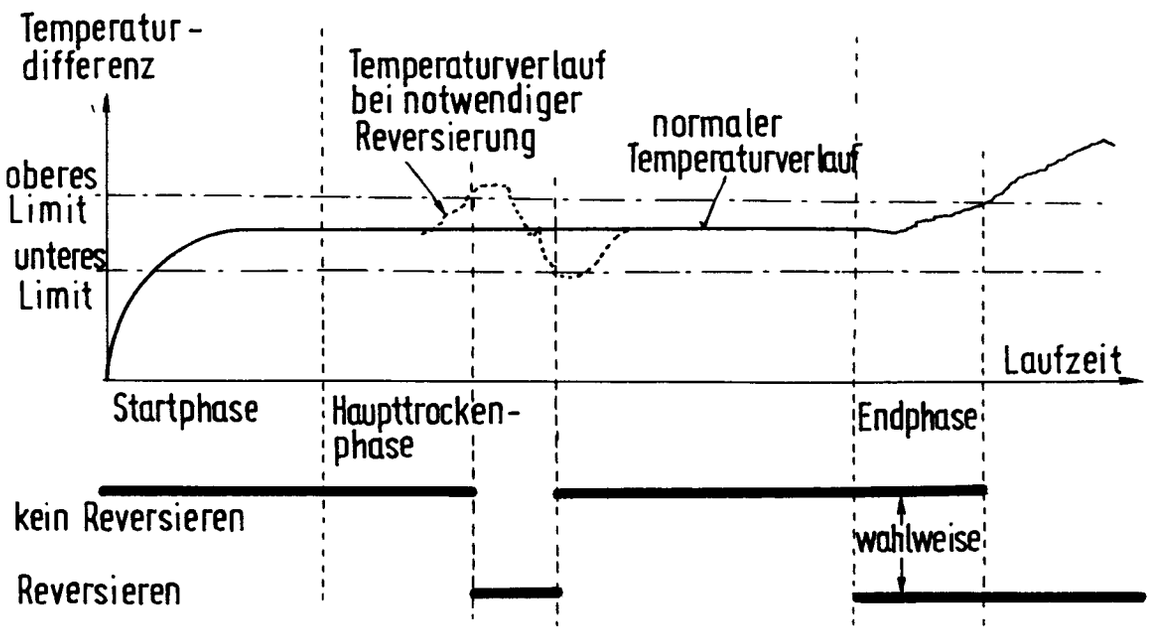
Fig.1


Temperatur-
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Haupttrocken-
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Endphase
kein Reversieren
wahlweise
Reversieren

Fig.2