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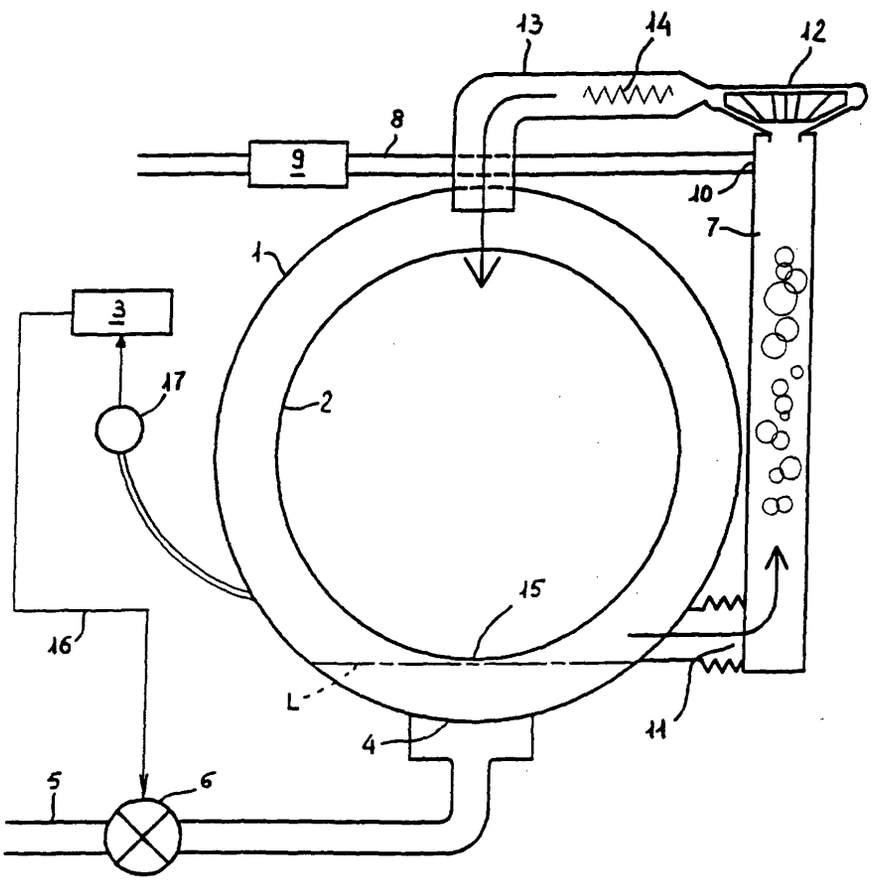
(54) Improved clothes drying machine

(57) The clothes drying machine has a condenser (7) cooled with water that collects in the washing vessel (1) together with condensation water. During drying, the drain pump (6) is normally de-energized and is only energized temporarily, in order to discharge the water that collects in the washing vessel (1), when this water reaches up to a threshold level (L) which is slightly lower than the base (15) of a rotating drum (2) containing the clothes to be dried.



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Description

[0001] The present invention refers to a clothes drying machine and, in particular to an automatic combined machine adapted to wash and/or dry the clothes.

[0002] Combined clothes washing and drying machines are largely known to generally comprise a vessel, or tub, adapted to contain, inside a rotating drum housed therein, the clothes that can be washed, rinsed, spin-extracted and/or dried there thanks to the provision of appropriate water carrying and handling circuits, as well as a drying circuit by means of which heated-up air that becomes progressively laden with the moisture subtracted from the clothes contained in the tub is caused to circulate through or in correspondence of condenser means for the condensation of said moisture.

[0003] In particular, during the clothes drying phase, the condenser is cooled by means of a moderate flow of water from the mains, which is then conveyed on to the bottom of the washing vessel together with the water resulting from the condensation of the moisture. At the same time, the water that so collects in the washing vessel is let out by the same drain pump that also is used to discharge the washing and the rinsing water at the end of the respective operation phases of the machine.

[0004] In order to let off such cooling and condensation water from the washing vessel of the machine in such a manner as to prevent it from undesirably wetting the clothes being dried, said drain pump is substantially caused to operate throughout the drying phase in a continuous manner and, therefore, under precarious priming conditions, since it is designed and rated on the basis of the relatively high flow rate it is required to handle for discharging the washing and rinsing water.

[0005] As a result, during the clothes drying phase, the drain pump tends to generate an undesirably high noise, uses electric energy and is practically subject to an anomalous state of operation which alters the reliability thereof.

[0006] It therefore is a purpose of the present invention to provide a clothes drying machine provided with a drain pump which is not only simple and reliable, but is also adapted to always operate under appropriate priming conditions, with a reduced energy usage under a reduced noise generation.

[0007] According to the present invention, this aim is reached in a clothes drying machine embodying the features as recited in the appended claims.

[0008] Anyway, characteristics and advantages of the present invention may be more readily understood from the description that is given below by way of non-limiting example with reference to the sole accompanying drawing, in which the related Figure is a schematical view of the main operating parts of the machine according to a preferred embodiment thereof.

[0009] With reference to the Figure, the machine is preferably a combined clothes washing a drying machine that mainly comprises, inside an outer casing (not shown), a washing vessel 1 that houses a clothes-holding drum 2 which is adapted to rotate at different revolving speeds to carry out, under the control of a programme sequence control unit 3, a sequence of operating phases in which the clothes are washed, rinsed, spin-extracted, dried, etc.

[0010] In a per sè known manner, the bottom 4 of the vessel 1 is connected to a drain 5 via a drain pump 5 adapted to let off, at the end of the respective phases, the washing and the rinsing water.

[0011] In order to perform its clothes drying duty, the machine is preferably provided with a condenser 7, through which there is conveyed, via a supply pipe 8 provided with electromagnetic valve 9, or the like, a flow of water taken in from the mains to condenser cooling purposes.

[0012] The condenser 7 is preferably of the type having an upper inlet 10 connected to the pipe 8, as well as a lower opening 11 connected to the lower portion of the vessel 1.

[0013] During the phase in which the machine dries the clothes contained in the drum 2, the condenser 7 is supplied in a substantially continuous manner with a moderate flow of water from the mains, which substantially cools down the same condenser and eventually flows out from the opening 11 so as to collect onto the bottom 4 of the vessel.

[0014] To the condenser 7 there is also associated a conduit 13 along which, during the clothes drying phase, a fan 12 causes a flow of air to be circulated, in which said air is first heated up by an electric heating element 14, or the like, and then flows into the vessel 1 to remove the moisture released by the clothes being dried. The hot moisture-laden air enters the condenser 7 through the opening 11 and there it bubbles through the cooling water.

[0015] The moisture has therefore a way to condense in the condenser 7 and, through the opening 11, collects then in a liquid form onto the bottom 4 of the vessel together with the cooling water in view of being let off by means of the drain pump 6.

[0016] According to a feature of the present invention, the programme sequence control unit 3 of the machine is set in such a manner as to ensure that, during the clothes drying phase, the drain pump 6 is normally de-energized, while the same pump is then energized temporarily, so as to substantially let off the water collecting onto the bottom 4 of the vessel 1, only when said water reaches up to a threshold level L that is slightly lower than the base 15 of the rotating drum 2.

[0017] In a most simple embodiment, such a temporary operation of the drain pump 6 may be time-controlled through a control output 16 of the programme sequence control unit 3, on the basis of statistical, experimentally found data.

[0018] In a preferred manner, however, the level of the water in the vessel 1 is detected by a sensor 17, which may for instance comprise an analogue pressure

switch, or the like, and in a per sè known manner is capable of driving the programme sequence control unit 3 with a signal that is representative of said water level. In this case, therefore, the programme sequence control unit 3 triggers, ie. energizes in a most accurate manner the drain pump 6 when said sensor 17 detects the above cited water level L, while it then de-energizes the same pump as soon as the level of the water in the vessel decreases to a pre-established minimum (practically nil) value.

[0019] In any case, during the clothes drying phase, the drain pump 6 will be operated repeatedly, whenever the water in the vessel reaches up to said level L, ie. only slightly in advance of its being able to undesirably wet the clothes being dried inside the rotating drum 2, for short intervals of time as required to just let off the same water. As a result, during said intervals of time, the drain pump 6 is able to operate under adequate priming conditions that are effective in improving the performance and the efficiency thereof, reduce the noise generated thereby, and conclusively boost the durability thereof.

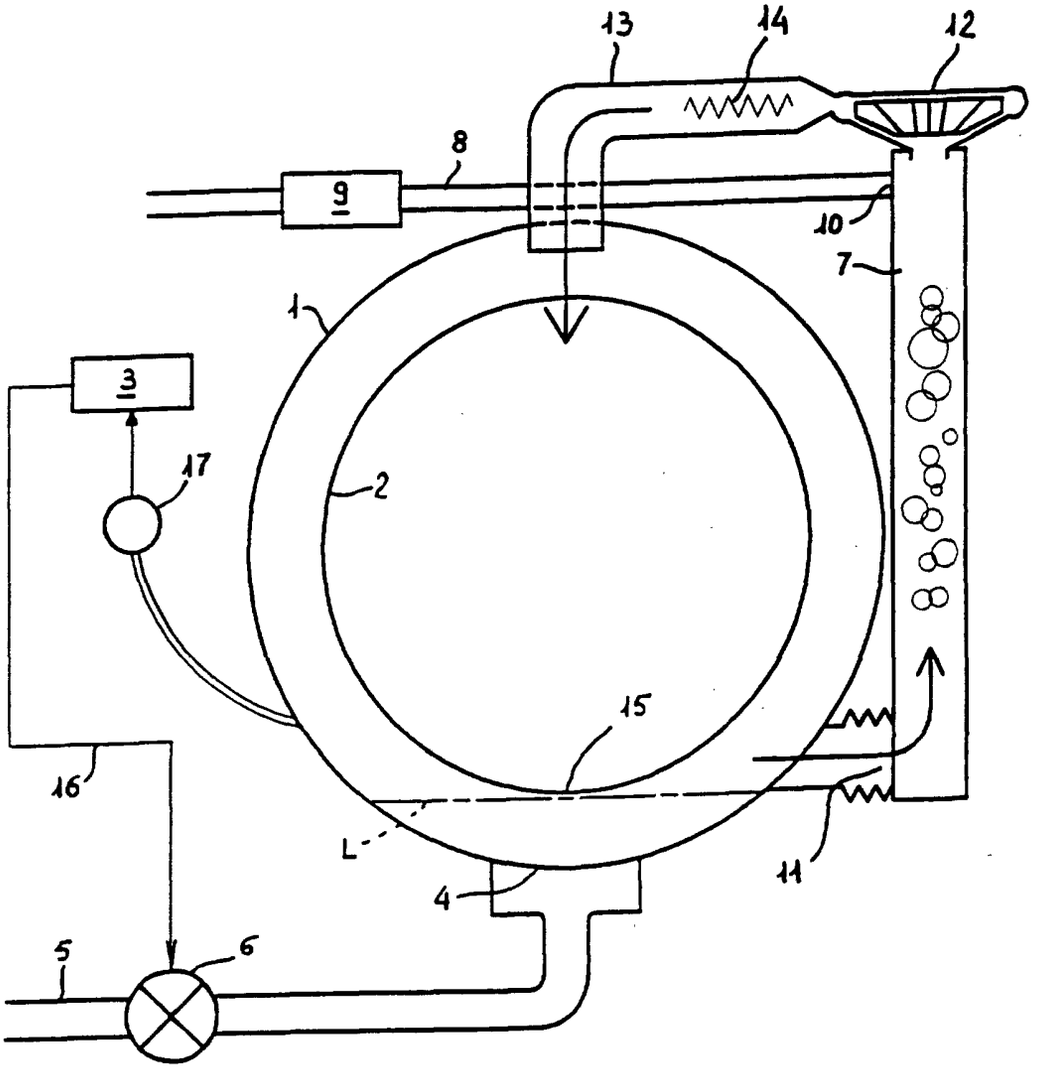
[0020] It can be furthermore most readily appreciated that, during the clothes drying phase, the noise generated by the drain pump 6 is not only reduced in its intensity, but also in its duration, since the same pump only operates for short intervals of time, as mentioned above, which also means a corresponding reduction in energy usage.

Claims

1. Clothes drying machine comprising a condenser (7) for the moisture removed from the clothes contained in a rotating drum (2) housed in a washing vessel (1) of the machine, in which the condenser is supplied, during a clothes drying phase, with cooling water that collects onto the bottom (4) of said vessel (1), together with the water resulting from the condensation of said moisture, to be then let off by means of a drain pump (6), **characterized in that,** during said clothes drying phase, the drain pump (6) is normally de-energized and is only energized temporarily, in order to substantially discharge the water that collects on the bottom (4) of the vessel (1), when this water reaches up to a threshold level (L) which is slightly lower than the base (15) of said rotating drum (2).

2. Clothes drying machine according to claim 1, **characterized in that** said temporary operation of the drain pump (6) is controlled in a timed manner by a programme sequence control unit (3) of the machine, on the basis of experimentally found statistical data.

3. Clothes drying machine according to claim 1, **characterized in that** during the clothes drying phase said drain pump (6) is operated under the control of sensor means (17) adapted to detect the level of the water collecting on the bottom (4) of the vessel (1).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