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(54) **A method for operating a washing machine or washer-dryer and a corresponding washing machine or washer-dryer**

(57) The present invention relates to a method for operating a washing machine or washer-dryer (1), wherein said washing machine or washer-dryer (1) comprises a washing tub (2), a laundry drum (3) within said washing tub (2) and a circulation pump (14) for pumping up water from a bottom region of said washing tub (2) into a higher region of said washing tub (2). The method comprises the step of detecting, determining and/or inputting the amount of laundry (4) in the laundry drum (3). The circulation pump (14) is deactivated, if the amount of the laundry (4) in the laundry drum (3) exceeds a predetermined threshold value. Further, the present invention relates to a corresponding washing machine or washer-dryer (1), further comprising a control device (7) for controlling said circulation pump (14), and means for detecting, determining and/or inputting the amount of laundry (4) in the laundry drum (3). The circulation pump (14) is automatically switched off by the control device (7) if the amount of the laundry (4) in the laundry drum (3) exceeds a predetermined threshold value.

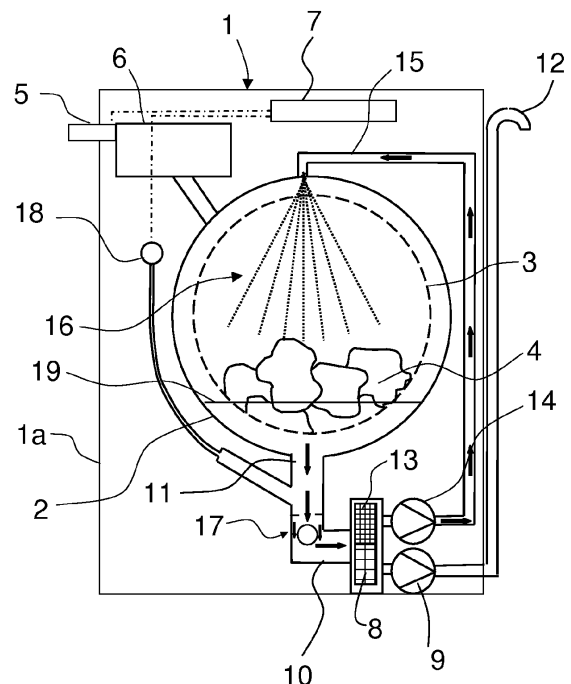


Fig. 1

Description

[0001] The present invention relates to a method for operating a washing machine or washer-dryer and to a washing machine or washer-dryer for performing this method.

[0002] The operation of a washing machine or a washer-dryer causes a lot of noise. The noise in a conventional washing machine and washer-dryer is generated by several components of said washing machine or washer-dryer. It is desired that the noise generated by the washing machine or washer-dryer is reduced.

[0003] It is an object of the present invention to provide a method for operating a washing machine or a washer-dryer and a corresponding washing machine or washer-dryer wherein the noise generated by the washing machine or washer-dryer is reduced.

[0004] The object of the present invention is achieved by a method for operating a washing machine or a washer-dryer according to claim 1.

[0005] According to the present invention the circulation pump is deactivated if the amount (i.e. weight, quantity) of the laundry in the laundry drum exceeds a predetermined threshold value.

[0006] The core of the present invention is the deactivation of the recirculation pump if the amount of the loaded laundry exceeds a predetermined threshold value, wherein the recirculation pump is deactivated even if the actual washing cycle would activate said recirculation pump. In other words the fact that the amount of the loaded laundry exceeds a predetermined threshold value takes priority over all other relevant process parameters. Further, the excess of the amount of the laundry takes priority over all selections of the user. The recirculation pump is very noisy, so that its deactivation reduces the noise of the washing machine or washer-dryer.

[0007] It has been found that the effect of the water circulation is not very important for the washing performance if the amount of laundry exceeds a predetermined threshold value. If the amount of laundry within the rotatable laundry drum is large, then the internal space of the laundry drum is almost completely filled by said laundry. In this condition the spraying of the water jets of the recirculated water into the filled laundry drum is not very effective in wetting the laundry.

[0008] In an advantageous embodiment the amount (i.e. the weight, the quantity) of the laundry loaded in the laundry drum may be determined by an input into a user interface by a user. In this case, the amount of the laundry can be input directly or as one or more parameters related to said amount.

[0009] According to a further embodiment, the amount of the laundry in the laundry drum may be detected by a weight sensor of the washing machine or washer-dryer.

[0010] According to another embodiment the amount of the laundry in the laundry drum may be determined by calculating said amount as a function of at least one detected parameter related to a motor driving the laundry

drum. In this case, the detected parameter may be, for example, the current absorbed by the motor, the torque of the motor and/or the speed of the motor.

[0011] Moreover, the amount of the laundry in the laundry drum may be advantageously determined by calculating said amount as a function of at least one detected parameter related to the water absorbed by the laundry. In this case, the detected parameter may be the amount of water absorbed by the laundry during a wetting phase at the beginning of a washing cycle.

[0012] The object of the present invention is further achieved by a washing machine or a washer-dryer according to claim 10.

[0013] According to the present invention the circulation pump is automatically switched off if the amount of the laundry in the laundry drum exceeds a predetermined threshold value.

[0014] For example, the washing machine or washer-dryer may comprise a user interface by which a user may input the amount (i.e. the weight, the quantity) of the laundry loaded in the laundry drum or at least one parameter related to the amount of the laundry loaded in the laundry drum.

[0015] According to a further example, the washing machine or washer-dryer may comprise at least one weight sensor for detecting the amount of the laundry in the laundry drum. According to another example, the washing machine or washer-dryer may comprise at least one control device for calculating the amount of the laundry in the laundry drum as a function of at least one detected parameter related to a motor driving the laundry drum. In this case, the at least one detected parameter may be for example the current absorbed by the motor, the torque of the motor and/or the speed of the motor.

[0016] According to another example the washing machine or washer-dryer may comprise at least one control device for calculating the amount of the laundry in the laundry drum as a function of at least one detected parameter related to water absorbed by the laundry.

[0017] The invention will be described in further detail with reference to the drawings, in which

FIG 1 illustrates a schematic frontal cross section of a washing machine or washer-drier according to a preferred embodiment of the present invention with a low amount of laundry loaded in the washing tub, and

FIG 2 illustrates a schematic frontal cross section of the washing machine or washer-drier of FIG 1 with an amount of laundry loaded in the washing tub exceeding a prefixed threshold value.

[0018] FIG 1 illustrates a schematic frontal cross section of a washing machine or washer-drier 1 according to a preferred embodiment of the present invention.

[0019] The washing machine 1 comprises a washing tub 2 having substantially the form of a cylinder, prefer-

ably horizontal, which is arranged internally of the casing 1a of the washing machine or washer-drier 1. A laundry drum 3 is arranged within the washing tub 2. The laundry drum 3 is preferably marginally smaller than the washing tub 2. In the example of FIG 1 the laundry drum 3 is loaded with a small amount of laundry 4, which doesn't exceed a prefixed threshold value. In the condition illustrated in FIG 1 the water in the laundry drum 3 is at a low level 19, so that only a small part of the laundry is immersed in the water.

[0020] A sump is advantageously arranged below the washing tub 2. The sump is preferably subdivided into a lower sump 10 and an upper sump 11. Between the upper sump 11 and the lower sump 10 a one-way valve 17 is preferably arranged. The lower sump 10 is preferably connected to a first drain filter 8 (adapted for filtering foreign object like coins, buttons, etc) and optionally to a second drain filter 13 (adapted for filtering foreign object like coins, buttons, etc). The first drain filter 8 and the second drain filter 13 are advantageously arranged side by side, and/or they may be a single-piece construction (i.e. they are one single body).

[0021] The first drain filter 8 is advantageously connected to the inlet of a draining pump 9. An outlet of the draining pump 9 is advantageously connected to an outlet duct 12 of the washing machine or washer-drier 1.

[0022] The washing machine or washer-drier 1 advantageously comprises also a circulation pump 14, which functioning is preferably controlled by a control device 7 arranged for example in an upper portion of the washing machine or washer-drier 1.

[0023] Advantageously the inlet of the circulation pump 14 is connected to a bottom region of the tub 2; preferably, as in the embodiment illustrated in FIG 1, the inlet of the circulation pump 14 is connected to the bottom region of the washing tub 2 via the sump and the second drain filter 13. The outlet of the circulation pump 14 is connected to a conduit 15, which ends in a region of the washing tub 2 higher than the region to which the inlet of the circulation pump 14 is connected; preferably the outlet of the circulation pump 14 is connected to a top region or to a lateral side of the washing tub 2. The circulation pump 14 and the conduit 15 are adapted to generate water jets 16 in the washing tub 2 and laundry drum 3. In the condition illustrated in FIG 1 the circulation pump 14 is activated and the water jets 16 are shown.

[0024] Preferably, in particular if the washing machine or washer-drier 1 is a front loading washing machine, the outlet of the conduit 15 is positioned in a frontal and upper region of the tub 2, and is arranged in such a way to spray the water jets 16 into the drum 3 from the frontal access opening of the latter.

[0025] In a further embodiment, not illustrated, there is only a single pump, functioning both as circulation pump 14 and as draining pump, which inlet is connected to the tub 2 or to the sump (preferably via a suitable filter adapted for filtering foreign object like coins, buttons, etc), and which outlet is connected for example to a three-

way valve, not illustrated, which other two ways are connected respectively to the outlet duct 12 and to the conduit 15. Advantageously a pressure sensor 18 is arranged besides the washing tube 2. The pressure sensor 18 is preferably connected, e.g. via a tube, to the upper sump 11. The pressure sensor 18 is preferably electrically connected to the control device 7.

[0026] A detergent container 6 is arranged preferably above the washing tub 2. The detergent container 6 is connectable to an external source of water preferably via a suitable pipe 5, preferably provided with an electrovalve commanded by the control device 7.

[0027] FIG 2 illustrates a schematic front view of the washing machine or washer-drier 1 of FIG 1 in a condition in which a great amount of laundry 4 has been loaded in the drum, and therefore the amount of the loaded laundry exceeds a predetermined threshold value. In this condition the circulation pump 14, and therefore the water jets 16, are deactivated by the control device 7, since the amount of the loaded laundry exceeds the predetermined threshold value.

[0028] Advantageously the washing machine or washer-drier according to the present invention allows the detection and/or determination of the amount of the laundry 4 loaded within the laundry drum 3. The amount of the laundry 4 is detected and/or determined in order to control the circulation pump 14. If the amount of the laundry 4 exceeds a predetermined threshold value, then the circulation pump 14 is deactivated in order to reduce the noise of the washing machine or washer-drier 1. There are several methods for detecting and/or determining the amount of the laundry 4 described below.

[0029] For example, the amount of the laundry 4 may be input by a user via a user interface. In this case, said user interface is preferably connected to the control device 7.

[0030] Further, the washing machine or washer-drier 1 may comprise a weight sensor. The weight sensor is provided for detecting the amount of the laundry 4 within the laundry drum 3 and to communicate this value to the control device 7. Preferably, the amount of the laundry 4 is detected before or at the beginning of a washing cycle.

[0031] In a further embodiment the amount of the laundry 4 within the laundry drum 3 may be calculated, preferably by the control device 7, as a function of one or more parameters related to the motor driving the laundry drum 3; for example the current absorbed by the motor, the torque and/or the speed.

[0032] According to a further example, the amount of the laundry 4 loaded within the laundry drum 3 may be calculated, preferably by the control device 7, as a function of the water absorbed by the laundry 4 during the wetting phase at the beginning of a washing cycle.

[0033] When the amount of the laundry exceeds the predetermined value, then the circulation pump 14 is deactivated by the control device 7 and the noise of the washing machine or washer-drier 1 is therefore reduced, since the circulation pump 14 is a significant source of

sound.

[0034] The excess of the amount of the laundry 4 takes priority over all other relevant process parameters. In a similar way, the excess of the amount of the laundry 4 takes priority over all selections of the user. The recirculation pump 14 is very noisy, so that its deactivation reduces the noise of the washing machine or washer-drier 1.

[0035] It has in fact been found that the effect of the water circulation is not very important for the washing performance if the amount of laundry 4 exceeds the predetermined threshold value. If the amount of laundry 4 within the rotatable laundry drum 3 is large, then the internal space of the laundry drum 3 is almost completely filled by said laundry 4. In this condition the spraying of the water jets 16 of the re-circulated water into the filled laundry drum 3 is not very effective in wetting the laundry 4.

[0036] Advantageously, in addition or as an alternative to the deactivation of the recirculation pump 14, other functions of the washing machine or washer-drier may be modified if the amount of the laundry 4 in the laundry drum 3 exceeds a predetermined threshold value. For example the rotation speed of the drum may be reduced, and/or the duty ratio (i.e. the ratio between the time in which the drum 3 rotates and the time in which the drum 3 is still) of the drum 3 may be modified. Also these modifications have the result of reducing the noise produced by the use of the washing machine.

[0037] Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to those precise embodiments, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0038]

- 1 washing machine
- 1a casing
- 2 washing tub
- 3 laundry drum
- 4 laundry
- 5 pipe
- 6 detergent container

- 7 control device
- 8 first drain filter
- 5 9 discharge pump
- 10 lower sump
- 11 upper sump
- 10 12 outlet
- 13 second drain filter
- 15 14 circulation pump
- 15 conduit
- 16 water jets
- 20 17 one-way valve
- 18 pressure sensor
- 25 19 lower water level

Claims

- 30 1. A method for operating a washing machine or washer-drier (1), wherein said washing machine or washer-drier (1) comprises a washing tub (2), a laundry drum (3) within said washing tub (2) and a circulation pump (14) for pumping up water from a bottom region of said washing tub (2) to a higher region of said washing tub (2), and wherein the method comprises the step of detecting, determining and/or inputting the amount of laundry (4) in the laundry drum (3),
35 **characterized in that**
40 the circulation pump (14) is deactivated if the amount of the laundry (4) in the laundry drum (3) exceeds a predetermined threshold value.
- 45 2. The method according to claim 1, wherein the amount of laundry (4) in the laundry drum (3) is determined by an input into a user interface by a user.
- 50 3. The method according to claim 1 or 2, wherein the amount of the laundry (4) in the laundry drum (3) is detected by a weight sensor of the washing machine or washer-dryer (1).
- 55 4. The method according to any one of the preceding claims, wherein the amount of the laundry (4) in the laundry drum (3) is determined by calculating said amount as a function of at least one detected parameter related to a motor driving the laundry drum (3).

5. The method according to claim 4, wherein the detected parameter is the current absorbed by the motor.
6. The method according to claim 4 or 5, wherein the detected parameter is the torque of the motor.
7. The method according to any one of the claims 4 to 6, wherein the detected parameter is the speed of the motor.
8. The method according to any one of the preceding claims, wherein the amount of the laundry (4) in the laundry drum (3) is determined by calculating said amount as a function of at least one detected parameter related to water absorbed by the laundry (4).
9. The method according to claim 8, wherein the detected parameter is the amount of water absorbed by the laundry (4) during a wetting phase at the beginning of a washing cycle.
10. A washing machine or washer-drier (1) comprising a washing tub (2), a laundry drum (3) within said washing tub (2), a circulation pump (14), controlled by a control device (7), for pumping up water from a bottom region of said washing tub (2) into a higher region of said washing tub (2), and means for detecting, determining and/or inputting the amount of laundry (4) in the laundry drum (3),
characterized in that
the circulation pump (14) is automatically switched off by said control device (7) if the amount of the laundry (4) in the laundry drum (3) exceeds a predetermined threshold value.
11. The washing machine or washer-dryer according to claim 10, wherein the washing machine or washer-dryer (1) comprises a user interface for inputting the amount of the laundry (4) in the laundry drum (3) or at least one parameter related to the amount of the laundry (4) in the laundry drum (3) by a user.
12. The washing machine or washer-dryer according to claim 10 or 11, wherein the washing machine (1) or washer-dryer comprises at least one weight sensor for detecting the amount of the laundry (4) in the laundry drum (3).
13. The washing machine or washer-dryer according to any one of the claims 10 to 12, wherein said control device (7) is adapted for calculating the amount of the laundry (4) in the laundry drum (3) as a function of at least one detected parameter related to a motor driving the laundry drum (3).
14. The washing machine or washer-dryer according to claim 13, wherein the at least one detected parameter is the current absorbed by the motor, the torque of the motor and/or the speed of the motor.
15. The washing machine or washer-dryer according to any one of the claims 10 to 14, wherein said control device (7) is adapted for calculating the amount of the laundry (4) in the laundry drum (3) as a function of at least one detected parameter related to water absorbed by the laundry (4).

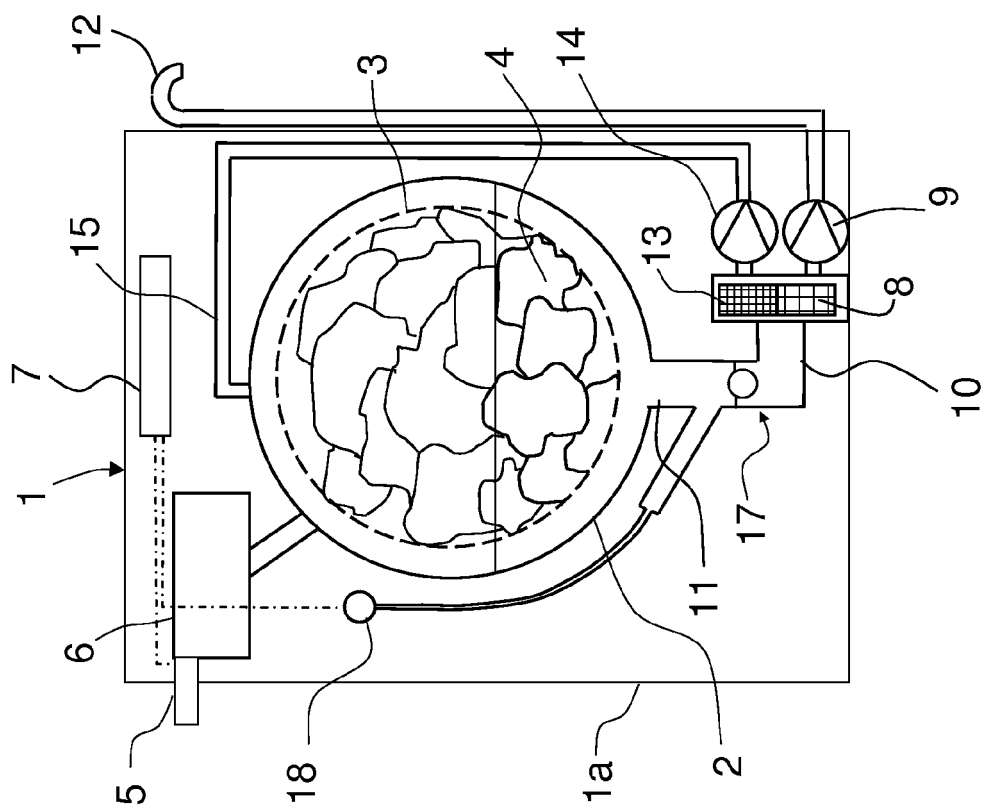


Fig. 2

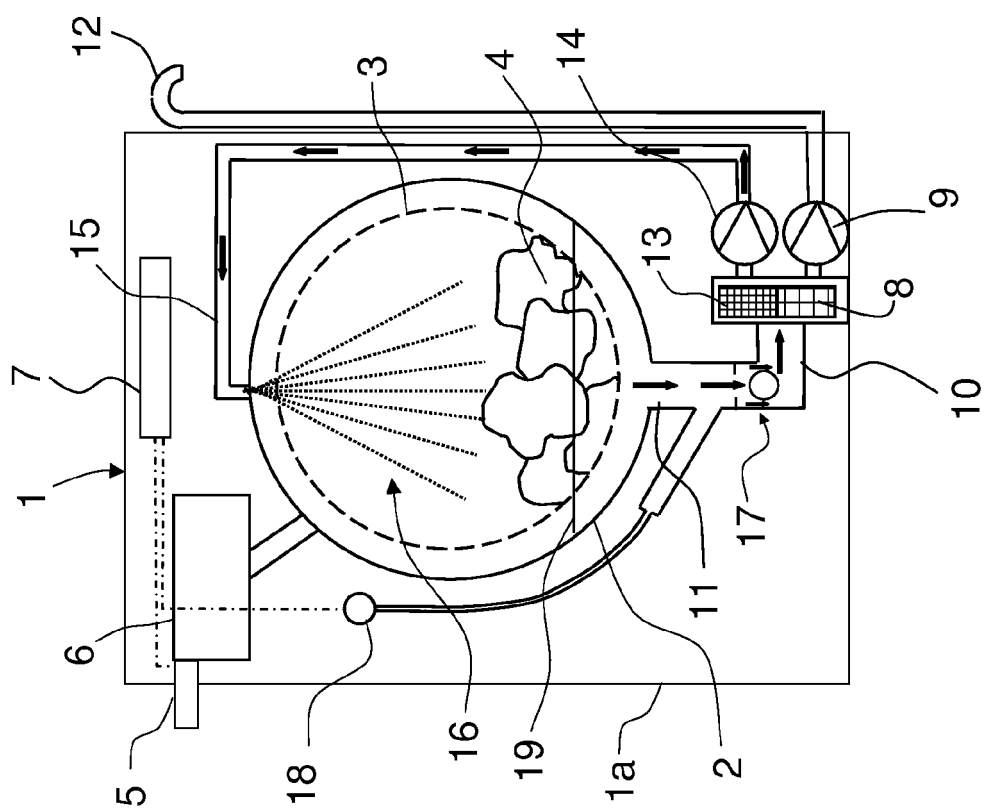


Fig. 1



EUROPEAN SEARCH REPORT

Application Number
EP 11 15 2303

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP 2009 291471 A (TOSHIBA CORP; TOSHIBA CONSUMER ELECT HOLDING; TOSHIBA HOME APPLIANCES) 17 December 2009 (2009-12-17) * abstract; claims 1,2; figures 5,6 * * paragraphs [0009], [0017] * * paragraphs [0046] - [0047] * -----	1-15	INV. D06F33/02 D06F39/00 D06F39/08
A	WO 2006/071022 A1 (LG ELECTRONICS INC [KR]; LYU JAE CHEOL [KR]) 6 July 2006 (2006-07-06) * paragraphs [0019] - [0020] * * paragraphs [0049] - [0053] * * paragraphs [0064] - [0081] * * figures 3-5 * -----	1-15	
			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 21 July 2011	Examiner Weinberg, Ekkehard
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
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 15 2303

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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21-07-2011

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