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(54) **Clothes washing device with drying procedure and method of controlling the same**

(57) A clothes washing device 1 with a drying procedure and a method of controlling the same are provided. The clothes washing device 1 includes a water tub 2, a drum 3 rotatably disposed in the water tub 2 to receive clothes of a user, a heating member 4 for heating air to perform drying operation on the clothes, and a blower for driving air circulation. The clothes washing device 1 is

provided with a washing procedure for performing washing operation on the clothes placed in the drum 3 by the user, and further provided with a cleaning procedure for performing cleaning operation by intermittently driving the blower 6. Through the cleaning procedure, the lint generated during the washing procedure and drying procedure can be washed away, thus ensuring a washing effect and drying effect of the device.



Description

[0001] The present invention relates to a clothes washing device and a method of controlling the same, and more particularly to a clothes washing device with a drying procedure and a method of controlling the same.

[0002] With the change of pace of work and the improvement of life quality, it becomes more and more common to use a single clothes dryer or a washing and drying machine integrated with a washing function (also known as a washer/dryer combo). Especially in cities or regions with a cold and wet weather, a clothes washing device with a clothes drying function is more popular.

[0003] A drum washing machine, as a common clothes washing device, is becoming more and more popular in East Asian countries subsequent to its long-standing common use in Europe due to its advantages such as lower damage to clothes and minimal use of water. Generally, an ordinary drum washing machine includes a water tub and a drum which is rotatable and disposed inside the water tub. When clothes are washed, a user puts the clothes to be washed in the drum, and the drum is driven by a motor to rotate and perform procedures such as washing, rinsing, and spinning in sequence to clean the clothes. A drum washing and drying machine generally adds a clothes drying function on the basis of a drum washing machine to dry clothes after spinning, so as to implement a washing and drying process.

[0004] Taking a common drum washing and drying machine as an example, the drying function thereof is implemented in the following way as shown in FIG. 1. The drum washing and drying machine includes a water tub 2, and a drum 3 which is disposed inside the water tub 2 and rotatable. A heating member 4 is set on the top of the water tub 2. The heating member 4 includes a heating unit 8 and a drying duct 9. An outlet 10 of the drying duct 9 is connected to the interior of the water tub 2 and the drum 3 disposed inside the water tub 2. Air is heated by the heating unit 8 to become dry hot air, which is transported into the drum 3 through the drying duct 9. The dry hot air exchanges heat with washed clothes inside the drum 3 to take moisture in the washed clothes away to form relative humid air. A condensation member 5 is set at a proper position on one side of the water tub 2. The condensation member 5 includes a condensation pipe 11 and a condensation unit 12. An inlet 13 of the condensation pipe 11 is connected to the water tub 2, and an outlet 14 thereof is connected to an inlet 15 of the drying duct 9. The drying duct 9, water tub 2, drum 3, and condensation pipe 11 form a circulation loop for an air flow. In order to promote the air flow, generally a blower 6 is set between the condensation unit 12 and the heating unit 8. The blower 6 is normally formed of a fan 16 and a motor 17 which drives the running of the fan 16. Under the action of the fan 16, the humid air formed after heat exchange with the washed clothes enters the condensation pipe 11 through the inlet 13 of the condensation pipe 11. After the condensation effect of the condensation unit

12, moisture in the humid air is condensed, while the air enters the drying duct 9 of the heating member 4 again, is heated by the heating unit 8 again, and is transported into the drum 3 for the next circulation. After several circulations, moisture in the washed clothes is gradually extracted, so as to implement the clothes drying function. However, such a drum washing and drying machine has a problem that in either the washing or the drying process, and especially in the drying process, small things such as threads and lint (hereinafter referred to as lint) inevitably fall off from the washed clothes. With the flowing of the air, the lint is attached to the inlet 13 of the condensation pipe 11, or at the surface of the condensation unit 12, or even some lint may enter the fan 16 of the blower 6 through the condensation pipe 11, or enter the heating member 4. After long time accumulation of lint, the condensation effect of the condensation unit 12 and the work efficiency of other parts such as the fan 16 are surely affected, thus seriously decreasing the drying efficiency of the washing and drying machine.

[0005] In order to avoid such lint attachment, in some drum washing and drying machines, a water flow in a washing procedure is used to wash away the attached lint to prevent the lint from affecting the air circulation. As an exemplified solution Japanese Patent Application No. H11-333185 (see pp 3-5 and FIG. 1 of the specification) discloses a drum washing and drying machine in which a rotating shaft of a drum in a water tub is in an approximately horizontal direction. The air circulation channel in a drying procedure thereof is as follows: The air inside the water tub is exhausted through an air exhaust opening below the water tub, subsequently enters a pipe set with a fan and a heater, and then enters the water tub via an opening disposed on a front side of the drum. When lint accumulated at an air hose connected to the air exhaust opening is present upon executing a washing procedure wherein the water level is higher than the air exhaust opening as a large amount of water is fed in the washing procedure, a part of the water flows into the air hose, and the water flow generated with the rotation of the drum washes away the lint attached to the air exhaust opening and the air hose. In addition, air pressure generated by operating the fan leads to fluctuations of the water level, thus increasing water scattering, so that the water can be scattered into a moisture removal unit connected to the drain hose, thereby washing away the lint attached to the moisture removal unit. However, in that method, the moisture removal unit is only cleaned by the scattering of the water, and the effect thereof is not very satisfactory.

[0006] In view of the problems above, the present invention is directed to an improved clothes washing device with a drying procedure, so as to effectively avoid accumulation of lint generated during a washing procedure or a drying procedure in the device, thus ensuring a washing effect and a drying effect of the clothes.

[0007] In order to achieve the purpose, the present invention is implemented as follows. The invention pro-

vides a clothes washing device with a drying procedure, which device includes a water tub, a drum rotatably disposed in the water tub to receive clothes of a user, a heating member for heating air to perform drying operation on the clothes, and a blower for driving air circulation. The clothes washing device is provided with a washing procedure for performing washing operation on the clothes placed in the drum by the user, and is further provided with a cleaning procedure for performing cleaning operation by intermittently driving the blower.

[0008] In one preferred embodiment of the present invention, the cleaning procedure is independent of the washing procedure.

[0009] In another preferred embodiment of the present invention, the cleaning procedure is integrated to the cleaning procedure.

[0010] In another preferred embodiment of the present invention, the clothes washing device further includes a spraying unit for supplying spraying water when performing the cleaning procedure.

[0011] In another preferred embodiment of the present invention, the clothes washing device further includes a condensation member for condensing moisture in air, in which the spraying water supplied by the spraying unit is sprayed on a surface of the condensation member from top to bottom.

[0012] The present invention is also directed to an improved control method of a clothes washing device with a drying procedure, through which lint generated in a washing procedure or a drying procedure may be effectively washed away, thus ensuring a washing effect and a drying effect of the clothes.

[0013] The above objectives are implemented as follows. The present invention provides a method of controlling a clothes washing device with a drying procedure, in which the clothes washing device includes a water tub, a drum rotatably disposed in the water tub to receive clothes of a user, a heating member for heating air to perform drying operation on the clothes, and a blower for driving air circulation, and the control method includes a step of performing a cleaning operation by intermittently driving the blower.

[0014] In one preferred embodiment of the present invention, the clothes washing device further includes a spraying unit, and the controlling method further includes activating the spraying unit to supply spraying water when performing the cleaning procedure.

[0015] Beneficial effects of the present invention include the following: The blower is intermittently driven, and a pressure difference between air pressures at both ends of the blower caused by the running of the blower make the liquid level inside the clothes washing device, especially the liquid level inside the condensation unit to rise and shake intermittently; and then, the spraying water provided by the spraying unit is sprayed on the surface of the condensation unit from top to bottom, thus cleaning the lint accumulated in pipes of the clothes washing device and especially on the surface of the condensation

unit more effectively, so as to adequately ensuring a washing effect and a drying effect of the clothes.

[0016] The present invention will become more fully understood from the detailed description of preferred embodiments given herein below. It is noted that these preferred embodiments are detailed for illustration only, and thus are not limitative of the present invention. In particular,

FIG. 1 is a structural schematic view of a conventional drum washing and drying machine; and Fig. 2 is a schematic view of a clothes washing device with a drying procedure according to a specific embodiment of the present invention.

[0017] As shown in FIG. 2, a clothes washing device 1 with a drying procedure according to a specific embodiment of the present invention includes a water tub 2, a drum 3 which is disposed inside the water tub 2 and rotatable, a heating member 4, and a blower 6. The heating member 4 is set on the top of the water tub 2 and includes a heating unit 8 and a drying duct 9. An opening 22 for putting in and taking out clothes by a user is set on one side of the water tub 2 and the drum 3 that faces the user. An outlet 10 of the drying duct 9 is connected to the interior of the water tub 2 and the drum 3 disposed inside the water tub 2 through the opening 22 or through another opening (not shown) above the opening 22. An air exhaust opening 18 is opened at a proper position on a lower part of one side of the water tub 2 and connected to a condensation member 5. The condensation member 5 includes a condensation pipe 11 and a condensation unit 12. An inlet 13 of the condensation pipe 11 is connected to the air exhaust opening 18. An outlet 14 of the condensation pipe 11 is connected to an inlet of the blower 6. The blower 6 includes a fan 16 and a motor 17 which drives the running of the fan 16. An outlet of the blower 6 is connected to an inlet of the drying duct 9. The drying duct 9, water tub 2, drum 3, and condensation pipe 11 form a circulation loop for an air flow.

[0018] Similar to a conventional drum washing and drying machine, the clothes washing device 1 with a drying procedure according to the specific embodiment of the present is provided with a washing procedure and a drying procedure.

[0019] When the washing procedure is performed, a user puts clothes to be washed in the drum 3 through the opening 22, and selects a corresponding washing procedure. The system turns on a water intake unit according to the user's selection to start feeding washing water in the drum 3 and the water tub 2. After a certain period of time, the system starts the washing procedure to perform washing operation on the clothes. Similar to a conventional washing procedure, the washing procedure of the clothes washing device with a drying procedure according to the specific embodiment is provided with many procedure combinations for the user's selection depending on demands such as washing of delicates, washing

of cotton clothes, and washing of silk clothes. Corresponding different washing procedures may, according to regular practice, include steps like prewash, soak, wash, rinse, and spin. A user may select a corresponding procedure according to a degree of dirtiness of the clothes and practical demands, and the clothes washing device will perform a washing operation on the clothes according to the procedure selected by the user.

[0020] Similarly, the drying procedure of the clothes washing device with a drying procedure according to the specific embodiment also includes many drying procedure combinations such as drying of delicates, drying of cotton clothes. When the drying procedure is performed, air is heated by the heating unit 8 to become dry hot air, and the dry hot air is transported into the drum 3 through the drying duct 9. The dry hot air exchanges heat with washed clothes inside the drum 3 to take moisture in the washed clothes away to become relatively humid air. Under the action of the fan 16, the humid air formed after heat exchange with the washed clothes enters the condensation pipe 11 through the inlet 13 of the condensation pipe 11. After the condensation effect of the condensation unit 12, moisture in the humid air are condensed, and the air enters the drying duct 9 of the heating member 4 again, is heated by the heating unit 8 again, and is transported into the drum 3. After several circulations, moisture in the washed clothes is gradually extracted, so as to implement the desired drying function of the washed clothes. The condensation device 12 may be a condensation unit by using cooling water, or a condensation unit by using cooling air, or a condensation unit by using other mediums. In a condensation unit by using the cooling water, usually a cooling water supply unit 19 is disposed between the condensation unit 12 and the fan 16. The cooling water supply unit 19 is connected to the water supply unit (not shown) of the device through a control valve 20. In the drying procedure, when the cooling water is needed, the system controls to open the control valve 20; and when cooling water is not needed, the system controls to close the control valve 20.

[0021] Differences between the clothes washing device with a drying procedure according to the present novel disclosure and a conventional drum washing machine include: The clothes washing device with a drying procedure according to specific embodiments of the present novelty further includes a cleaning procedure for cleaning the condensation pipe 11 and the condensation unit 12 by intermittently driving the blower. For example, when a rinsing procedure is performed, as a certain amount of water exists on the bottoms of the water tub 2, the condensation pipe 11, and the condensation unit 12, under the action of the blower, the liquid levels of the water on the bottoms of the condensation pipe 11 and the condensation unit 12 will rise. At the same time, the liquid levels will shake because the blower is driven intermittently, which further increases the impact force of the washing water on the condensation pipe 11 and the surface of the condensation unit 12, thus ensuring that

lint accumulated on the condensation pipe 11 and the condensation unit 12 in the drying procedure and/or the washing procedure can be washed away, so as to effectively avoid the lint accumulation on the condensation pipe 11 and the surface of the condensation unit 12 which affects the condensation effect, and at the same time, avoid the recontamination of clothes in the following washing or drying procedure due to the lint accumulation on the condensation pipe 11 and on the surface of the condensation unit 12, thereby ensuring the washing effect and the drying effect of the device.

[0022] In order to further ensure that lint accumulated on the condensation pipe 11 and the condensation unit 12 can be washed away, a spraying unit 7 is further disposed between the condensation unit 12 and the fan 16. One end of the spraying unit 7 is connected to the water supply unit of the washing device through a control valve 21, and the other end is disposed in the condensation pipe 11 between the condensation unit 12 and the fan 16. The flow rate of the spraying unit 7 is controlled by the control valve 21. Of course, the spraying unit 7 may also be replaced by the cooling water supply unit 19, that is, in the cleaning procedure, the control valve 20 may be controlled to control the opening and closing of the cooling water supply unit 19 as well as the flow rate of water intake, thus implement a function of washing away lint as that of the spraying unit 7. In this way, a water flow of the spraying water supplied by the spraying unit 7 is used to impact the surface of the condensation unit to wash away the lint accumulated on the surface of the condensation unit 12 into the condensation pipe 11; the water then mixes with washing water into the condensation pipe 11 by the intermittent movement of the blower, and is drained through a drainage unit.

[0023] Hereinafter, the control method of the clothes washing device with a drying procedure according to the specific embodiment of the present novelty will be described with reference to FIG. 2. The method includes a step of performing a washing procedure on clothes in the drum, and a step of performing a cleaning procedure by intermittently driving the blower. The cleaning procedure may be independent of the washing procedure, or be integrated to the washing procedure, that is, a user may select to separately perform a cleaning procedure, or a system may automatically perform the cleaning procedure at the same time when the user selects to perform the corresponding washing procedure, so as to clean the condensation pipe 11 and the condensation unit 12, thus ensuring that the lint accumulated on the condensation pipe 11 and the condensation unit 12 in the previous drying procedure or washing procedure are washed away, and effectively avoid the influences on the condensation effect of the condensation unit 12 and recontamination of the clothes caused by the lint. When the cleaning procedure is performed, the motor 17 is started to drive the fan 16 to move intermittently. Under the action of the fan 16, a pressure difference of air flow is formed between the two sides of the blower 6, so that the liquid levels at

the bottoms of the condensation pipe 11 and the condensation unit 12 rise. Because the blower 6 moves intermittently, the liquid levels shake correspondingly while rising, thus exerting a great impact force on the condensation pipe and the condensation unit. Under the action of the impact force, the lint accumulated on the condensation pipe and the condensation unit is washed away. Moreover, through the impact effect of the spraying water supplied by the spraying unit from top to bottom, the lint accumulated on the surface of the condensation unit will also be washed away by the strong impact of the spraying water and flow into the condensation pipe with the spraying water, and is finally drained through the drainage unit, so that the whole cleaning procedure is completed.

[0024] Of course, the embodiments described above are only preferred embodiments of the present invention, and the present invention may also have many other embodiments. Equivalent changes made to the present invention by persons of ordinary skill in the art under the instruction of the present invention shall still fall within the scope of the present invention as defined by the claims.

Claims

1. A clothes washing device (1) with a drying procedure, comprising: a water tub (2), a drum (3) rotatably disposed in the water tub (2) to receive clothes of a user, a heating member (4) for heating air to perform drying operation on the clothes, and a blower (6) for driving air circulation, wherein the clothes washing device (1) is provided with a washing procedure for performing washing operation on the clothes placed in the drum (3) by the user, and the clothes washing device (1) is further provided with a cleaning procedure for performing cleaning operation by intermittently driving the blower (6).
2. The clothes washing device (1) with a drying procedure according to claim 1, wherein the cleaning procedure is independent of the washing procedure.
3. The clothes washing device (1) with a drying procedure according to claim 1, wherein the cleaning procedure is integrated to the cleaning procedure.
4. The clothes washing device (1) with a drying procedure according to any preceding claim, further comprising a spraying unit (7) for supplying spraying water when performing the cleaning procedure.
5. The clothes washing device (1) with a drying procedure according to claim 4, further comprising a condensation member (5) for condensing moisture in air, wherein the spraying water supplied by the spraying unit (7) is sprayed on a surface of the condensation member (5) from top to bottom.

6. A method of controlling a clothes washing device (1) with a drying procedure, comprising: a water tub (2), a drum (3) rotatably disposed in the water tub (2) to receive clothes of a user, a heating member (4) for heating air to perform drying operation on the clothes, and a blower (6) for driving air circulation, wherein the clothes washing device (1) is provided with a washing procedure for performing washing operation on the clothes placed in the drum (3) by the user, and the clothes washing device (1) is further provided with a cleaning procedure for performing cleaning operation by intermittently driving the blower (6), the method comprising performing a cleaning procedure by intermittently driving the blower (6).
7. The method of controlling the clothes washing device (1) with a drying procedure according to claim 6, wherein the clothes washing device (1) further comprises a spraying unit (7), and the controlling method further comprises activating the spraying unit (7) to supply spraying water when performing the cleaning procedure.

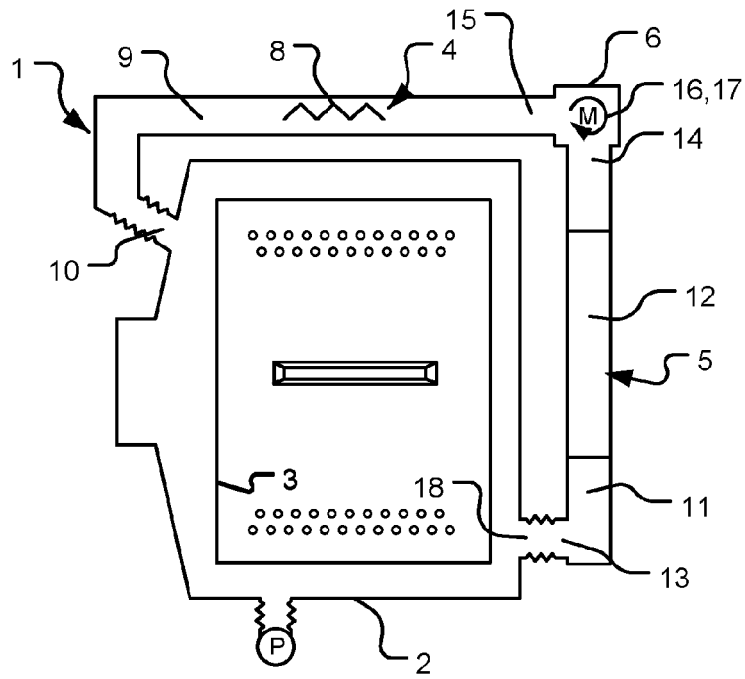


FIG. 1

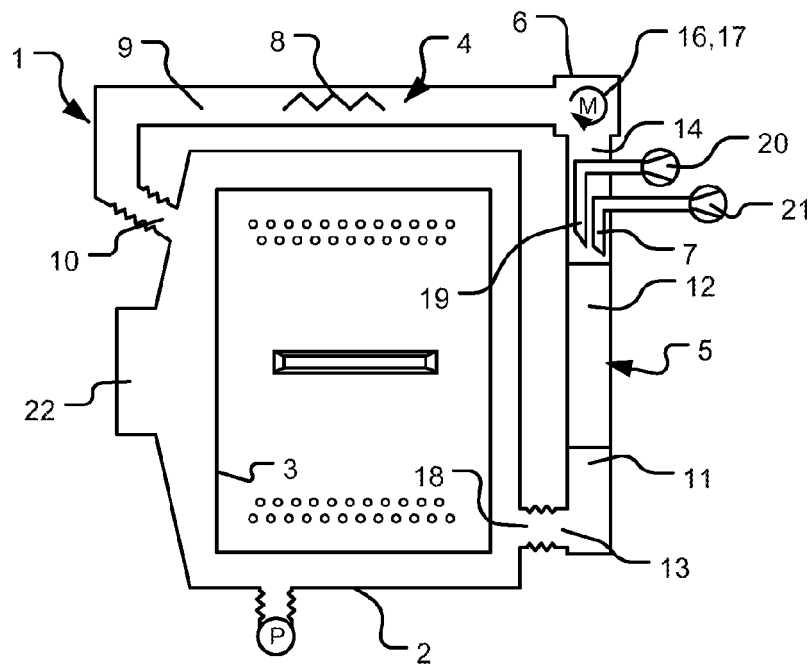


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 10 17 0066

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 098 028 A2 (BSH BOSCH SIEMENS HAUSGERÄTE [DE]) 9 May 2001 (2001-05-09) * column 1, line 44 - line 51; claim 1; figure 1 *	1,2,6	INV. D06F58/22
A	DE 43 03 655 A1 (MIELE & CIE [DE]) 11 August 1994 (1994-08-11) * claim 1; figure 1 *	1-7	
A	WO 2007/119989 A2 (LG ELECTRONICS INC [KR]; DOH YOUNG JIN [KR]) 25 October 2007 (2007-10-25) * paragraphs [0046], [0 49]; figure 1 *	1-7	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
Place of search		Date of completion of the search	Examiner
Munich		15 December 2010	Westermayer, Wilhelm
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 10 17 0066

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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15-12-2010

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1098028	A2	09-05-2001	AT 272141 T	15-08-2004
			DE 19952751 A1	21-06-2001
			ES 2223363 T3	01-03-2005

DE 4303655	A1	11-08-1994	NONE	

WO 2007119989	A2	25-10-2007	CN 101443506 A	27-05-2009
			EP 2013402 A2	14-01-2009
			KR 20070102905 A	22-10-2007
			US 2009077827 A1	26-03-2009

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H11333185 B [0005]