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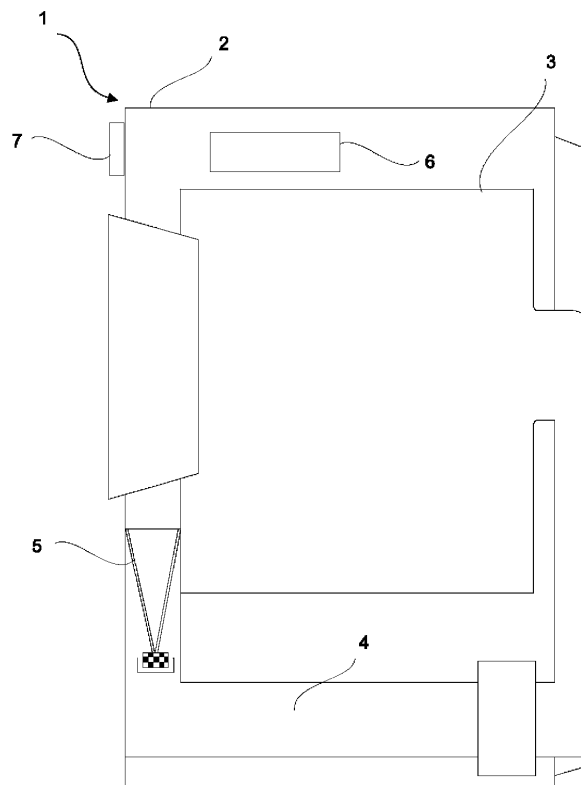
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(54) **A LAUNDRY DRYER COMPRISING A FILTER**

(57) The present invention relates to a laundry dryer (1) comprising a body (2); a drum (3) which is disposed in the body (2) and which is suitable for loading the laundry; an air circulation duct (4) which provides the delivery of the drying air into the drum (3); at least one filter (5)

which retains particles such as fiber, lint, etc. in the drying air; a control unit (6) which controls the drying process and which is suitable for determining the clogging rate of the filter (5); and a control panel (7) which enables the user to send commands to the control unit (6).

Figure 1



Description

[0001] The present invention relates to a laundry dryer comprising a filter.

[0002] While the laundry is being dried in the laundry dryer, fiber and dust break off from the laundry particularly due to mechanical effects. In state of the art laundry dryers, most of these particles are collected by means of one or more than one filter provided in the laundry dryer. If not cleaned, the fibers accumulated on the filter clog the filter and cause the disruption of the airflow passing through the filter. Generally, in the laundry dryers, the user is warned after each drying process to clean the filter. In laundry dryers wherein a filter with higher fiber retaining capacity is used, the user is warned of the clogging of the filter after a number of drying process predetermined by the producer. However, the amount of fibers accumulating on the filter during each drying process varies. Therefore, the clogging of the filter cannot be efficiently detected.

[0003] In the European Patent No. EP2333149, a laundry dryer is disclosed, comprising a control unit that detects the clogging of the filter.

[0004] The aim of the present invention is the realization of a laundry dryer wherein the clogging of the filter is accurately detected.

[0005] The laundry dryer of the present invention comprises a body; a drum which is disposed in the body; an air circulation duct which provides the delivery of air into the drum; a filter which is provided on the air circulation duct and which retains the fibers breaking off from the laundry in the drum; a control unit which is suitable for detecting the clogging of the filter; and a control panel which enables the user to send commands to the control unit. The laundry dryer of the present invention further comprises the control unit which calculates a filter dirtiness value after each drying process by using at least two factors from among a first factor dependent on the weight of the laundry loaded into the drum, a second factor dependent on the time from the beginning of the drying process to the moment the control unit decides that the laundry is dried, and a third factor dependent on the type of fiber of the laundry; which calculates the sum of calculated filter dirtiness values after each drying process so as to compare the total filter dirtiness value with a threshold value predetermined by the producer; and which decides that the filter is clogged if the total filter dirtiness value is equal to or above the threshold value predetermined by the producer. The process time is the time from the beginning of the drying process to the time the control unit decides that the laundry in the drum is dry by means of various sensors in the laundry dryer. The amount of fibers left by the laundry on the filter during the drying process varies depending on the process time, the amount of load of the laundry loaded into the drum to be dried and the type of fiber. The control unit calculates the filter dirtiness value corresponding to the amount of fibers accumulating on the filter during a drying

process by using at least two of the first factor, the second factor and the third factor which are numerical values. The control unit calculates the total filter dirtiness value by calculating the sum of the filter dirtiness value of each drying process. The control unit decides that the filter is clogged when the total filter dirtiness value is equal to or above a threshold value predetermined by the producer. Thus, the parameters affecting the amount of fibers to accumulate on the filter during a drying process are used in deciding on the clogging of the filter. Consequently, the control unit accurately decides on the clogging of the filter.

[0006] In an embodiment of the present invention, the laundry dryer comprises a control unit which calculates the filter dirtiness value by means of an algorithm which uses the first factor, the second factor and the three factors together. By using all the three factors, the filter dirtiness value is calculated according to all the parameters which are the process time, the weight of the laundry in the drum and the type of fiber. Thus, the amount of fibers to accumulate on the filter after the drying process is enabled to be calculated more accurately by means of the filter dirtiness value.

[0007] In another embodiment of the present invention, as the amount of laundry in the drum increases, the total amount of fibers breaking off from the laundry increases. Therefore, as the amount of weight increases, the control unit determines the first factor so as to increase the filter dirtiness value.

[0008] In another embodiment of the present invention, the second factor is determined with respect to the ratio of the process time to the drying time prerecorded in the control unit for the drying program selected by the user. As the process time increases, the amount of fibers breaking off from the laundry also increases.

[0009] In another embodiment of the present invention, the filter dirtiness value is calculated by multiplying the first factor, the second factor and the third factor.

[0010] In another embodiment of the present invention, the total filter dirtiness value is reset by the control unit after the filter is cleaned or changed. Thus, the control unit is prevented from making an erroneous filter clogging decision after the filter is cleaned or changed without any clogging.

[0011] In another embodiment of the present invention, the laundry dryer comprises a control unit which warns the user audibly or visually of the clogging of the filter when the total filter dirtiness value is equal to above a threshold value predetermined by the producer. Consequently, the user is enabled to be informed of the clogging of the filter.

[0012] By means of the present invention, a laundry dryer is realized wherein the clogging of the filter is accurately detected.

[0013] The advantages of the laundry dryer of the present invention will be disclosed with the detailed description of the embodiments with reference to the accompanying figure, where:

[0014] Figure 1 - is the schematic view of the laundry dryer in an embodiment of the present invention.

[0015] The following numerals are referred to in the description of the present invention:

1. Laundry dryer
2. Body
3. Drum
4. Air circulation duct
5. Filter
6. Control unit
7. Control panel

[0016] The laundry dryer (1) comprises a body (2); a drum (3) which is disposed in the body (2) and which is suitable for loading the laundry; an air circulation duct (4) which provides the delivery of the drying air into the drum (3); at least one filter (5) which retains the fiber particles in the drying air; a control unit (6) which controls the drying process and which is suitable for determining the clogging rate of the filter (5); and a control panel (7) which enables the user to send commands to the control unit (6).

[0017] The laundry dryer (1) of the present invention comprises the control unit (6) which calculates a filter (5) dirtiness value after each drying process by using at least two factors from among a first factor dependent on the weight of the laundry loaded into the drum (3), a second factor dependent on the time from the beginning of the drying process to the moment the control unit (6) decides that the laundry is dried, and a third factor dependent on the type of fiber of the laundry; which calculates the sum of calculated filter (5) dirtiness values after each drying process so as to compare the total filter (5) dirtiness value with a threshold value predetermined by the producer; and which decides that the filter (5) is clogged if the total filter (5) dirtiness value is equal to the threshold value or above the threshold value predetermined by the producer. The first factor, the second factor and the third factor are numerical values. The first factor is determined by the control unit (6) depending on the weight of the laundry loaded into the drum (3) to be dried. The weight of the laundry in the drum (3) can be determined by means of sensors in the body (2). In a preferred version of the present invention, the weight of the laundry in the drum (3) is classified as full load, half load, quarter load and loads under 1 kilogram. The control unit (6) selects the first factor according to the class of the weight determined. The second factor is determined by the control unit (6) according to the length of the process time. The third factor is determined by the control unit (6) depending on the type of fiber of the laundry to be loaded into the drum (3). The user can enter the type of the laundry loaded into the drum (3) to the control unit (6) by means of the control panel (7). The user selects one of the options such as cotton, synthetic, mixed, delicate, etc. via the control panel (7) and transmits the type of fiber of the laundry loaded into the drum (3) to the control unit (6).

The third factor is determined by the control unit (6) depending on the type of fiber of the laundry. Since the cotton laundry produces more fibers than the synthetic laundry during the drying process, the third factor is determined so as to increase the filter (5) dirtiness value when the cotton laundry is selected. After each drying process, the filter (5) dirtiness value is calculated by using at least two of the first factor, the second factor and the third factor. The total filter (5) dirtiness value is obtained by calculating the sum of the calculated filter (5) dirtiness values. The control unit (6) decides that the filter (5) is clogged when the total filter (5) dirtiness value is equal to the threshold value or above a threshold value predetermined by the producer.

[0018] In another embodiment of the present invention, the laundry dryer (1) comprises the control unit (6) which calculates the filter (5) dirtiness value by using all three of the first factor, the second factor and the third factor after each drying process. Thus, the parameters directly affecting the amount of fibers accumulating on the filter (5) during the drying process are further used, ensuring an accurate detection of the clogging.

[0019] In another embodiment of the present invention, the laundry dryer (1) comprises the control unit (6) which increases the first factor so as to increase the filter (5) dirtiness value as the weight of the laundry loaded into the drum (3) increases. In a preferred version of the present invention, the weight of the laundry is classified as full load, half load, quarter load and loads under 1 kilogram. As the weight of the laundry in the drum (3) increases, the amount of fibers released into the air circulation duct (4) during the drying process also increases.

[0020] In another embodiment of the present invention, the laundry dryer (1) comprises the control unit (6) which changes the second factor according to the ratio of the process time to the time selected by the user via the control panel (7) or predefined by the producer. The user enters the drying program selection to the control unit (6) via the control panel (7) before the start of the drying process. When the user selects the program, the process continues for the time predefined in the control unit (6) for the selected program type. The process time is the time from the beginning of the drying process to the moment the dryness of the laundry is detected by means of the sensors in the body (2). The process time is not always equal to the time predefined in the control unit (6) for the selected program type. As the process time increases, the amount of fibers breaking off from the laundry loaded into the drum (3) also increases. The second factor is determined by the control unit (6) according to the ratio of the process time to the time predefined in the control unit (6) for the selected program type. As said ratio increases, the control unit (6) changes the second factor so as to increase the filter (5) dirtiness value.

[0021] In another embodiment of the present invention, the laundry dryer (1) comprises the control unit (6) which calculates the filter (5) dirtiness value by multiplying the

first factor, the second factor and the third factor. For example, when the weight of the laundry in the drum (3) corresponds to the full load class, the first sector is selected as 4 by the control unit (6). When the drying process time is as long as the time predetermined by the producer if the cotton laundry is loaded into the drum (3) as full load, the second factor is selected as 3. When the type of fiber of the laundry loaded into the drum (3) is selected as cotton, the third factor is selected as 5 by the control unit (6). When the process time is as long as a time predetermined by the producer while drying cotton laundry under full load, the control unit (6) multiplies said three factors after the drying process and calculates the filter (5) dirtiness value as 60.

[0022] In another embodiment of the present invention, the laundry dryer (1) comprises the control unit (6) which resets the total filter (5) dirtiness value after the filter (5) is changed or cleaned. When the user pushes the buttons on the control panel (7) in a combination predetermined by the producer after changing the filter (5), the control unit (6) receives the information that the filter (5) is changed or the filter (5) is cleaned. In another version of the present invention, the control unit (6) can determine whether the filter (5) is cleaned or changed by means of the sensors provided in the laundry dryer (1). The total filter (5) dirtiness value is reset after the control unit (6) receives the information that the filter (5) is changed or cleaned. Thus, the algorithm is enabled to be run more than once.

[0023] In another embodiment of the present invention, the laundry dryer (1) comprises the control unit (6) which warns the user audibly or visually when the filter (5) is detected to be clogged.

[0024] By means of the present invention, a laundry dryer (1) is realized, comprising the control unit (6) which accurately determines the clogging of the filter (5) by using the parameters such as the weight and the type of fiber of the laundry loaded into the drum (3) to be dried. Thus, the user is prevented from cleaning the filter (5) more or less than required, increasing the economic life of the filter (5).

Claims

1. A laundry dryer (1) comprising a body (2); a drum (3) which is disposed in the body (2) and which is suitable for loading the laundry; an air circulation duct (4) which provides the delivery of the drying air into the drum (3); at least one filter (5) which retains the fiber particles in the drying air; a control unit (6) which controls the drying process and which is suitable for determining the clogging rate of the filter (5); and a control panel (7) which enables the user to send commands to the control unit (6), **characterized by** the control unit (6)

- which calculates a filter (5) dirtiness value after

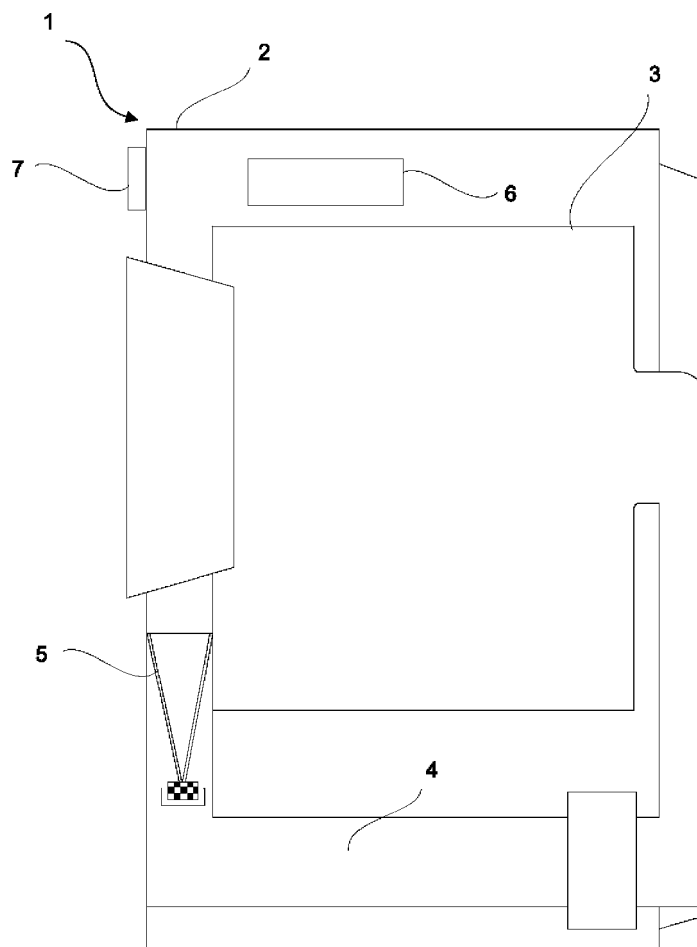
each drying process by using at least two factors from among a first factor dependent on the weight of the laundry loaded into the drum (3), a second factor dependent on the time from the beginning of the drying process to the moment the control unit (6) decides that the laundry is dried, and a third factor dependent on the type of fiber of the laundry;

- which calculates the sum of calculated filter (5) dirtiness values after each drying process so as to compare the total filter (5) dirtiness value with a threshold value predetermined by the producer; and

- which decides that the filter (5) is clogged if the total filter (5) dirtiness value is equal to the threshold value or above the threshold value predetermined by the producer.

2. A laundry dryer (1) as in Claim 1, **characterized by** the control unit (6) which calculates the filter (5) dirtiness value by using all three of the first factor, the second factor and the third factor after each drying process.
3. A laundry dryer (1) as in any one of the above claims, **characterized by** the control unit (6) which increases the first factor so as to increase the filter (5) dirtiness value as the weight of the laundry loaded into the drum (3) increases.
4. A laundry dryer (1) as in any one of the above claims, **characterized by** the control unit (6) which changes the second factor according to the ratio of the process time to the time selected by the user via the control panel (7) or predefined by the producer.
5. A laundry dryer (1) as in any one of the above claims, **characterized by** the control unit (6) which calculates the filter (5) dirtiness value by multiplying the first factor, the second factor and the third factor.
6. A laundry dryer (1) as in any one of the above claims, **characterized by** the control unit (6) which resets the total filter (5) dirtiness value after the filter (5) is changed or cleaned.
7. A laundry dryer (1) as in any one of the above claims, **characterized by** the control unit (6) which warns the user audibly or visually when the filter (5) is detected to be clogged.

Figure 1





EUROPEAN SEARCH REPORT

Application Number
EP 21 17 6427

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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	US 2011/271550 A1 (KIM DONGHYUN [KR] ET AL) 10 November 2011 (2011-11-10) * paragraph [0193] - paragraph [0198]; claim 28; figures 1, 9-13 *	1-3	INV. D06F58/22 D06F58/45
A	KR 2019 0121586 A (LG ELECTRONICS INC [KR]) 28 October 2019 (2019-10-28) * claim 3 *	1-7	ADD. D06F103/04 D06F103/06 D06F103/38 D06F103/42
A	KR 2011 0122463 A (LG ELECTRONICS INC [KR]) 10 November 2011 (2011-11-10) * claims 1, 3 *	1-7	D06F105/34 D06F105/58 D06F105/60 D06F34/18 D06F34/28
			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 17 August 2021	Examiner Diaz y Diaz-Caneja
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
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 17 6427

5 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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17-08-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011271550 A1	10-11-2011	AU 2011249157 A1	13-12-2012
		BR 112012028154 A2	09-08-2016
		CN 102884245 A	16-01-2013
		DE 202011110331 U1	09-07-2013
		EP 2567018 A2	13-03-2013
		US 2011271550 A1	10-11-2011
		WO 2011139097 A2	10-11-2011

KR 20190121586 A	28-10-2019	NONE	

KR 20110122463 A	10-11-2011	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2333149 A [0003]