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(54) **CONTROL METHOD OF CLOTHING CARE PROGRAM OF WASHING MACHINE**

(57) A control method of a clothing care program of a washing machine (100) is disclosed. The washing machine (100) includes a rotatable drum (4) driven by a motor (5) and a tub (6) disposed around the drum (4), where two ends of an air passage (8) are separately connected to the tub (6), and a fan (9) and an airborne particle filtering device (11) are disposed in the air passage (8). The control method includes: starting the motor (5) to rotate the drum (4) at a rotational speed lower than a speed making clothing move centrifugally; and starting the fan to make air in the tub pass through the filtering device (11). In the process of rotating the drum (4), particles sticking on the clothing are separated from the clothing, and fly into air. When the air carrying the particles passes through the airborne particle filtering device (11) disposed in the air passage (8), the particles are captured by the filtering device (11). After continuous circulation, the particles in the clothing are slowly transferred to the filtering device (11).

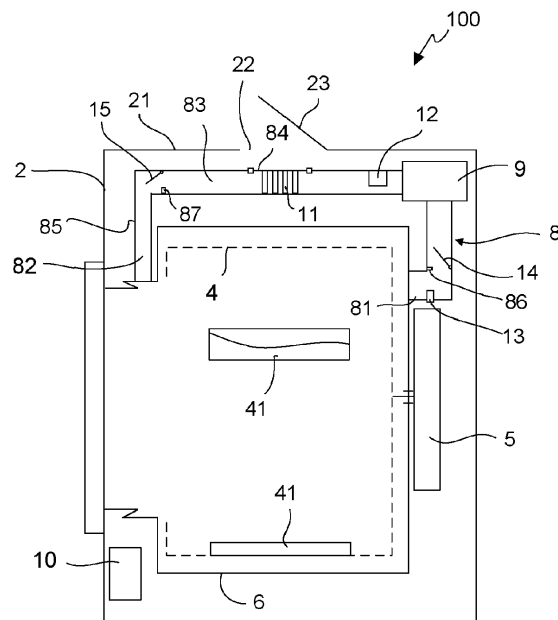


FIG. 1

Description

BACKGROUND

Technical Field

[0001] The present invention relates to a control method of a clothing care machine, and in particular, to a method for removing particles sticking on clothing.

Related Art

[0002] There are tons of tiny particles in a haze, and some tiny particles carry germs. In a hazy weather, people's coats may carry a lot of particles after outdoor activities, and these particles may be brought indoors and pollute indoor air when people go back indoors. The germs carried by the particles are a threat to people's health.

[0003] An existing clothing care machine such as a washing machine or a drying machine may wash, dry, or deodorize and degerm clothing, but does not have a function and control program for removing tiny particles in the clothing.

SUMMARY

[0004] The objective of the present invention is to provide a control method for removing tiny particles in clothing by using a washing machine.

[0005] For the foregoing objective, the present invention provides a control method of a clothing care program of a washing machine, where the washing machine includes a rotatable drum driven by a motor and a tub disposed around the drum, two ends of an air passage are separately connected to the tub, a fan and an airborne particle filtering device are disposed in the air passage, and the control method includes: starting the motor to rotate the drum at a rotational speed lower than a speed making clothing move centrifugally; and starting the fan to make air in the tub pass through the filtering device.

[0006] In the process in which the drum is driven by the motor to rotate at the rotational speed lower than the speed making clothing move centrifugally, the clothing is lifted and thrown over and over in the drum, to make particles sticking on the clothing be separated from the clothing, and fly into air. The air circulates in the air passage and the tub under the effect of the fan. When the air carrying the particles passes through the airborne particle filtering device disposed in the air passage, the particles are captured by the filtering device. After continuous circulation, the air gradually becomes clean, and the particles in the clothing are slowly transferred to the filtering device. In this way, the particles of the clothing are removed. The particles may be as small as pm 2.5 that poses a severe threat to human body health and that is also an important composition of a haze.

[0007] In an optional further implementation solution,

the control method includes starting a sterilization device located in the air passage or the tub to sterilize the air.

[0008] In an optional further implementation solution, a particle concentration sensor located in the air passage or disposed near the air passage detects a concentration of particles in the air, and sends particle concentration information to a control device, and after the concentration of particles is lower than a predetermined value, the control device turns off the fan and turns off the motor.

[0009] In an optional further implementation solution, the control device sends real-time air quality information associated with the concentration of particles to a display device.

[0010] In an implementation, the display device is located on a mobile terminal in communication connection to the washing machine, and the control device sends the information to the display device by wireless communications.

[0011] Preferably, movable valves are disposed respectively in the upstream and the downstream of the airborne particle filtering device, the valves may move between a first position at which the air passage is opened and a second position at which the air passage is closed, before the fan is started, the control device makes the valves move to the first position, and after the fan is turned off, the control device makes the valves move to the second position. In this way, after an airborne particle removal program ends, the filtering device may be isolated to protect the performance by preventing the filtering device from being affected by other programs, for example, from being affected by wash water, foam, or a high temperature.

[0012] Preferably, the control device records particle concentration information during each running of the clothing care program, calculates the service life of the filtering device based on the particle concentration information associated with wind volume information, and when the filtering device reaches or approaches the end of the service life, reminds a user to replace the filtering device. The wind volume information may be obtained through calculation according to running parameters of the fan and the structure of the air passage, or measured by disposing a sensor associated with the wind volume. The clothing care program is the airborne particle removal program.

[0013] The washing machine includes a control device, the control device includes an independent airborne particle removal program, and the method includes: receiving, by the control device, a running instruction of the airborne particle filtering program, and then starting the motor and the fan.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIG. 1 is a simplified schematic diagram of a washing machine; and

FIG. 2 is a schematic modularized diagram of a washing machine and a mobile terminal.

DETAILED DESCRIPTION

[0015] As shown in FIG. 1, a washing machine 100 includes a shell 2. A control device 10 is mounted in the shell 2, and provided with various control programs, and may control running of each electric element according to program settings. A drum 4 for accommodating clothing is disposed in the shell 2. The tub 6 is disposed around the drum 4, and is used for accommodating laundry detergent. The drum 4 may be driven by the motor 5 to rotate. A lifting rib 41 is mounted in the drum 4. When the drum 4 is driven by the motor 5 to rotate, the lifting rib 41 may drive the clothing to roll in the drum 4.

[0016] An air passage 8 is disposed near an upper side of the tub 6. An inlet 81 and an outlet 82 of the air passage 8 are separately connected to the tub 6, to form an air circulation space between the air passage 8 and the tub 6. A fan 9 is disposed in the air passage 8. When being running, the fan 9 drives air to circulate in the tub 6 and the air passage 8.

[0017] The air passage 8 includes a section 83 that is higher than the top of the tub 6 and located between the tub 6 and a top plate 21 of the shell 2, and the section 83 is close to the top plate 21. The section 83 is mounted with an airborne particle filter screen 11, to capture tiny particles in air passing through the filter screen 11. The density of the filter screen 11 can filter pm 2.5. The filter screen 11 is a multilayer structure, and includes an HEPA filter screen and an activated carbon filter screen.

[0018] To replace the filter screen 11, a position that is on the air passage 8 and that is mounted with the filter screen 11 includes a mounting portion 84 that may be opened. In addition, a position on the top plate 21 that is mounted with the filter screen 11 is provided with an opening 22. The opening 22 is closed or opened by a cover 23 hinged with the top plate 21. When the opening 22 is opened, a user may replace the filter screen 11 by reaching and opening the mounting portion 84 through the opening 22 with hands.

[0019] An ozone generator 12 is further disposed in the air passage 8, and may generate ozone, and kill germs in air.

[0020] A particle concentration sensor 13 is disposed near the inlet 81 of the air passage 8. The control device 10 includes an airborne particle removal program, and when the program is selected and running, the particle concentration sensor 13 detects in real time a concentration of particles in the air entering the air passage 8, and sends a detection result to the control device 10 in a form of an electric signal. The control device 10 determines, according to the received information, whether to end the airborne particle removal program.

[0021] In addition, the control device 10 further sends real-time air quality information associated with the concentration of particles to a display device 21. The display

device 21 may be located on the washing machine 100. In another implementation, as shown in FIG. 2, the display device 21 is located on a mobile terminal 20. The control device 10 of the washing machine includes a first wireless communications module 101. The mobile terminal 20 includes a second wireless communications module 201. The first wireless communications module 101 is in communication connection to the wireless communications module 201. The control device 10 sends the air quality information to the display device 21 located on the mobile terminal 20 by using the first wireless communications module 101 and the second wireless communications module 201, so that the user can learn a program running status at any time conveniently.

[0022] To isolate the filter screen 11 when other programs are running, movable valves 14 and 15 are respectively disposed in the upstream and the downstream of the filter screen 11. The valves 14 and 15 may move between a first position at which the air passage 8 is opened and a second position at which the air passage 8 is closed. In the embodiment shown in FIG. 1, the valves 14 and 15 are separately hinged on a wall 85 of the air passage 8. When the fan 9 is not started, the valves 14 and 15 close the air passage 8 under the effect of gravity, and lean on stopping blocks 86 and 87. After the fan 9 is started, a pressure formed by airflow pushes the valves 14 and 15 to open the air passage 8. In an optional implementation, the stopping blocks 86 and 87 may be disposed to include an electromagnet, which is connected to the control device 10. The stopping blocks 86 and 87 have magnetism after being powered on, attract the valves 14 and 15, and close the air passage 8. After the stopping blocks 86 and 87 are powered off, the magnetism disappears, and the valves 14 and 15 may be opened under the effect of a wind pressure.

[0023] An independent airborne particle removal program is disposed inside the control device 10. After the airborne particle removal program is selected by the user and started, the control device 10 first cuts off power of the electromagnet of the stopping blocks 86 and 87 according to a received running instruction of the airborne particle filtering program, and then starts the motor 5 to rotate the drum 4 at a rotational speed lower than a speed making clothing move centrifugally. As the drum 4 rotates, the clothing is lifted by the lifting rib 41 and then falls down to the bottom of the drum 4 from the high position, and this repeats again and again. In the process, the clothing is rolled and thrown over and over under the effect of the mechanical force, and the tiny particulate pollutants are separated from the clothing and fly into air.

[0024] The control device 10 starts the fan 9 simultaneously or later. After the fan 9 operates, the fan 9 generates a negative pressure in the upstream, to open the valve 14 in the upstream, and the airflow pushes the valve 15 in the downstream, so that the air in the tub 6 enters the air passage 8 and passes through the filter screen 11, and then returns to the tub 6, and this repeats again and again, to remove the tiny particles in the air.

[0025] The process of running the airborne particle filtering program further includes starting the ozone generator 12 by using the control device 10, to sterilize the air.

[0026] In the process of running the airborne particle filtering program, the particle concentration sensor 13 detects a concentration of particles in the air, and sends particle concentration information to the control device 10. After the concentration of particles is lower than a predetermined value, the control device 10 turns off the fan 9, turns off the motor 5, and supplies power to the electromagnet of the stopping blocks 86 and 87. The electromagnet generates magnetism after being powered on, so that the valves 14 and 15 move and are fixed at the second position.

[0027] The control device 10 records particle concentration information during each running of the airborne particle removal program, calculates the service life of the filter screen 11 based on the particle concentration information associated with wind volume information, and when the filter screen 11 reaches or approaches the end of the service life, reminds the user to replace the filter screen 11. Such reminding information may be sent by using the display device 21 on the mobile terminal 20.

[0028] The various specific implementations described above and shown in the accompanying drawings are only used to illustrate the present invention, but are not all of the present invention. In the scope of the basic technical idea of the present invention, modifications in any form made to the present invention by a person of ordinary skill in the related technical field shall fall within the protection scope of the present invention.

Claims

1. A control method of a clothing care program of a washing machine, wherein the washing machine comprises a rotatable drum driven by a motor and a tub disposed around the drum, two ends of an air passage are separately connected to the tub, a fan and an airborne particle filtering device are disposed in the air passage, and the control method comprises: starting the motor to rotate the drum at a rotational speed lower than a speed making clothing move centrifugally; and starting the fan to make air in the tub pass through the filtering device.
2. The control method according to claim 1, **characterized by** comprising starting a sterilization device located in the air passage or the tub to sterilize the air.
3. The control method according to claim 1, **characterized in that:** a particle concentration sensor located in the air passage or disposed near the air passage detects a concentration of particles in the air, and sends particle concentration information to a control device, and after the concentration of particles is lower than a predetermined value, the control device

turns off the fan and turns off the motor.

4. The control method according to claim 3, **characterized in that:** the control device sends real-time air quality information associated with the concentration of particles to a display device.
5. The control method according to claim 4, **characterized in that:** the display device is located on a mobile terminal in communication connection to the washing machine, and the control device sends the information to the display device by wireless communications.
6. The control method according to claim 1, **characterized in that:** movable valves (14, 15) are disposed respectively in the upstream and the downstream of the airborne particle filtering device, the valves may move between a first position at which the air passage is opened and a second position at which the air passage is closed, before the fan is started, the control device makes the valves move to the first position, and after the fan is turned off, the control device makes the valves move to the second position.
7. The control method according to claim 3, **characterized in that:** the control device records particle concentration information during each running of the clothing care program, calculates the service life of the filtering device based on the particle concentration information associated with wind volume information, and when the filtering device reaches or approaches the end of the service life, reminds a user to replace the filtering device.
8. The control method according to claim 1, **characterized in that:** the washing machine comprises a control device, the control device comprises an independent airborne particle filtering program, and the method comprises: receiving, by the control device, a running instruction of the airborne particle filtering program, and then starting the motor and the fan.

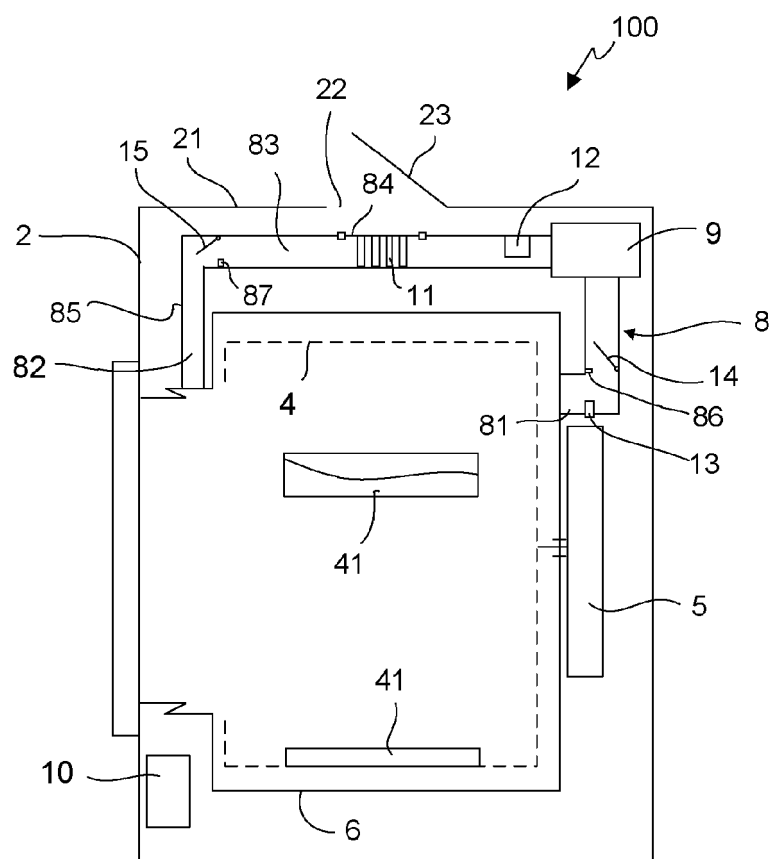


FIG. 1

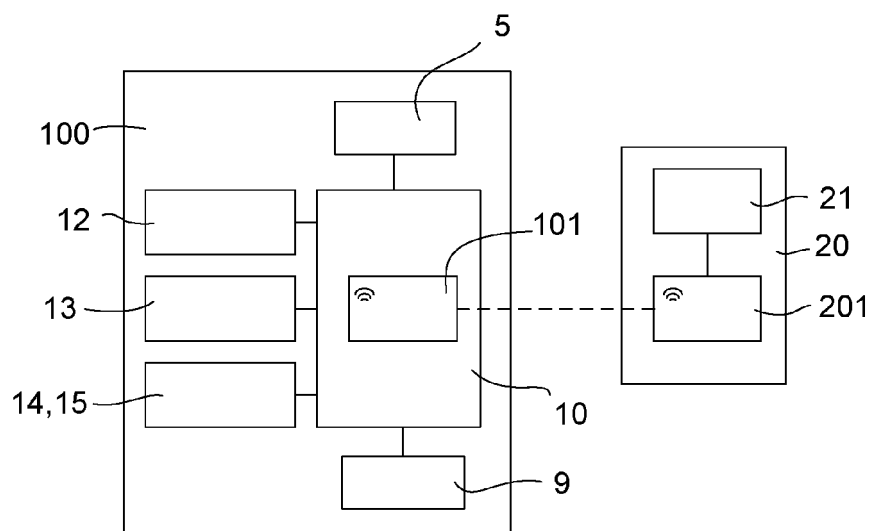


FIG. 2



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 21 0634

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Place of search Munich		Date of completion of the search 18 April 2019	Examiner Spitzer, Bettina
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 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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