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(54) **Household clothes drying device**

(57) A household clothes drying device with its rear side closed by a backboard, comprising a drying air circuit wherein the drying air circulates to remove the moisture in the washed clothes; condensing means, which condensing means condenses with cold air the moisture carried by the drying air; and an air exhaust structure, which air exhaust structure is provided on the backboard for

introducing the air discharged from the condensing means to the outside of the device; wherein the air exhaust structure comprises a plurality of substantially upright openings. In this way, said cold air can be smoothly discharged via the openings of the air exhaust structure and the distribution of the cold air is made relatively even, so that the condensing effects of the condensing device are significantly improved.

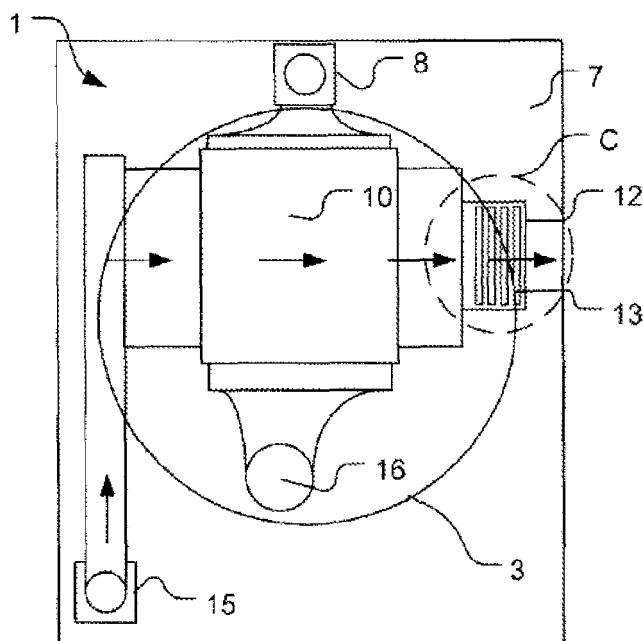


Fig. 2

Description

Technical field

[0001] The present invention relates to a clothes drying device and, in particular, to a condensing-type clothes drying device.

Background art

[0002] Household clothes drying devices (such as clothes drying machines or clothes washing and drying machines) are generally classified into water condensing type, air condensing type, and mixed water-air condensing type clothes drying devices in accordance with the condensing method. Just as the names imply, the water condensing type clothes drying device uses water as the condensing medium to condense the water carried by the drying air, so as to remove the moisture absorbed into the clothes during the washing process; while the air condensing type clothes drying device uses the external air as the condensing medium, and the mixed water-air condensing type clothes drying device uses the mixture of water and cold air as the condensing media. In comparison with the water condensing type clothes drying device, the air condensing type and the mixed water-air condensing type clothes drying devices are more economic and practical, because no additional consumption of condensing water is needed during the drying process.

[0003] European Patent Application No. EP 1 925 714 A1 and German Patent No. DE 1 610 090 A1 disclose a household clothes drying machine, which clothes drying machine comprises an air inlet provided in the front or on the back of the machine and an air exhaust provided opposite to the air inlet, so that the air outside the machine (hereinafter referred to as "cold air") is sucked into the machine via the air inlet and discharged out of the machine via the air exhaust. However, neither of the above patent or patent application has provided detailed description of the structure of the air exhaust, while it is just the structure of the air exhaust which greatly affects the heat exchange between the cold air sucked from outside and the drying air circulating within the clothes drying machine.

Contents of the invention

[0004] Aiming at the above problem, an object of the present invention is to provide a household clothes drying device for improving the condensing efficiency thereof.

[0005] To achieve the above object, one embodiment of the present invention is a household clothes drying device, with its rear side closed by a backboard, comprising a drying air circuit wherein the drying air circulates to remove the moisture contained in the clothes; condensing means, which condensing means condenses with cold air the moisture carried by the drying air; and an air exhaust structure, which air exhaust structure is

provided on the backboard for introducing the air discharged from the condensing means to the outside of the device; wherein the air exhaust structure comprises a plurality of substantially upright openings. In this way, the cold air can be smoothly discharged via the openings of the air exhaust structure and the distribution of the cold air is relatively even, so that the condensing effects of the condensing means are significantly improved.

[0006] As a preferred embodiment of the present invention, said drying air circuit is a closed circuit, so as to avoid the debris carried by the external air from entering into the drying air circuit and damaging other elements and parts provided in the drying air circuit, or re-contaminating the clothes, and also to avoid the occurrence of the problem of uncertain drying effects caused by the entering of the external air.

[0007] As another preferred embodiment of the present invention, said air exhaust structure is integral with the backboard, so as to effectively reduce the production costs.

[0008] As another preferred embodiment of the present invention, said air exhaust structure is provided on the top right part of the backboard to ensure sufficient strength of the backboard.

[0009] As another preferred embodiment of the present invention, said plurality of openings are provided on a slope of the backboard, so as to make the cold air discharged from the air exhaust structure more evenly distributed at the openings, and in turn to increase the air circulating speed.

[0010] As another preferred embodiment of the present invention, said plurality of openings are shaped as successive steps along the slope with respect to the air flow direction.

[0011] As another preferred embodiment of the present invention, any of said plurality of openings is provided substantially perpendicular to the flow direction of the cold air discharged from the air exhaust structure, so as to reduce the resistance of the air exhaust structure itself to the cold air as much as possible and therefore, to further increase the circulating speed of the cold air and to further improve the condensing efficiency.

[0012] As another preferred embodiment of the present invention, the household clothes drying device is a clothes drying machine or a clothes washing and drying machine.

Description of the accompanying drawings

[0013]

Fig. 1 is a cross-sectional view of the clothes drying device according to an embodiment of the present invention.

[0014] Fig. 2 is a rear view of the clothes drying device as shown in Fig. 1.

Fig. 3 is an enlarged schematic diagram of the cross section of the part indicated by "C" in Fig. 2.

Particular embodiments

[0014] Referring to Fig. 1, which is a schematic diagram of the clothes drying device 1 according to an embodiment of the present invention, the clothes drying device 1 can be a clothes drying machine or a clothes washing and drying machine, and comprises a rotary tub 2 for receiving clothes to be washed and/or dried. The circumference of the rotary tub 2 is formed in advance with a number of through holes, which are contained in an outer tub 3. One side of said clothes drying device 1 is provided with a clothes introducing opening 4, which clothes introducing opening 4 is closed by a door 5 provided on a casing 6 of said clothes drying device 1, and the back of said clothes drying device 1 is closed by a backboard 7.

[0015] To realize the drying procedure, the clothes drying device 1 utilizes two air circuits, one is a drying air circuit as indicated by the arrow signs in Fig. 1; and the other is a condensing air circuit as indicated by the arrow signs in Figs. 2 and 3. During the operation of the drying procedure, heating means 9 provided in the drying air circuit is used to heat the drying air under the effects of air-blowing means 8, the heated drying air is introduced into the rotary tub 2 which is provided in advance with a number of through holes for contacting with the clothes in the rotary tub 2 placed therein by the user, then the drying air is discharged into condensing means 10 via an air exhaust provided at an appropriate position on the outer tub 3, and the moisture contained in the clothes which is carried away by the drying air is condensed into water under the effects of the condensing means 10. Then the drying air is re-sucked into the heating means 9 and heated under the effects of the air-blowing means 8 and enters into the next cycle. Under the effects of the continuous circulation of the drying air, the moisture contained in the clothes is gradually removed, and the clothes are gradually dried.

[0016] Said condensing means 10 can be air condensing means which only utilize air as the condensing medium, or air-water condensing means which utilize a mixture of air and water as the condensing media. As shown in Fig. 2 in conjunction with Fig. 1, one end of said condensing means 10 is connected to an air inlet 11, the cold air around the device is sucked into the device under the effects of a blower 15 via the air inlet 11; and the other end of said condensing means 10 is directly or indirectly in communication with the air exhaust structure 12. The cold air enters into the condensing means via the air inlet 11 to condense the drying air which is circulating in the drying air circuit, and then it is discharged out of the device 1. In order to precisely control the degree of drying of the clothes, the condensing means 10 is preferably independent of the drying air circuit, that is so say, the cold air for condensing will not flow into the circuit where the drying air is circulating to mix with the drying air. Of course, the condensing means 10 can be designed to mix said cold air for condensing, so as to improve the heat exchange efficiency to a certain extent.

[0017] Now referring to Fig. 3, as shown in the figure, the air exhaust structure 12 comprises a plurality of openings 13 for introducing the air discharged from the condensing means 10 into the external space of the device 1. Said plurality of openings 13 are provided substantially upright on the top right of the backboard 7. In order to ensure the strength of the backboard 7 and at the same time to simplify the overall structure of the backboard 7, said plurality of openings 13 are integrally formed with the backboard 7. Preferably, the surface 14 on which the plurality of openings 13 are located is a convex slope, so as to make the air flow relatively smooth; and more preferably, the plurality of openings 13 are shaped as successive steps along the surface 14 with respect to the air flow direction, wherein the cross section of each of the openings 13 is substantially perpendicular to the air flow direction, so as to make the air flow more smoothly, and at the same time to reduce the resistance by the opening 13 itself to the air flow as much as possible. By speeding up the air flow, the condensing effects of the condensing means 10, or the heat exchange between the cold air and the drying air is significantly improved, so that the drying efficiency of the clothes drying device according to the present invention is greatly improved.

[0018] Of course, the embodiments exemplified above are merely preferred embodiments of the present invention, the present invention can have many other embodiments, and the equivalent variants of the present invention under the teaching of the present invention made by those skilled in the art are covered in the scope claimed in the claims of the present invention.

Claims

1. A household clothes drying device (1), with its rear side closed by a backboard (7), comprising:
 - a drying air circuit wherein the drying air circulates to remove the moisture contained in the clothes;
 - condensing means (10), which condensing means condenses with cold air the moisture carried by the drying air; and
 - an air exhaust structure (12), which air exhaust structure is provided on the backboard (7) for introducing the air discharged from the condensing means to the outside of the device; **characterized in that:**
 - said air exhaust structure (12) comprises a plurality of substantially upright openings (13).
2. The household clothes drying device (1) according to claim 1, **characterized in that** the drying air circuit is a closed circulation circuit.
3. The household clothes drying device (1) according to claim 1, **characterized in that** the air exhaust

structure (12) is integral with the backboard (7).

4. The household clothes drying device (1) according to claim 1, **characterized in that** the air exhaust structure (12) is provided on the top right part of the backboard (7). 5
5. The household clothes drying device (1) according to claim 1, **characterized in that** said plurality of openings (13) are provided on a slope (14) of the backboard (7). 10
6. The household clothes drying device (1) according to claim 5, **characterized in that** said plurality of openings (13) are shaped as continuous steps along said slope (14) with respect to the air flow direction. 15
7. The household clothes drying device (1) according to one of the preceding claims, **characterized in that** the cross section of each of said openings (13) is substantially perpendicular to the flow direction of the air discharged from said air exhaust structure (12). 20
8. The household clothes drying device (1) according to one of the preceding claims, **characterized in that** the household clothes drying device is a clothes drying machine or a clothes washing drying machine. 25

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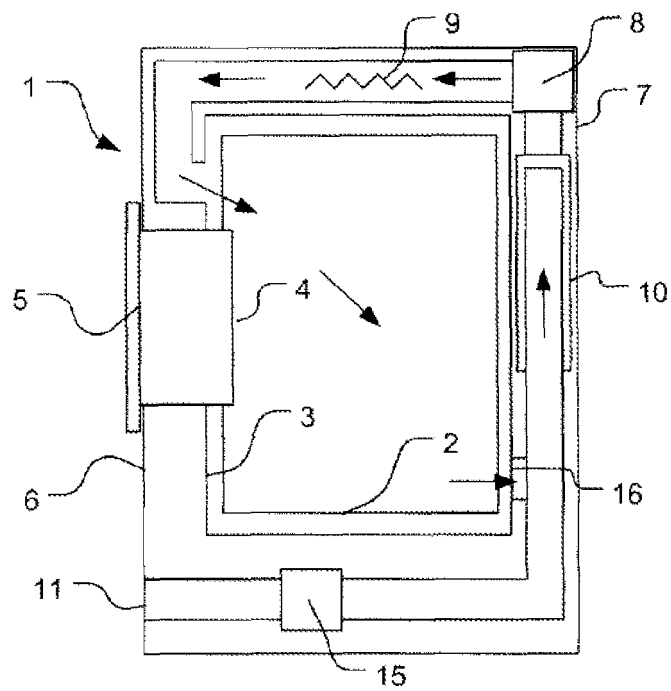


Fig. 1

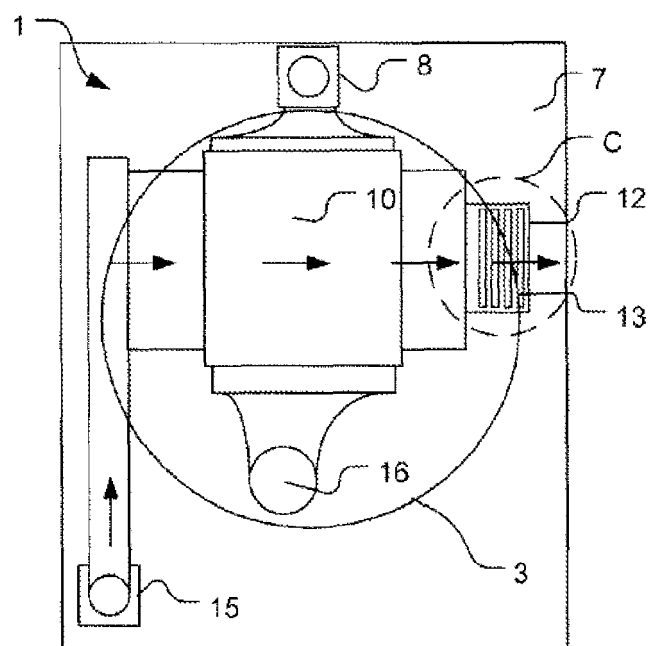


Fig. 2

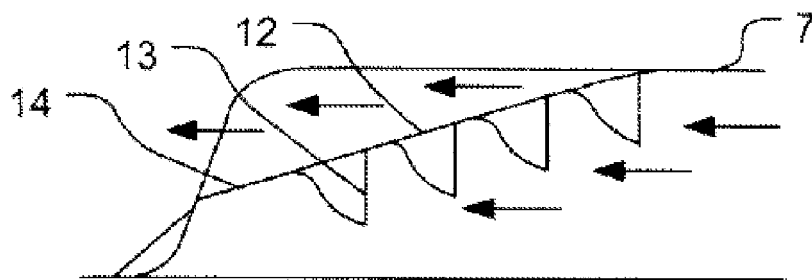


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1925714 A1 [0003]
- DE 1610090 A1 [0003]