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(54) **CLOTHES DRYER INCLUDING CONDENSING APPARATUS**

(57) A clothes dryer including a condensing apparatus is provided, where the condensing apparatus (10) includes a hot air channel (4), in communication with a drying chamber (2), and a water supply apparatus (8), for feeding cooling water into the hot air channel (4), an inlet (41) of the hot air channel (4) being located at a lower location, an outlet (42) of the hot air channel (4) being located at a higher location, where at least one flow guide rib (11a, 11b) is formed on a wall (4a, 4b, 4c, 4d) of the hot air channel (4), an upper end (111a, 111b) of the flow guide rib (11a, 11b) is close to an outlet (81) of the water supply apparatus (8), a lower end (112a, 112b) thereof is close to the inlet (41) of hot air channel (4), and the flow guide rib (11a, 11b) and the wall (4a, 4b, 4c, 4d) of the hot air channel (4) define a cooling water flowing area (12) together. After entering the hot air channel, the cooling water subsequently enters the cooling water flowing area defined by the flow guide rib and the wall of the hot air channel together, and would not be splashed randomly. Therefore, a condensing effect is more stable, and condensing efficiency is improved.

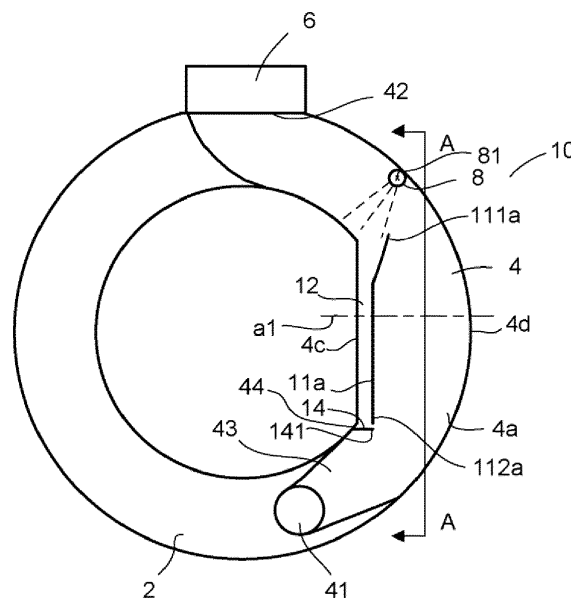


FIG. 1

Description

[0001] The present invention relates to a clothes dryer including a condensing apparatus, where the condensing apparatus includes a hot air channel, in communication with a drying chamber, and a water supply apparatus for feeding cooling water into the hot air channel.

[0002] Clothes dryers usually include machines purely having a function of a clothes dryer and machines integrated with clothes washing and clothes drying functions. A drying principle of a clothes dryer may be generally summarized as follows: under an effect of a heating apparatus, after being heated by the heating apparatus, dry air forms dry hot air, which then enters a drying drum to exchange heat with wet clothes and removes moisture from the clothes, and forms relatively damp hot air; upon condensation by a condensing apparatus, moisture of the damp hot air is condensed into water, which is then discharged through a drain pipe; after being condensed, the air becomes relatively dry cold air, and under an effect of a fan, is led into the heating apparatus again, and forms dry hot air after being heated to enter a next cycle; and such a process is repeated until a drying program ends.

[0003] The condensing apparatus may include a cooling water supply apparatus. After meeting with wet hot air, cooling water reduces the temperature of the hot air, to separate moisture from the hot air. After entering a hot air channel, the cooling water is likely to be blown about by a high-speed air flow, a condensing effect is unstable. Meanwhile, water droplets that are blown about may enter the fan and a heating channel that are downstream in a circulation direction of the hot air, resulting in reduction of drying efficiency.

[0004] An objective of the present invention is to improve condensing efficiency of a condensing apparatus of an existing clothes dryer.

[0005] For the foregoing objective, the present invention provides a clothes dryer including a condensing apparatus, where a condensing apparatus includes a hot air channel, in communication with a drying chamber, and a water supply apparatus, for feeding cooling water into the hot air channel, an inlet of the hot air channel being located at a lower location, an outlet of the hot air channel being located at a higher location, where at least one flow guide rib is formed on a wall of the hot air channel, an upper end of the flow guide rib is close to an outlet of the water supply apparatus, a lower end thereof is close to the inlet of hot air channel, and the flow guide rib and the wall of the hot air channel define a cooling water flowing area together. After entering the hot air channel, the cooling water subsequently enters the cooling water flowing area defined by the flow guide rib and the wall of the hot air channel together. In this area, a water flow flows downward along the wall. The flow guide rib also avoids transverse interference of hot air, so that the water flow is stable and would not be splashed randomly. Therefore, a condensing effect is more stable, and condensing efficiency is improved.

[0006] A further improvement of the present invention is that: the wall included by the hot air channel includes a first wall and a second wall that face each other and that are relatively broad and a third wall that connects the first wall and the second wall and that is relatively narrow, a first flow guide rib is located on the first wall, a second flow guide rib is located on the second wall, and the cooling water flowing area is formed on the first wall, the second wall, and the third wall that use the first flow guide rib and the second flow guide rib as boundaries. In such a structure, both the wall of the hot air channel and the flow guide rib implement a flow guiding function, so that the water flow stably flows along a side of the hot air channel.

[0007] Preferably, the outlet of the water supply apparatus is higher than a horizontal centerline of the hot air channel, and is disposed toward the cooling water flowing area. Such deposition provides a longer heat exchange path for the cooling water, and meanwhile, ensures the water to flow into the cooling water flowing area.

[0008] A protruding structure that transversely extends out is disposed below the cooling water flowing area. On the one hand, the protruding structure blocks and changes a flowing path of the cooling water, so that the cooling water transversely is dispersed on a surface of the protruding structure; on the other hand, the protruding structure blocks hot air below, to cause turbulence of the hot air. Hence, the turbulent hot air meets the dispersed cooling water at a location of the protruding structure, and the two get in sufficient contact with each other, disturb each other, and perform heat exchange. In view of this, the protruding structure produces a significant positive effect. Meanwhile, because the protruding structure is disposed below the cooling water flowing area, when arriving at the protruding structure, the cooling water has accumulated a certain amount of potential energy, so that the cooling water is dispersed on the protruding structure.

[0009] Particularly, the protruding structure extends out from the third wall toward an interior of the hot air channel and includes a free end extending out toward a central area of a cross section of the hot air channel in a suspended manner. The cooling water flows out from the free end, so that the cooling water is closer to the central area of the cross section of the hot air channel, and gets in sufficient contact with the hot air below.

[0010] Further, the protruding structure connects the first wall and the second wall. Hence, the cooling water only falls down on the free end of the protruding structure, and is more likely to enter the central area of the cross section of the hot air channel.

[0011] The hot air channel includes a bend proximal to the inlet, and the protruding structure is disposed at a bend joint. Air turbulence at the bend is stronger, and disposing the protruding structure at the bend more beneficially utilizes a design feature of the hot air channel and improves condensing efficiency.

[0012] The protruding structure is a plate integrally

formed with the wall of the hot air channel.

[0013] The present invention is further described below by referring to the accompanying drawings.

FIG. 1 is a schematic structural diagram of a drum and a condensing apparatus of a clothes dryer; and

FIG. 2 is a schematic diagram of a cross section along an A-A line in FIG. 1.

[0014] As shown in FIG. 1, a clothes dryer includes a drum 2, forming a drying chamber from clothes, a hot air channel 4, in spatial communication with the drum 2, and a fan 6, enabling air to circulate between the drum 2 and the hot air channel 4. The hot air channel 4 includes an inlet 41, located at a lower location and connected to the drum 2, and an outlet 42, located at a higher location and connected to the fan 6. A water supply apparatus 8 for feeding cooling water into the hot air channel 4 is disposed at a suitable location on the hot air channel 4 and higher than a horizontal centerline a1 of the hot air channel 4. The hot air channel 4 and the water supply apparatus 8 are main elements for forming a condensing apparatus 10.

[0015] As shown in FIG. 1 and FIG. 2, the hot air channel 4 includes a first wall 4a and a second wall 4b that face each other and that are relatively broad and a third wall 4c that connects the first wall 4a and the second wall 4b and that is relatively narrow. A first flow guide rib 11a is integrally formed on the first wall 4a, and a second flow guide rib 11b is integrally formed on the second wall 4b. The first flow guide rib 11a and the second flow guide rib 11b protrude toward an interior of the hot air channel 4, and meanwhile, are close to the third wall 4c that connects the first wall 4a and the second wall 4b. Hence, a cooling water flowing area 12 is formed on the first wall 4a, the second wall 4b, and the third wall 4c that use the first flow guide rib 11a and the second flow guide rib 11b as boundaries. Upper ends 111a and 111b of the first flow guide rib 11a and the second flow guide rib 11b are close to an outlet 81 of the water supply apparatus 8, and lower ends 112a and 112b thereof are close to the inlet 41 of the hot air channel. To make the cooling water enter the cooling water flowing area 12 more stable, the outlet 81 of the water supply apparatus is disposed toward the cooling water flowing area 12.

[0016] A baffle plate 14 integrally manufactured with the third wall 4c is disposed below the cooling water flowing area 12 and transversely extends from the third wall 4c toward the interior of the hot air channel 4. A side opposite to a side, on which the baffle plate 14 is connected to the third wall 4c, is a free end 141 extending toward a central area of a cross section of the hot air channel 4 in a suspended manner. Two other sides of the baffle plate 14 may be connected to the first wall 4a and the second wall 4b. In a process of falling down along the cooling water flowing area 12, the cooling water is blocked by the baffle plate 14, then, changes a flowing

path, is transversely dispersed on a surface of the baffle plate 14, and falls into the central area of the cross section of the hot air channel 4 from the free end 141. On the other hand, the baffle plate 14 blocks hot air below, to cause turbulence of the hot air. The turbulent hot air meets the dispersed cooling water at a location of the baffle plate 14, and the two get in sufficient contact with each other, disturb each other, and perform heat exchange. The hot air channel 4 includes bend 43 proximal to the inlet 41. The baffle plate 14 is disposed at a bend joint 44. Air turbulence at the bend is stronger, and disposing the baffle plate 14 at the bend more beneficially utilizes a design feature of the hot air channel 4 and improves condensing efficiency.

[0017] The foregoing descriptions and various specific implementation manners shown in the accompanying drawings are merely used for describing the present invention rather than all of the present invention. Within the scope of the basic technical ideas of the present invention, a change made by a person of ordinary skill in related art to the present invention in any form shall fall within the protection scope of the present invention.

Claims

1. A clothes dryer comprising a condensing apparatus, wherein a condensing apparatus (10) comprises a hot air channel (4), in communication with a drying chamber (2), and a water supply apparatus (8), for feeding cooling water into the hot air channel, an inlet (41) of the hot air channel being located at a lower location, an outlet (42) of the hot air channel being located at a higher location, **characterized in that:** at least one flow guide rib (11a, 11b) is formed on a wall (4a, 4b, 4c, 4d) of the hot air channel, an upper end (111a, 111b) of the flow guide rib is close to an outlet (81) of the water supply apparatus, a lower end (112a, 112b) thereof is close to the inlet (41) of the hot air channel, and the flow guide rib (11a, 11b) and the wall (4a, 4b, 4c, 4d) of the hot air channel define a cooling water flowing area (12) together.
2. The clothes dryer according to claim 1, **characterized in that:** the wall comprised by the hot air channel comprises a first wall (4a) and a second wall (4b) that face each other and that are relatively broad and a third wall (4c) that connects the first wall (4a) and the second wall (4b) and that is relatively narrow, a first flow guide rib (11a) is located on the first wall, a second flow guide rib (11b) is located on the second wall, and the cooling water flowing area (12) is formed on the first wall (4a), the second wall (4b), and the third wall (4c) that use the first flow guide rib (11a) and the second flow guide rib (11b) as boundaries.

3. The clothes dryer according to claim 1, **characterized in that:** the outlet (81) of the water supply apparatus is higher than a horizontal centerline (a1) of the hot air channel, and is disposed toward the cooling water flowing area (12). 5
4. The clothes dryer according to claim 1, **characterized in that:** a protruding structure (14) that transversely extends out is disposed below the cooling water flowing area (12). 10
5. The clothes dryer according to claim 4, **characterized in that:** the protruding structure (14) extends out from the third wall (4c) toward an interior of the hot air channel (4) and comprises a free end (141) extending out toward a central area of a cross section of the hot air channel (4) in a suspended manner. 15
6. The clothes dryer according to claim 5, **characterized in that:** the protruding structure (14) connects the first wall (4a) and the second wall (4b). 20
7. The clothes dryer according to claim 5, **characterized in that:** the hot air channel (4) comprises a bend (43) proximal to the inlet (41), and the protruding structure (14) is disposed at a bend joint (44). 25
8. The clothes dryer according to claim 4, **characterized in that:** the protruding structure is a plate (14) integrally formed with the wall (4a, 4b, 4c, 4d) of the hot air channel. 30

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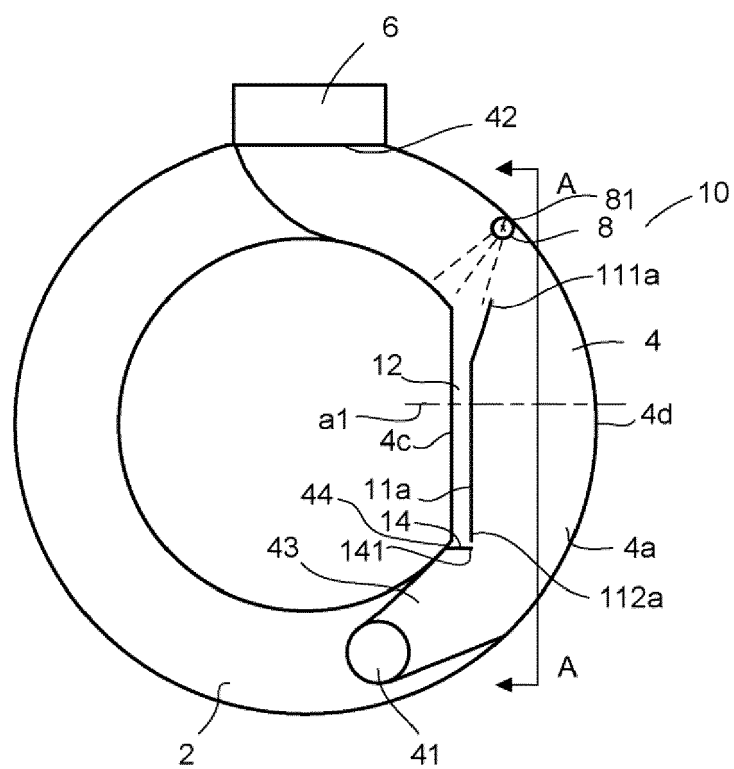


FIG. 1

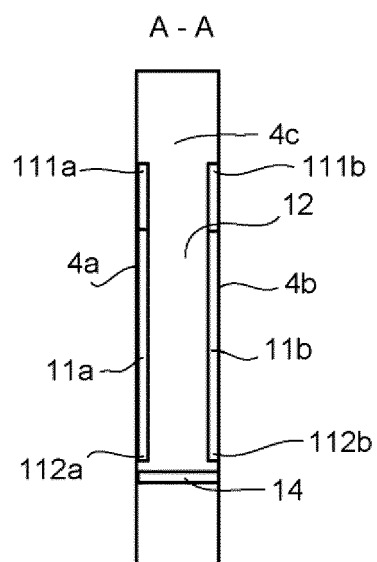


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 18 16 5733

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A	US 2016/369450 A1 (LEE SUNG MYUN [KR]) 22 December 2016 (2016-12-22) * paragraphs [0004] - [0006] * * paragraphs [0030] - [0039] * * figures 1-4 *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 August 2018	Examiner Weidner, Maximilian
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
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EP 18 16 5733

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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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