(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 723 928 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.04.2015 Bulletin 2015/18

(21) Application number: **12729106.0**

(22) Date of filing: **20.06.2012**

(51) Int Cl.:
D06F 25/00 *(2006.01)* ***D06F 33/02*** *(2006.01)*
D06F 58/24 *(2006.01)*

(86) International application number:
PCT/EP2012/061816

(87) International publication number:
WO 2013/000784 (03.01.2013 Gazette 2013/01)

(54) LAUNDRY WASHING AND DRYING MACHINE WITH AIR-COOLED CONDENSER

WASCHMASCHINE UND TROCKNER MIT LUFTGEKÜHLTEM KONDENSATOR

MACHINE À LAVER ET À SÉCHER LE LINGE DOTÉE D'UN CONDENSATEUR REFROIDI À L'AIR

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **27.06.2011 TR 201106336**

(43) Date of publication of application:
30.04.2014 Bulletin 2014/18

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WO-A1-2010/118935

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EP 2 723 928 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to a laundry washing and drying machine comprising an air-cooled condenser.

[0002] In laundry washing and drying machines, air-cooled condensers are widely used, that realize the condensation process by using the outer environment air in the drying process after the washing step. Humid air that comes from over the laundry and passes through the processing air channel is condensed in the condenser cooled by means of the outer environment air, thus the air that is dried by being dehumidified is sent again onto the laundry through the processing air channel. The condensation process realized in the air-cooled condenser depends on the temperature of the air coming from the outer environment. The outer environment temperature must be below a certain value in order that sufficient condensation may occur in the condenser and that the laundry can be dried. When the outer environment temperature increases, amount of moisture condensing in the condenser decreases and desired efficiency cannot be obtained in the drying process.

[0003] In the state of the art International Patent Application No. WO2010118935, a washer-dryer is described, wherein the outer environment temperature is measured by a temperature sensor on the cooling channel and wherein the speed of the cooling fan of the condenser is changed when the outer environment temperature rises over a certain value.

[0004] In the state of the art European Patent Application No. EP2169107, a spraying device is described, providing the condenser in a dryer to be washed and thus cleaned of fiber and lint at the end of the drying process.

[0005] The aim of the present invention is the realization of a laundry washing and drying machine wherein the condensing efficiency of the air-cooled condenser is improved at high outer environment temperatures.

[0006] The laundry washing and drying machine realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims comprises at least one temperature sensor detecting the temperature of the cooling air and/or the processing air and a water spraying device connected to the outer water mains through a valve and providing the condenser to be cleaned of fiber and lint, and if the temperature of the cooling air and/or the processing air exceeds the predefined limit values, the water spraying device sprays water onto the condenser. The water spraying device is operated in order to cool the condenser even if no fiber and lint accumulates on the condenser. Thus, the air-cooled condenser is operated with air and water double cold source when the outer environment temperature rises.

[0007] In an embodiment of the present invention, the water spraying device is placed in the vicinity of the condenser so as to aim the cooling channels through which the outer environment air, i.e. the cooling air, passes.

[0008] In another embodiment of the present invention, the water spraying device is placed at the inlet or the outlet part of the air circulation duct through which the processing air passes and by which it is connected to the condenser, and the water spraying device sprays water onto the outer surfaces of the cooling channels in the condenser.

[0009] In another embodiment of the present invention, when the temperature of the cooling air and/or the processing air exceeds the limit values, the fan providing the circulation of the processing air and the water spraying device are operated at intervals in the same time period, thus water sprayed over the condenser for cooling is prevented from being sent onto the laundry together with the processing air.

[0010] In another embodiment of the present invention, the water spraying device is placed at the part of the outer air line that enters into or exits from the condenser, and the water spraying device sends water to the inner surfaces of the cooling channels in the condenser.

[0011] In the laundry washing and drying machine of the present invention, the water spraying device is activated when the temperature of the cooling air and/or the processing air rises and is used for cooling the condenser, thus water cooling support is provided for the air-cooled condenser and the laundry is provided to be dried quickly.

[0012] The laundry washing and drying machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the schematic view of a laundry washing and drying machine.

Figure 2 - is the schematic view of a laundry washing and drying machine

[0013] in another embodiment of the present invention.

[0014] The elements illustrated in the figures are numbered as follows:

1. Laundry washing and drying machine
2. Drum
3. Air circulation duct
4. First fan
5. Condenser
6. Outer air line
7. Second fan
8. Drying channel
9. Cooling channel
10. 110 Temperature sensor
11. Valve
12. Water spraying device
13. Control unit

[0015] The laundry washing and drying machine (1) comprises a drum (2) wherein the laundry is placed, an air circulation duct (3) wherein the circulation of the processing air (PA) providing the drying of the laundry is realized at the drying process after the washing process,

a first fan (4) providing the circulation of the processing air (PA), an air-cooled condenser (5) condensing the processing air (PA), an outer air line (6) and a second fan (7) delivering the cooling air (CA) received from the outer environment to the condenser (5) in order to provide the cooling of the condenser (5), a heater (H) placed in the air ventilation duct (3), providing the dehumidified processing air (PA) coming from the condenser (5) to be heated and sent onto the laundry, at least one drying channel (8) passing through the condenser (5), through which passes the processing air (PA) coming from the air ventilation duct (3) by means of the first fan (4), at least one cooling channel (9) passing through the condenser (5), providing to draw heat from the drying channels (8), through which passes the cooling air (CA) coming from the outer air line (6) by means of the second fan (7), at least one temperature sensor (10, 110) placed in the outer air line (6) and/or at the condenser (5) outlet of the air ventilation duct (3), detecting the temperature of the cooling air (CA) and/or processing air (PA), a water spraying device (12) spraying water onto the condenser (5), a valve (11) placed prior to the water spraying device (12), connected to the water mains (S) and a control unit (13) controlling the washing - drying processes.

[0016] The laundry washing and drying machine (1) of the present invention comprises the control unit (13) that provides water to be sprayed onto the condenser (5) from the water spraying device (12) by opening the valve (11) when the temperature of the cooling air (CA) and/or the processing air (PA) detected by the temperature sensor (10, 110) exceeds the predefined limit temperature values saved in its memory and thus provides the air-cooled condenser (5) to be cooled with water besides air when the temperature of the cooling air (CA) and/or the processing air (PA) rises.

[0017] In an embodiment of the present invention, the water spraying device (12) is positioned near the condenser (5), aiming the walls of the cooling channels (9) so that the cooling channels (9) contact water, and water sprayed onto the condenser (5) touches the cooling channels (9) from inside or outside and decreases the temperature of the cooling air (CA) that passes through the cooling channels (9). Thus, the difference between the cooling air (CA) and the processing air (PA) is increased and the processing air (PA) is provided to be condensed in a quick manner in the drying channels (8) that transfer heat to the cooling channels (9).

[0018] While the drying process continues in the laundry washing and drying machine (1), the processing air (PA) getting humid by passing over the laundry in the drum (2) is sent to the condenser (5) by means of the first fan (4) and the air ventilation duct (3) and passes through the drying channels (8). The condenser (5) condenses and dehumidifies the processing air (PA) and the heater (H) heats the processing air (PA). The cooling air (CA) passes through the cooling channels (9) in the condenser (5) and the processing air (PA) passes through the drying channels (8). The cooling channels (9) decreases the temperature of the humid processing air (PA) passing through the drying channels (8) with which the cooling channels (9) have a heat-transfer relation and condenses the processing air (PA), and the dry processing air (PA) is sent onto the laundry in the drum (2). The temperature of the outer environment varies depending on the season and/or the temperature of the room wherein the laundry washing and drying machine (1) operates. When the temperature of the outer environment rises, for examples when it exceeds 30 - 35 ° C, as a matter of course the cooling air (CA) that draws heat from the humid processing air (PA) heats up and cannot provide a sufficient temperature difference for an efficient condensation. When the temperature of the cooling air (CA) rises and/or when the desired temperature difference does not occur at the inlet or the outlet of the condenser (5) as a result of the increase in the processing air (PA) temperature, the control unit (13) opens the valve (11) and activates the water spraying device (12) and thus water is sprayed onto the condenser (5) while the drying process continues. The water sprayed onto the condenser (5) contacts the walls of the cooling channels (9) and decreases the temperature thereof, consequently the temperature of the cooling air (CA) passing through the cooling channels (9) decreases, thus, the processing air (PA) is quickly dehumidified by increasing the temperature difference between the processing air (PA) and the cooling air (CA), and the drying effectiveness of the laundry washing and drying machine (1) at high outer environment temperatures is increased.

[0019] In another embodiment of the present invention, the water spraying device (12) is placed at the part of the air ventilation duct (3) that enters into or exists from the condenser (5) and when the temperature of the cooling air (CA) and/or the temperature of the processing air (PA) during the drying process exceeds the recorded limit values, the control unit (13) opens the valve (11) and provides water to be sent from the water spraying device (12) onto the outer surfaces of the cooling channels (9) that are one within the other with the drying channels (8) (Figure 1). The water sprayed from the water spraying device (12) passes through the drying channels (8) and contacts the outer surfaces of the walls forming the cooling channels (9) and decreases the temperature of the cooling air (CA) that passes through the cooling channels (9). Thus, the temperature difference between the processing air (PA) and the cooling air (CA) is increased, thereby increasing the condensation effectiveness of the condenser (5). In this embodiment, the water spraying device (12) sprays water to the drying channels (8) in the condenser (5) after the drying process is completed, and thus provides the removal of the fiber and lint accumulating in the drying channels (8).

[0020] In another embodiment of the present invention, the control unit (13) alternately activates the first fan (4) and the water spraying device (12) at intervals, when the temperature of the cooling air (CA) and/or the processing air (PA) rises. When the first fan (4) is operated by the

control unit (13), the valve (11) is closed, and when the valve (11) is opened, that is when the water spraying device (12) is operated, the first fan (4) is deactivated. Thus, the water sprayed from the water spraying device (12) is prevented from mixing into the processing air (PA) passing through the drying channels (8) and from being sent onto the laundry in the drum (2).

[0021] In another embodiment of the present invention, the water spraying device (12) is placed at the part of the outer air line (6) that enters into or exists from the condenser (5) and when the temperature of the cooling air (CA) and/or the temperature of the processing air (PA) rises during the drying process, the control unit (13) opens the valve (11) and provides water to be sent from the water spraying device (12) onto the inner surfaces of the cooling channels (9) (Figure 2). Water contacts the inner surfaces of the walls forming the cooling channels (9) and decreases the temperature of the cooling air (CA). Thus, the temperature difference between the processing air (PA) and the cooling air (CA) is increased, thereby increasing the condensation effectiveness of the condenser (5).

[0022] In the laundry washing and drying machine (1) of the present invention, the water spraying device (12) that sprays water onto the condenser (5), thereby providing it to be cleaned of fiber and lint accumulating at the end of the drying process and that is used for the same purpose in the known embodiments, is activated by the control unit (13) when the temperature of the cooling air (CA) and/or the processing air (PA) rises and is used in order to cool the condenser (5). With the activation of the water spraying device (12), the air-cooled condenser (5) becomes air- and water-cooled, thus providing an efficient and fast drying.

[0023] It is to be understood that the present invention is not limited by the embodiments disclosed above and a person skilled in the art can easily introduce different embodiments. These should be considered within the scope of the protection disclosed by the claims of the present invention.

Claims

1. A laundry washing and drying machine (1) **comprising** a drum (2) wherein the laundry is placed, an air circulation duct (3) wherein the circulation of the processing air (PA) providing the drying of the laundry is realized at the drying process after the washing process, a first fan (4) providing the circulation of the processing air (PA), an air-cooled condenser (5) condensing the processing air (PA), an outer air line (6) and a second fan (7) delivering the cooling air (CA) received from the outer environment to the condenser (5) in order to provide the cooling of the condenser (5), at least one drying channel (8) arranged in the condenser (5), through which the processing air (PA) passes, at least one cooling channel (9) passing through the condenser (5), through which passes the cooling air (CA) coming from the outer air line (6) by means of the second fan (7), at least one temperature sensor (10, 110) placed in the outer air line (6) and/or at the condenser (5) outlet of the air ventilation duct (3), a water spraying device (12) spraying water onto the condenser (5), a valve (11) placed prior to the water spraying device (12), connected to the water mains (S) and a control unit (13), **characterized in that** the control unit (13) for providing water to be sprayed onto the condenser (5) from the water spraying device (12) by opening the valve (11) when the temperature of the cooling air (CA) and/or the processing air (PA) detected by the temperature sensor (10, 110) exceeds the predefined limit temperature values saved in its memory.

2. A laundry washing and drying machine (1) as in Claim 1, **characterized in that** the water spraying device (12) positioned in the vicinity of the condenser (5) so as to aim the walls of the cooling channels (9).

3. A laundry washing and drying machine (1) as in Claim 1 or 2, **characterized in that** the water spraying device (12) placed at the condenser (5) inlet or the condenser (5) outlet of the air ventilation duct (3) and that sprays water to the outer surfaces of the cooling channels (9).

4. A laundry washing and drying machine (1) as in any one of the above claims, **characterized in that** the control unit (13) alternately operates the first fan (4) and the water spraying device (12) at intervals when the temperature of the cooling air (CA) and/or the processing air (PA) rises.

5. A laundry washing and drying machine (1) as in Claim 1 or 2, **characterized in that** the water spraying device (12) is placed at the condenser (5) inlet or the condenser (5) outlet of the outer air line (6) and that it sprays water to the inner surfaces of the cooling channels (9).

Patentansprüche

1. Wasch- und Trockenmaschine (1), **umfassend** eine Trommel (2), in die die Wäsche gegeben wird, einen Luftzirkulationskanal (3), in dem die Zirkulation der Prozessluft (PA) zum Trocknen der Wäsche während des Trocknungsvorgangs nach dem Waschvorgang stattfindet, ein erstes Gebläse (4), das die Zirkulation der Prozessluft (PA) entwickelt ermöglicht, einen luftgekühlten Kondensator (5), der die Prozessluft (PA) kondensiert, eine Außenluftleitung (6) und ein zweites Gebläse (7), das die Kühlungsluft (CA) von der Außenumgebung an den Kondensator (5) leitet, um die Kühlung des Kondensators (5) zu

ermöglichen, wenigstens einen Trocknungskanal (8), der im Kondensator (5) angeordnet ist und durch den die Prozessluft (PA) strömt, wenigstens einen Kühlungskanal (9), der durch den Kondensator (5) verläuft und durch den mittels des zweiten Gebläses (7) die Kühlungsluft (CA) von der Außenluftleitung (6) strömt, wenigstens einen Temperatursensor (10, 110), der in der Außenluftleitung (6) und/oder am Auslass des Kondensators (5) des Lüftungskanals (3) angeordnet ist, eine Wassersprühvorrichtung (12), die Wasser auf den Kondensator (5) sprüht, ein Ventil (11), das vor der Wassersprühvorrichtung (12) angeordnet ist und mit der Wasserversorgung (S) verbunden ist, und eine Steuereinheit (13), **dadurch gekennzeichnet, dass** die Steuereinheit (13) dafür sorgt, dass Wasser von der Wassersprühvorrichtung (12) auf den Kondensator (5) gesprüht wird, indem das Ventil (11) geöffnet wird, wenn die Temperatur der Kühlungsluft (CA) und/oder der Prozessluft (PA), die von dem Temperatursensor (10, 110) erkannt wird, die in ihrem Speicher gespeicherten vordefinierten Grenztemperaturwerte übersteigt.

2. Wasch- und Trockenmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Wassersprühvorrichtung (12) in der Nähe des Kondensators (5) angeordnet ist, um auf die Wände der Kühlkanäle (9) zu zielen.

3. Wasch- und Trockenmaschine (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Wassersprühvorrichtung (12) am Einlass des Kondensators (5) oder am Auslass des Kondensators (5) des Lüftungskanals (3) angeordnet ist und Wasser auf die Außenflächen der Kühlkanäle (9) sprüht.

4. Wasch- und Trockenmaschine (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Steuereinheit (13) in Intervallen abwechselnd das erste Gebläse (4) und die Wassersprühvorrichtung (12) betreibt, wenn die Temperatur der Kühlungsluft (CA) und/oder der Prozessluft (PA) ansteigt.

5. Wasch- und Trockenmaschine (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Wassersprühvorrichtung (12) am Einlass des Kondensators (5) oder am Auslass des Kondensators (5) der Außenluftleitung (6) angeordnet ist und Wasser auf die Innenflächen der Kühlkanäle (9) sprüht.

Revendications

1. Une machine à laver/sécher (1) **comprenant** un tambour (2) où le linge est placé, un conduit de circulation d'air (3) où l'air de processus (PA) permettant le séchage du linge est circulé au processus de séchage après le processus de lavage, un premier ventilateur (4) permettant la circulation de l'air de processus (PA), un condenseur à air (5) condensant l'air de processus (PA), une conduite d'air extérieure (6) et un second ventilateur (7) délivrant l'air de refroidissement (CA) reçu de l'environnement extérieur au condenseur (5) afin de permettre le refroidissement du condenseur (5), au moins un canal de séchage (8) arrangé dans le condenseur (5), à travers lequel l'air de processus (PA) passe, au moins un canal de refroidissement (9) qui passe à travers le condenseur (5) et à travers lequel passe l'air de refroidissement (CA) venant de la conduite d'air extérieure (6) au moyen du second ventilateur (7), au moins un capteur de température (10, 110) placé dans la conduite d'air extérieure (6) et/ou à la sortie du conduit de circulation d'air (3) au condenseur (5), un dispositif de pulvérisation d'eau (12) qui pulvérise l'eau sur le condenseur (5), une soupape (11) qui est placée avant le dispositif de pulvérisation d'eau (12) et reliée à l'alimentation en eau (S) et une unité de commande (13), **caractérisée par** l'unité de commande (13) qui permet la pulvérisation de l'eau sur le condenseur (5) du dispositif de pulvérisation d'eau (12) en ouvrant la soupape (11) lorsque la température de l'air de refroidissement (CA) et/ou l'air de processus (PA) détectée(s) par le capteur de température (10, 110) dépasse les valeurs limites de température prédéterminées qui sont enregistrées dans sa mémoire.

2. Une machine à laver/sécher (1) selon la Revendication 1, **caractérisé par** le dispositif de pulvérisation d'eau (12) qui est positionné à proximité du condenseur (5) de manière à viser les parois des canaux de refroidissement (9).

3. Une machine à laver/sécher (1) selon la Revendication 1 ou 2, **caractérisé par** le dispositif de pulvérisation d'eau (12) qui est placé à l'entrée du condenseur (5) ou à la sortie du condenseur (5) du conduit de circulation d'air (3) et qui pulvérise l'eau aux surfaces extérieures des canaux de refroidissement (9).

4. Une machine à laver/sécher (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** l'unité de commande (13) fonctionne alternativement le premier ventilateur (4) et le dispositif de pulvérisation d'eau (12) à des intervalles lorsque la température de l'air de refroidissement (CA) et/ou de l'air de processus (PA) augmente/augmentent.

5. Une machine à laver/sécher (1) selon la Revendication 1 ou 2, **caractérisé en ce que** le dispositif de pulvérisation d'eau (12) est placé à l'entrée du condenseur (5) ou à la sortie du condenseur (5) de la conduite d'air extérieure (6) et qu'il pulvérise l'eau aux surfaces intérieures des canaux de refroidissement (9).

Figure 1

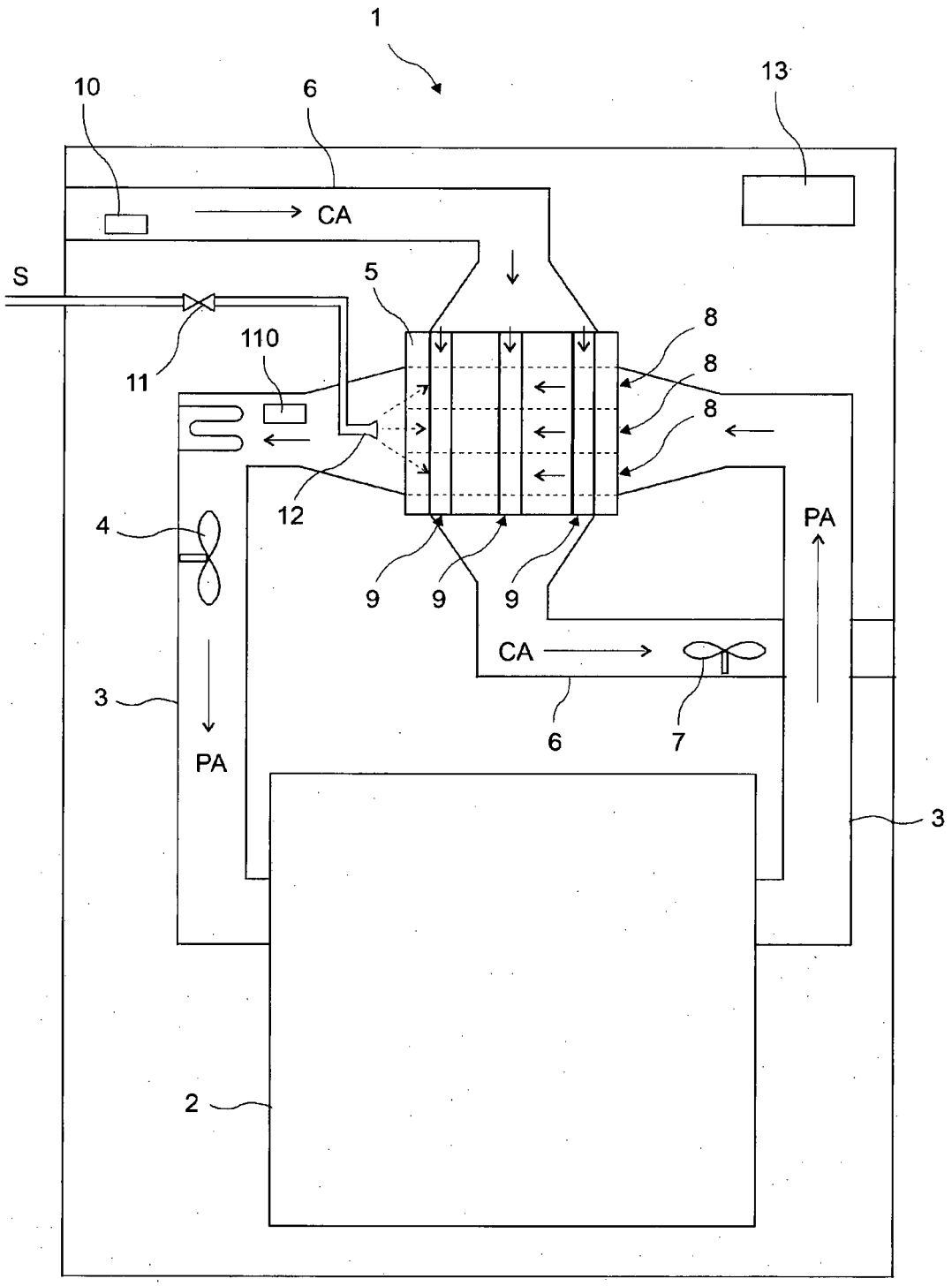
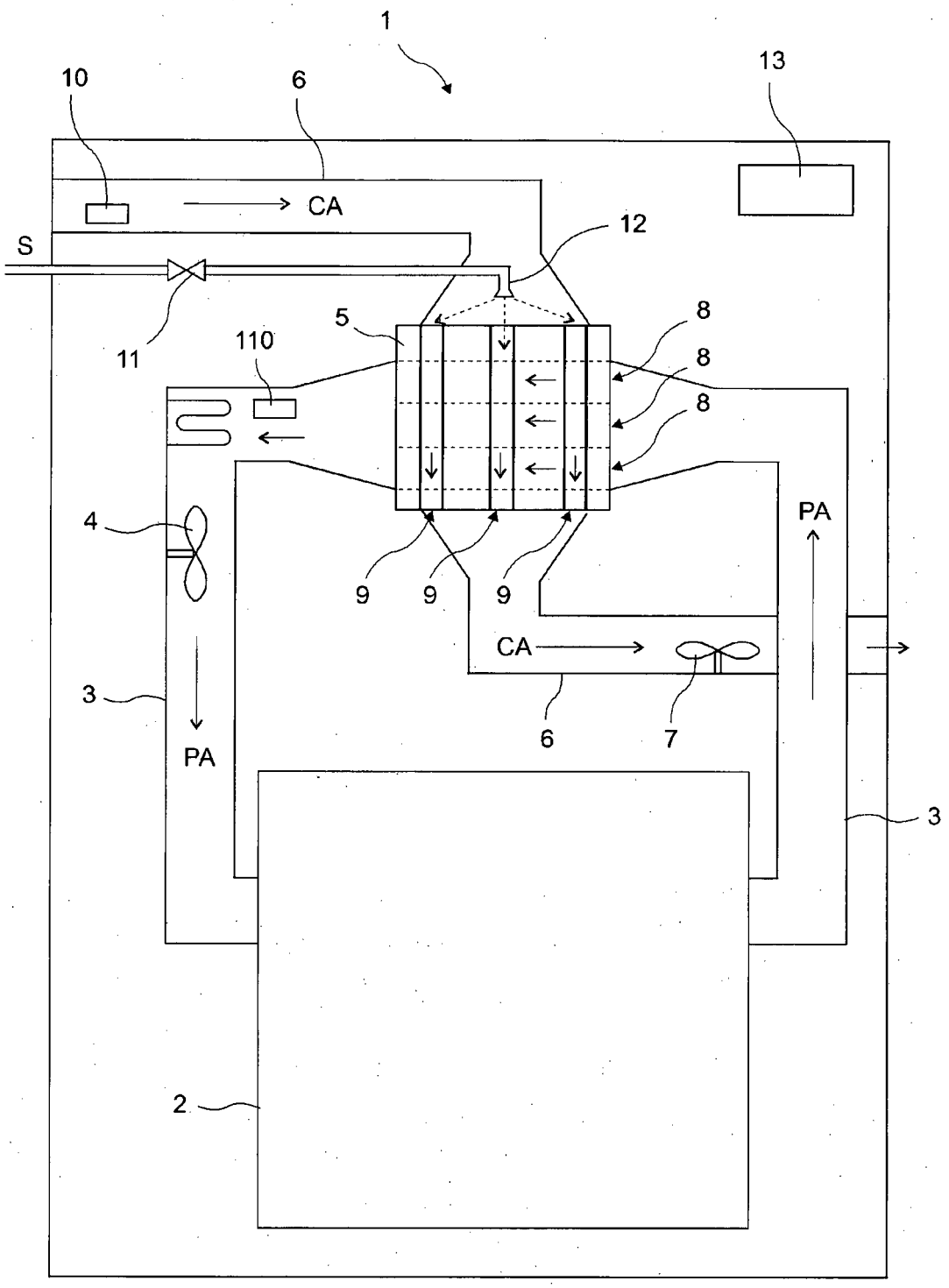


Figure 2



REFERENCES CITED IN THE DESCRIPTION

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