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(54) **A LAUNDRY WASHING AND DRYING MACHINE COMPRISING A CONDENSER**

WASCHMASCHINE UND WÄSCHETROCKNER MIT EINEM KONDENSATOR

MACHINE À LAVER ET À SÉCHER LE LINGE COMPRENANT UN CONDENSEUR

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Description

[0001] The present invention relates to a laundry washing and drying machine that comprises a condenser.

[0002] In laundry washing and drying machines, air-cooled condensers are widely used, which realize the condensation process by using the outer environment air in the drying process after washing. The humid air that comes from over the laundry and passes through the processing air duct 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 duct. During the drying process, fibers and lint are formed as the result of laundry rubbing against each other or the drum and these are carried to the condenser together with the drying air. Fibers and lint accumulate especially at the inlets and the inner surfaces of the processing air passage ducts in the condenser. Fibers and lint accumulating in the condenser form a layer on the air channel surface and adversely affect the heat transfer and the efficiency of the condenser. The decreasing efficiency of the condenser increases the drying time and energy consumption. Water spraying devices are used to cleanse the fibers and lint formed at the end of the drying cycle; however, fibers and lint accumulating especially in the very narrow air channels inside the condensers cannot be properly cleansed.

[0003] In the state of the art European Patent Application No. EP2169107, a spraying device is described, providing the condenser disposed in a dryer to be washed and thus cleaned of fiber and lint at the end of the drying process.

[0004] The aim of the present invention is the realization of a laundry washing and drying machine wherein the fibers and lint accumulating in the condenser are provided to be cleansed.

[0005] 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 thereof comprises an air-cooled condenser that is situated at the circulation duct wherein the processing air cycle, providing the laundry to be dried at the drying process after the washing process, is performed. The condenser has air channels extending in the flow direction of the processing air. Tube-shaped spraying devices are disposed into the air channels. The spraying devices receive water from a water dispenser placed at the condenser inlet or the condenser outlet and carry the water into the air channels, thus providing the fibers and lint to be cleansed. Nozzles branching off from the spraying devices oppositely extend in the opposite directions into the air channels and jets of water sprayed from the nozzles are collided against each other, thus providing the fibers and lint sticking onto the air channels to be efficiently cleansed.

[0006] In an embodiment of the present invention, into each air channel, two spraying devices are disposed, extending along the right and left sides of the channel. The

nozzles facing each other on the spraying devices spray water towards each other, and jets of water sprayed from both sides are provided to be collided in the middle of the air channel.

[0007] In another embodiment of the present invention, water is sprayed into the air channel by means of two nozzles situated oppositely on the spraying devices at the condenser inlet side, two nozzles situated oppositely at the condenser outlet side and two nozzles situated oppositely in the middle of the spraying devices and close to the condenser inlet. Jets of water sprayed from the nozzles generate a vortex in the middle of the air channel and the fibers and lint sticking onto the lower and upper surfaces of the air channel are efficiently cleansed.

[0008] In another embodiment of the present invention, the nozzles on the spraying devices spray water angularly to the condenser inlet and especially the condenser inlet where the fibers and lint densely accumulate is efficiently cleansed.

[0009] In another embodiment of the present invention, the spraying device is placed longitudinally at the middle of the condenser air channel and the nozzles extending sideways in opposite directions from the spraying device spray water to the air channel.

[0010] In an embodiment of the present invention, the condenser is placed onto the tub in an inclined manner, the spraying device extends from the condenser outlet towards the condenser inlet and the water sprayed flows downwards through the inclined air channel and leaves the condenser.

[0011] In the laundry washing and drying machine of the present invention, the fibers and lint sticking onto the surfaces surrounding the condenser air channels are efficiently cleansed by means of the spraying devices and the nozzles extending into the air channels, thus the efficiency of the condenser is improved.

[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 perspective view of the tub, the circulation duct and the condenser all situated in a laundry washing and drying machine.

Figure 3 - is the schematic view wherein a condenser and spraying devices therein are perpendicular to the processing air flow.

Figure 4 - is the schematic view wherein a condenser and spraying devices therein are in the same direction as the processing air flow.

Figure 5 - is the schematic view wherein a condenser and spraying devices therein are perpendicular to the processing air flow in another embodiment of the present invention.

[0013] The elements illustrated in the figures are numbered as follows:

1. Laundry washing and drying machine
2. Drum
3. Tub
4. Circulation duct
5. Fan
6. Air channel
7. Condenser
8. Condenser inlet
9. Condenser outlet
10. Dispenser
11. Spraying device
12. Nozzle
13. Heater

[0014] The laundry washing and drying machine (1) is horizontal axis and front loading type, and comprises a drum (2) wherein the laundry is placed, a tub (3) wherein the drum (2) moves, a circulation duct (4) wherein the processing air (PA) circulation, providing the drying of the laundry, is performed in the drying process after the washing process, a fan (5) that provides circulation of the processing air (PA) in the circulation duct (4), a heater (13) heating the processing air (PA), an air-cooled condenser (7) disposed onto the circulation duct (4), having at least one air channel (6) wherein the processing air (PA) passing therethrough is condensed, a condenser inlet (8) through which the processing air (PA) enters the condenser (7) and a condenser outlet (9) through which the processing air (PA) leaves the condenser (7).

[0015] The laundry washing and drying machine (1) of the present invention comprises

- a dispenser (10) that is placed at the condenser inlet (8) or the condenser outlet (9) and that directs the water received from the water mains to the air channel (6) during the fiber and lint cleansing process performed at the end of the drying process,
- at least one tube-shaped spraying device (11) that is connected to the dispenser (10), that is placed into the air channels (6) and that carries the water coming from the dispenser (10) into the air channel (6), and
- more than one nozzle (12) that are situated on the spraying device (11) and that sprays water into the air channel (6) in the opposite directions and towards each other.

[0016] In the laundry washing and drying machine (1), during the drying process, the processing air (PA) passing over the laundry and becoming humid is delivered to the condenser (7) by passing from the tub (3) outlet by means of the circulation duct (4) and is condensed by passing through the air channels (6) in the condenser (7). During the drying process, the fibers and lint formed as the result of the laundry rubbing against the drum (2) and each other are conveyed by the processing air (PA) and accumulate at the condenser inlet (8) and in the air channels (6) inside the condenser (7). The spraying device (11) is operated for cleansing the fibers and lint at

the end of the drying process. The water received from the mains is carried to the air channel (6) by means of the dispenser (10) and the spraying device (11). The water sprayed into the air channel (6) from the nozzles (12) cleanses the fibers and lint accumulating at the condenser inlet (8) and on the surfaces surrounding the air channel (6). The nozzles (12) are positioned on the spraying device (11) in the opposite directions and facing each other, and the jets of water sprayed from the nozzles (12) are provided to be collided with each other and/or to hit the surfaces surrounding the air channel (6), thus to be stirred and agitated. The jets of water sprayed from the nozzles (12) almost completely contact the surfaces surrounding the air channel (6) and the air channel (6) is efficiently cleansed of fibers and lint.

[0017] In an embodiment of the present invention, the laundry washing and drying machine (1) comprises two spraying devices (11) that extend between the condenser inlet (8) and the condenser outlet (9) in the processing air (PA) flow direction and that are placed right and left at the sides of the air channel (6), and the nozzles (12) positioned oppositely and facing each other on the spraying devices (11) such that the jets of water sprayed thereby collide at the middle of the air channel (6) (Figure 2, Figure 3, Figure 4). The jets of water sprayed by the nozzles (12) from the sides of the air channel (6) toward the middle thereof collide at the middle of the air channel (6) and the lower and upper surfaces of the air channel (6) are provided to be efficiently cleansed.

[0018] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises two nozzles (12) positioned oppositely on the spraying devices (11) at the condenser inlet (8) side, two nozzles (12) positioned oppositely on the spraying devices (11) at the condenser outlet (9) side and two nozzles (12) positioned oppositely on the spraying devices (11) at the middle of the spraying devices (11) so as to be close to the nozzles (12) at the condenser inlet (8) (Figure 4).

[0019] The jets of water sprayed from the nozzles (12) at the condenser inlet (8) side collide at the middle of the air channel (6) and cleanse the condenser inlet (8). The jets of water sprayed from the opposite nozzles (12) at the middle of the spraying devices (11) and at the condenser outlet (9) side form a vortex at the middle of the air channel (6) and spread in a wide area, thus provides this region to be efficiently cleansed of fibers and lint. The water vortex, furthermore, creates a barrier against the jets of water that are sprayed from the nozzles (12) at the condenser inlet (8) side into the air channel (6) and that flow towards the condenser outlet (9), thus the water is provided to stay in the air channel (6) for a longer period of time.

[0020] In another embodiment of the present invention, the nozzles (12) on the spraying devices (11) spray water angularly to the condenser inlet (8) (Figure 4). In this embodiment, the water sprayed from the nozzles (12) moves inside the air channel (6) towards the condenser inlet (8) and the condenser inlet (8) is provided to be

washed with a large amount of water.

[0021] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises the spraying device (11) that extends between the condenser inlet (8) and the condenser outlet (9) in the processing air (PA) flow direction and that is placed at the middle of the air channel (6), and more than one nozzle (12) positioned at the right and left of the spraying device (11), in opposite directions with respect to each other, spraying water towards the sides of the air channel (6) (Figure 5).

[0022] In another embodiment of the present invention, the condenser (7) is placed at the upper side of the tub (3) in an inclined manner so that the condenser inlet (8) is above the condenser outlet (9) level and the air channel (6) extends downhill from the condenser inlet (8) towards the condenser outlet (9) in an inclined manner (Figure 1, Figure 2). The dispenser (10) is placed at the condenser outlet (9) and the water spraying device (11) carries the water uphill inside the air channel (6) from the condenser outlet (9) towards the condenser inlet (8) in an opposite direction to the processing air (PA) flow direction (there is no processing air (PA) flow during the condenser (7) washing process, the term "processing air (PA) flow direction" is provided only for defining the said directions). Some of the water sprayed by means of the nozzles (12) from the spraying device (11) to the air channel (6) moves uphill inside the air channel (6) with the effect of the pressure to be carried to the condenser inlet (8) and cleanses the condenser inlet (8), then flows downhill inside the air channel (6) due to the inclination and leaves the condenser (7) via the condenser outlet (9).

[0023] In the laundry washing and drying machine (1) of the present invention, the jets of water oppositely sprayed from the nozzles (12) branching out in opposite directions from the spraying devices (11) that extend into the condenser (7) air channel (6) are collided and a water agitation effect is created inside the air channel (6). The fibers and lint accumulating in the condenser (7) air channel (6), especially at the condenser inlet (8) and the lower and upper surfaces of the air channel (6), are efficiently cleansed. The efficiency of the condenser (7) is improved, the duration of the drying process is shortened and energy saving is provided.

[0024] 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 postulated 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,

- a tub (3) wherein the drum (2) moves,
- a circulation duct (4) wherein the processing air (PA) circulation, providing the drying of the laundry, is performed in the drying process after the washing process,
- a fan (5) that provides circulation of the processing air (PA) in the circulation duct (4),
- an air-cooled condenser (7) disposed onto the circulation duct (4), having at least one air channel (6) wherein the processing air (PA) passing therethrough is condensed,
- a condenser inlet (8) through which the processing air (PA) enters the condenser (7),
- a condenser outlet (9) through which the processing air (PA) leaves the condenser (7),
- a dispenser (10) that is placed at the condenser inlet (8) or the condenser outlet (9) and that directs the water to the air channel (6) during the fiber and lint cleansing process performed at the end of the drying process,
- at least one spraying device (11) that is connected to the dispenser (10), that is placed into the air channels (6) and that carries the water coming from the dispenser (10) into the air channel (6),

characterized in that

- the dispenser (10) receives water from the water mains, and
- more than one nozzle (12) are situated on the spraying device (11) and spray water into the air channel (6) in the opposite directions and towards each other.

2. A laundry washing and drying machine (1) as in Claim 1, **characterized by** two spraying devices (11) that extend between the condenser inlet (8) and the condenser outlet (9) in the processing air (PA) flow direction and that are placed at the sides of the air channel (6), and the nozzles (12) positioned oppositely and facing each other on the spraying devices (11).

3. A laundry washing and drying machine (1) as in Claim 1 or 2, **characterized by** two nozzles (12) positioned oppositely on the spraying devices (11) at the condenser inlet (8) side, two nozzles (12) positioned oppositely on the spraying devices (11) at the condenser outlet (9) side and two nozzles (12) positioned oppositely on the spraying devices (11) at the middle of the spraying devices (11) so as to be close to the condenser inlet (8).

4. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** the nozzles (12) on the spraying devices (11), spraying water angularly to the condenser inlet (8).

5. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** the spraying device (11) that extends between the condenser inlet (8) and the condenser outlet (9) in the processing air (PA) flow direction and that is placed at the middle of the air channel (6), and more than one nozzle (12) positioned at the right and left of the spraying device (11), in opposite directions with respect to each other, spraying water towards the sides of the air channel (6).
6. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** the air channel (6) extending downhill from the condenser inlet (8) towards the condenser outlet (9), the dispenser (10) placed at the condenser outlet (9) and the water spraying device (11) that carries the water inside the air channel (6) from the condenser outlet (9) towards the condenser inlet (8).

Patentansprüche

1. Wäschewasch- und -trockenmaschine (1), umfassend
- eine Trommel (2), in die die Wäsche gegeben wird,
 - einen Behälter (3), in dem sich die Trommel (2) bewegt,
 - eine Zirkulationsleitung (4), in der die Zirkulation der Prozessluft (PA), die für das Trocknen der Wäsche sorgt, im Trocknungsvorgang nach dem Waschvorgang durchgeführt wird,
 - ein Gebläse (5), das für die Zirkulation der Prozessluft (PA) in der Zirkulationsleitung (4) sorgt,
 - einen luftgekühlten Kondensator (7), der an der Zirkulationsleitung (4) angeordnet ist und wenigstens einen Luftkanal (6) aufweist, in dem die Prozessluft (PA), die durch diesen hindurchströmt, kondensiert wird,
 - einen Kondensatoreinlass (8), durch den die Prozessluft (PA) in den Kondensator (7) gelangt,
 - einen Kondensatorauslass (9), durch den die Prozessluft (PA) den Kondensator (7) verlässt,
 - eine Abgabevorrichtung (10), die am Kondensatoreinlass (8) oder Kondensatorauslass (9) angeordnet ist und das Wasser während des Faser- und Flusenreinigungsvorgangs, der am Ende des Trockenvorgangs durchgeführt wird, zum Luftkanal (6) lenkt,
 - wenigstens eine Sprühhvorrichtung (11), die mit der Abgabevorrichtung (10) verbunden ist, die in den Luftkanal (6) angeordnet ist und das Wasser, das von der Abgabevorrichtung (10) kommt, in den Luftkanal (6) leitet,

dadurch gekennzeichnet, dass

- die Abgabevorrichtung (10) Wasser vom Wasserversorgungsnetz erhält, und
 - mehrere Düsen (12) an der Sprühhvorrichtung (11) angeordnet sind und in entgegengesetzten Richtungen und zueinander hin Wasser in den Luftkanal (6) sprühen.
2. Wäschewasch- und -trockenmaschine (1) nach Anspruch 1, **gekennzeichnet durch** zwei Sprühhvorrichtungen (11), die sich zwischen dem Kondensatoreinlass (8) und dem Kondensatorauslass (9) in der Strömungsrichtung der Prozessluft (PA) erstrecken und auf den Seiten des Luftkanals (6) angeordnet sind, und **dadurch**, dass die Düsen (12) an den Sprühhvorrichtungen (11) einander gegenüber und einander zugewandt angeordnet sind.
3. Wäschewasch- und -trockenmaschine (1) nach Anspruch 1 oder 2, **gekennzeichnet durch** zwei Düsen (12), die auf der Seite des Kondensatoreinlasses (8) einander gegenüber an den Sprühhvorrichtungen (11) angeordnet sind, zwei Düsen (12), die auf der Seite des Kondensatorauslasses (9) einander gegenüber an den Sprühhvorrichtungen (11) angeordnet sind, und zwei Düsen (12), die in der Mitte der Sprühhvorrichtungen (11) einander gegenüber an den Sprühhvorrichtungen (11) angeordnet sind, derart, dass sie nah am Kondensatoreinlass (8) sind.
4. Wäschewasch- und -trockenmaschine (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Düsen (12) an den Sprühhvorrichtungen (11) Wasser abgewinkelt zum Kondensatoreinlass (8) sprühen.
5. Wäschewasch- und -trockenmaschine (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sich die Sprühhvorrichtung (11) zwischen dem Kondensatoreinlass (8) und dem Kondensatorauslass (9) in Strömungsrichtung der Prozessluft (PA) erstreckt und in der Mitte des Luftkanals (6) angeordnet ist, und dass mehrere Düsen (12) rechts und links von der Sprühhvorrichtung (11) in zueinander entgegengesetzten Richtungen angeordnet sind, die Wasser zu den Seiten des Luftkanals (6) sprühen.
6. Wäschewasch- und -trockenmaschine (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sich der Luftkanal (6) vom Kondensatoreinlass (8) zum Kondensatorauslass (9) abwärts erstreckt, die Abgabevorrichtung (10) am Kondensatorauslass (9) angeordnet ist und die Wassersprühhvorrichtung (11) Wasser im Luftkanal (6) vom Kondensatorauslass (9) zum Kondensatoreinlass (8) befördert.

Revendications

1. Un lave/sèche-linge (1) comprenant

- un tambour (2) dans lequel le linge est placé 5
- une cuve (3) dans laquelle le tambour (2) se déplace,
- un conduit de circulation (4) où la circulation de l'air de processus (PA) permettant le séchage du linge est effectuée au processus de séchage après le processus de lavage, 10
- un ventilateur (5) permettant la circulation de l'air de processus (PA) dans le conduit de circulation (4),
- un condenseur à air (7) qui est disposé sur le conduit de circulation (4) et qui présente au moins un canal d'air (6) où l'air de processus (PA), qui le traverse, est condensé, 15
- une entrée de condenseur (8) par laquelle l'air de processus (PA) entre dans le condenseur (7), 20
- une sortie de condenseur (9) par laquelle l'air de processus (PA) sort du condenseur (7),
- un distributeur (10) qui est placé à l'entrée de condenseur (8) ou à la sortie de condenseur (9) et qui dirige l'eau vers le canal d'air pendant le processus de nettoyage de fibres et peluches effectué à la fin du processus de séchage, 25
- au moins un dispositif de pulvérisation (11) qui est relié au distributeur (10), et qui est placé dans les canaux d'air (6) et qui transporte l'eau venant du distributeur (10) dans le canal d'air (6), 30

caractérisé en ce que

- le distributeur (10) reçoit l'eau de l'alimentation en eau, et 35
- plusieurs buses (12) sont situées sur le dispositif de pulvérisation (11) et pulvérisent l'eau dans le canal d'air (6) dans les directions opposées et l'un vers l'autre. 40

2. Un lave/sèche-linge (1) selon la Revendication 1, **caractérisé par** deux dispositifs de pulvérisation (11) qui s'étendent entre l'entrée de condenseur (8) et la sortie de condenseur (9) dans la direction de l'écoulement de l'air de processus (PA) et qui sont placés aux côtés du canal d'air (6), et les buses (12) qui sont positionnées de manière opposée et face à face sur les dispositifs de pulvérisation (11). 45

3. Un lave/sèche-linge (1) selon la Revendication 1 ou 2, **caractérisé par** deux buses (12) qui sont positionnées de manière opposée sur les dispositifs de pulvérisation (11) au niveau de l'entrée de condenseur (8), deux buses (12) qui sont positionnées de manière opposée sur les dispositifs de pulvérisation (11) au niveau de la sortie de condenseur (9) et deux buses (12) qui sont positionnées de manière oppo- 50

sée sur les dispositifs de pulvérisation (11) au milieu des dispositifs de pulvérisation (11) de manière à être proche de l'entrée de condenseur (8).

4. Un lave/sèche-linge (1) selon l'une quelconque des revendications précédentes, **caractérisé par** les buses (12) sur les dispositifs de pulvérisation (11), qui pulvérisent l'eau de manière angulaire à l'entrée de condenseur (8). 5

5. Un lave/sèche-linge (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le dispositif de pulvérisation (11) qui s'étend entre l'entrée de condenseur (8) et la sortie de condenseur (9) dans la direction de l'écoulement de l'air de processus (PA) et qui est placé au milieu du canal d'air (6) et plusieurs buses (12) qui sont positionnées à droite et à gauche du dispositif de pulvérisation (11) dans les directions opposées, qui pulvérisent l'eau vers les côtés du canal d'air (6). 10

6. Un lave/sèche-linge (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le canal d'air (6) qui s'étend en descendant à partir de l'entrée de condenseur (8) vers la sortie de condenseur (9), le distributeur (10) qui est placé à la sortie de condenseur (9) et le dispositif de pulvérisation d'eau (11) qui transporte l'eau dans le canal d'air (6) à partir de la sortie de condenseur (9) vers l'entrée de condenseur (8). 15

Figure 1

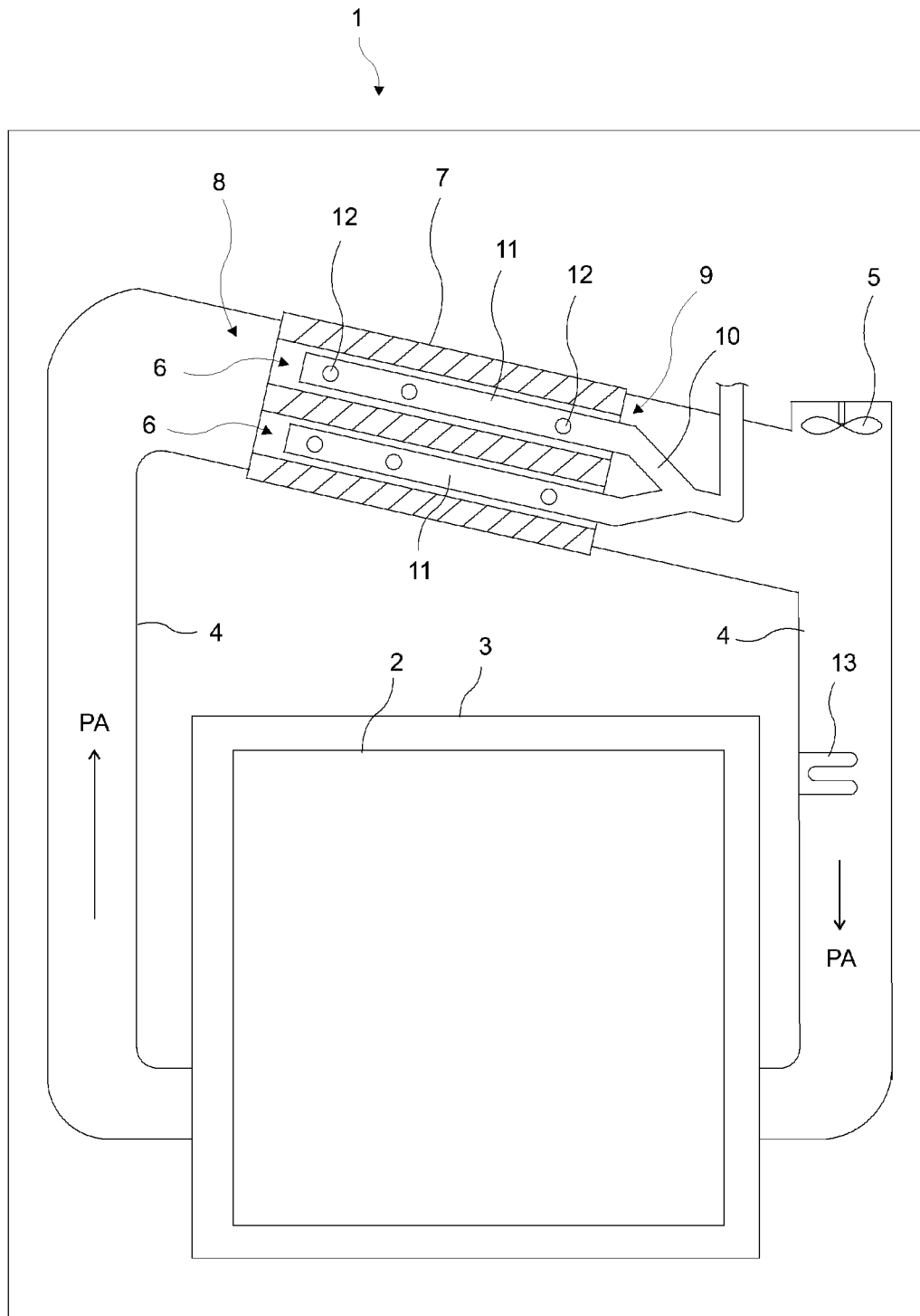


Figure 2

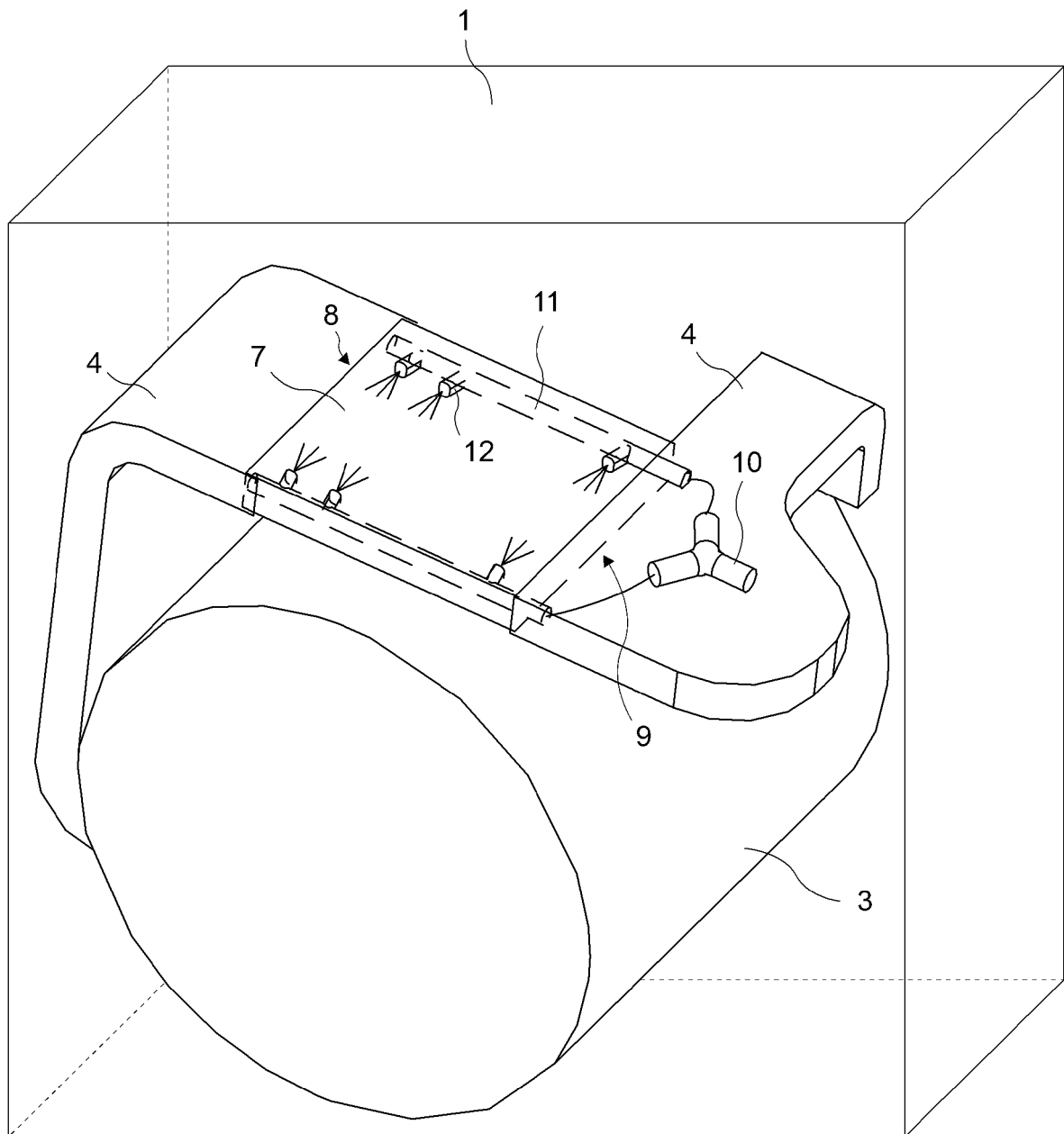


Figure 3

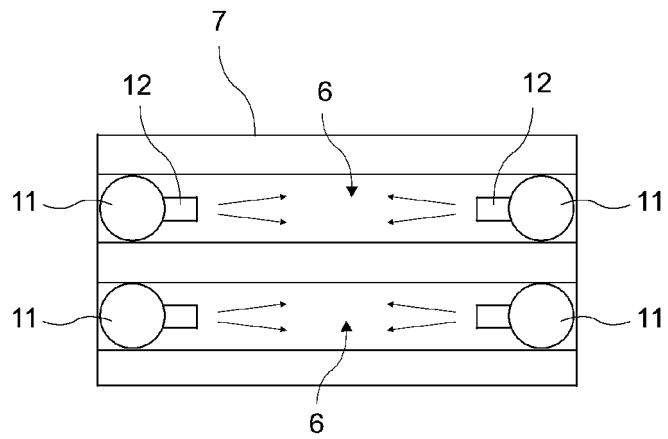


Figure 4

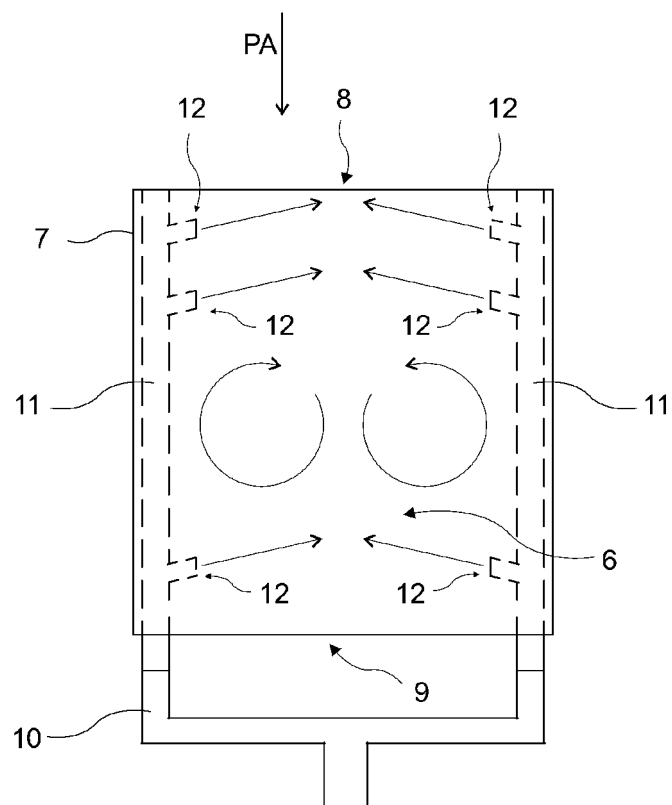
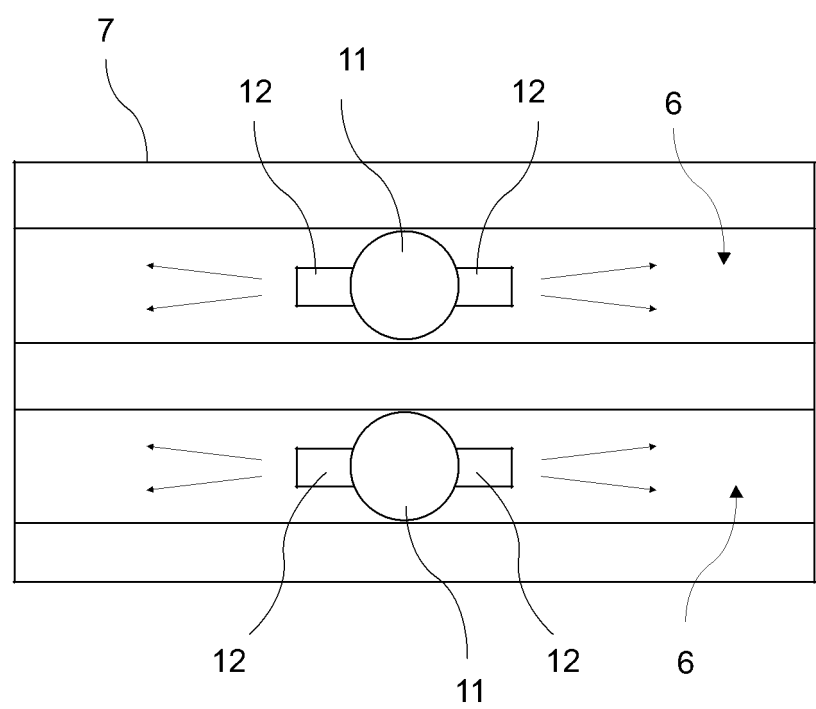


Figure 5



REFERENCES CITED IN THE DESCRIPTION

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