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(54) **Drying appliance comprising a spraying device**

Trockner mit einer Sprüheinrichtung

Sêchoir avec un dispositif de diffusion

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(56) References cited:
EP-A1- 1 524 361
EP-A2- 1 612 318
DE-A1-102006 018 469
DE-C2- 3 738 031

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Description

[0001] The present invention relates to an improved drying appliance, such as a dryer or a washer-dryer, and in particular to a drying appliance, comprising: a drum, a condensing device, a spraying device associated with the condensing device, said spraying device having a water inlet and an end portion, a drying channel for introducing processing air into the drum, wherein the spraying device has a spraying head which is provided on the end portion thereof; and wherein said spraying head is in the form of a cup, and has plurality of spraying holes.

[0002] Such drying appliance is disclosed in EP 1 524 361 A1. That known drying appliance is a washer-dryer devised both for washing and drying laundry and its condensing device is a simple vertical channel with the spraying device located at its top end. Thus, the spraying device injects water which traverses the condensing device from top to bottom, thereby providing a cooling effect on humid process air flowing through the channel from bottom to top and condensing humidity from the process air.

[0003] DE 10 2006 018 469 A1 discloses a drying appliance having a heat pump which includes two heat exchangers, one for heating and one for cooling process air, and a spraying device for use to immerse the heat exchangers in water in order to assist in starting the heat pump. As a side effect, some cleaning is attained for the heat exchangers by removing fluff by the immersing water.

[0004] Typically a drying appliance, such as dryer or washer-dryer for use as a household appliance, has the following drying process: After being heated by a heating device, dry processing air is heated within a heating channel, and is driven into a drum wherein heat is exchanged between the heated processing air and the wet fabric to evaporate moisture from the fabric into the processing air, such that the processing air carries moisture from the fabric and moves into the condensing device through an exit which is formed on the drum. Condensed by the condensing device, the moisture of the processing air is turned to water, and the processing air becomes relatively dry and cool. The condensed processing air is then driven by a fan to a heating channel and heated again to enter the drum in a next drying cycle.

[0005] During the process of washing or drying, fluff which is dust-like fragments of textile fibers is always produced and carried by the moist processing air into the condensing assembly, and then is adhered on inner walls of the condensing device, which influences effect of condensing or blocks up the processing air. And also, fluff may even be driven into the fan and the heating device, which may cause dangers.

[0006] To flush off the fluff, a spraying device to clean the condensing device and possibly other parts of the drying device by water spray may be provided. Some drawbacks are commonly existent in the spraying devices of prior art, which are: the effective area that is cleaned by the water spray is extremely limited; water pressure is dispersed, and force of flushing is not big enough, and so on. For instance, EP 0 636 732 A1 disclosed a presently known spraying device uses spraying water, which is splashed from a certain baffle, to wash off fluff from the condensing device. With such structure, potential energy of the water is somewhat consumed when it hits the baffle, so the force of flushing is weakened. And under most conditions, a spraying device only has one spraying hole, or otherwise has several spread distributed spraying holes, and thus the flushing area is extremely limited, or the water pressure is dispersed, which also decrease effect of condensing.

[0007] Normally there are several sorts of condensing devices, one of which uses water and others use other coolant, such as air, for condensation. A condensing device of other coolant is preferred for saving water, but meanwhile has much more problems with the fluff, which will be described in detail hereinafter.

[0008] The spraying water of a water-condensing device will carry a portion of fluff in the processing air, and also will flush at least a portion of the inner walls of the condensing device. An air-condensing device, for example, usually imports fresh air from outside of the drying appliance. The fresh air will then cool down the processing air within the condensing device, and subsequently flows out of the drying appliance. The condensing device usually has several processing air channels, which usually have elongate section such as to make the processing air be well cooled. So it is quite difficult to completely wash each processing air channel. DE 37 38 031 C1 discloses such a known spraying device for the air-condensing device: the spraying device has a water inlet tube and a series of spraying heads distributed along a line towards the flowing direction of the water. And each of the spraying head associates with a processing air channel. Each spraying head has only one spraying direction, such that the effective area is relatively small. The disadvantages of the system as set forth above are: Firstly, the spraying heads are aligned in a line, such that the water pressure is dispersed and unsymmetrical, and the flush force of the spraying water is relatively small and unsymmetrical. Secondly, the spraying heads only wash the processing air channels, such that the processing air inlet channel and outlet channel which are connected to the condensing device can not be washed; and also, each spraying head only has one spraying hole, and the effective area is relatively small, such that the processing air channels can not be fully washed.

[0009] An object of the present invention is to provide an improved drying appliance, which overcomes the foregoing drawbacks of the prior art, and has more reliable effect of flushing off fluff.

[0010] To achieve the object, a drying appliance, such as a dryer or a washer-dryer, is provided which comprises a drum, a condensing device, a spraying device associated with the condensing device, said spraying device having a water inlet and an end portion, a drying channel for introducing processing air into the drum, wherein the

spraying device has a spraying head which is provided on the end portion thereof; and wherein said spraying head is in the form of a cup, and has plurality of spraying holes, and wherein said condensing device has at least one processing air channel and at least one cooling air channel arranged in heat-exchanging relation to each other.

[0011] Since the spraying head is provided on the end portion of the spraying device, the water pressure is thereby concentrated, and because of the cup-shaped form of the spraying head, waste of potential energy is minimized, such that the flushing force is relatively large, and the spraying area is relatively large, which is good for flushing off fluff and good for condensing as well.

[0012] According to the invention said condensing device has at least one processing air channel and at least one cooling air channel arranged in heat-exchanging relation to each other, such that water is saved for condensing, and good spraying device is especially need for such kind of condensing device.

[0013] Preferably, the spraying holes oriented in different directions. So the effective flushing area is relatively large.

[0014] Preferably, the spraying head has an axis, around which the spraying holes are distributed. Therefore, the water pressure is relatively symmetrical, and also enlarges the effective flushing area.

[0015] Preferably, a respective wedge-shaped splitter disposed between each two spraying holes. Therefore, water is smoothly guided into the spraying holes.

[0016] Preferably, the wedge-shaped splitters connected with each other at bottom ends thereof, and have knife-edges joining at a central point such as to form wedge-shaped slots radially distributed and beginning from the point, wherein the wedge-shaped slots form a portion of the spraying holes. Therefore, the water comes from the water inlet tube will not be blocked by any surface; instead, it will be well guided to the slots smoothly.

[0017] Preferably, the spraying head has a round wall on which the spraying holes are formed. Since the spraying holes are formed on a round wall, they are three-dimensionally disposed, and the water ejected from the spraying holes has relatively big work area.

[0018] Preferably, the at least one processing air channel comprising two ends respectively connected to an air-inlet channel and an air-outlet channel, said spraying device is mounted on one of the air-inlet channel and the air-outlet channel. Therefore, the air-inlet channel and the air-outlet channel can also be washed from fluff.

[0019] Preferably, said at least one processing air channel is substantially vertically disposed, and the spraying device is disposed there above in relation to a direction of gravity. Therefore, water drops from the spraying device and onto the processing air channel. Because of the gravity, the water has more reliable flushing force.

[0020] Preferably, the spraying device is mounted on a topmost portion of the one of the air-inlet channel and the air-outlet channel. Therefore, the air-inlet channel or air-outlet channel on which the spraying device is mounted can be fully cleaned.

[0021] Preferably, said axis of the spraying head aligned with a central portion of said at least one processing air channel. Therefore, water from the spraying device is symmetrically spread.

[0022] Preferably, the spraying head is disposed below the water inlet tube, such that energy of the water flow is increased when it drops from the water inlet tube to the spraying head, and thus the water spray has relatively big flushing force.

[0023] Preferably, the spraying device has an interior that is connected to an outside of the drying appliance by an air-guiding connection, and includes a water line projecting through the interior and has an opening within the interior.

[0024] Preferably, the inventive drying appliance is embodied in a household appliance, in particular in a laundry dryer or a washer/dryer.

[0025] The foregoing and other objects in view, features and advantages of the present invention will also be apparent from the following more particular description of preferred embodiments of the present invention, as illustrated in the Figures of the accompanying drawing, wherein:

Fig.1 is a schematic view of a drying appliance;

Fig.2 is a schematic view of a spraying device associated with a condensing device and an air-outlet channel;

Fig.3 is a side view of a spraying device of the drying appliance, wherein a portion of which is broken to show inner structure thereof; and

Fig.4 is a section view of the spraying head along B-B of Fig.3.

[0026] The present invention is applicable for drying appliance having either an air-cooled or water-cooled condenser, or even having a condenser cooled by any coolant, while in the embodiments which will are described hereinbelow, an air-cooled condenser is used as an example.

[0027] Referring to Fig.1, a drying appliance 1 is under drying process. At that time, dry processing air 3 is heated by a heating device 2 within a heating channel 4, and is driven into a drum 5 whereat heat exchanged between the heated processing air 3 and wet fabric, such that the processing air 3 carries moisture from the fabric and moves into the condensing device 7 through a condensing air-inlet channel 6. Condensed by the condensing device 7, the moisture of the processing air 3 is turned to water, and the processing air 3 becomes relatively dry and cool. The condensed processing air 3 is then driven by a first fan 8 through a condensing air-outlet channel

9 to the heating channel 4 to enter a next dying cycle.

[0028] As shown in Fig.1 and Fig.2, the condensing device 7 is connected to the condensing air-inlet channel 6 and the condensing air-outlet channel 9 at its two ends, and has at least one processing air channel 11 and at least one cooling air channel 12 which are arranged in heat-exchanging relation to each other. The at least one processing air channel 11 is substantially perpendicular to a bottom surface 14 of a housing 13 of the drying appliance 1. A spraying device 10 is mounted on the condensing air-outlet channel 9, and is above the condensing device 7 in relation to a direction of gravity. In another aspect, the processing air channel 11 may be inclined or parallel to the bottom surface 14. Also, the spraying device 10 may be mounted on the condensing air-inlet channel 6.

[0029] Fresh cooling air 15 from outside of the housing 13 is driven by a second fan 16 into a cooling air inlet channel 17, and subsequently into the cooling air channel 12 whereat heat exchanged between the cooling air 15 and the processing air 3 which is in the processing air channel 11. Then the processing air 3 is cooled down, and the cooling air 15 is discharged out of the housing 13 through a cooling air outlet channel 18.

[0030] Referring to Fig.3, the spraying device 10 comprises a water inlet tube 19 and an end portion 33. A spraying head 20 is disposed on the end portion 33. A guiding device 21 disposed between the water inlet tube 19 and the spraying head 20 for guiding the water from the water inlet tube 19 to the spraying head 20. In other aspect, the guiding device 21 may connected with the water inlet tube 19 such as to form a portion of the water inlet tube 19. The spraying head 20 is in the form of a cup, at the end of which a semi-spherical wall 22 is formed. Pluralities of spraying holes 23 with different directions are formed on the semi-spherical wall 22. More accurately, the spraying holes 23 are radially distributed around a central axis 24 of the spraying head 20. Besides the structure as disclosed above, the spraying head 20 may have other cup shape. Herein cup shape can be defined as a tridimensional component which has a continuously connected bottom and side wall, and an opening opens at one end. The cup shape may also have other appropriate definition. Accordingly, the spraying head 20 may also be tapered, columned, or has other shape of curved wall or prismatic walls. Additionally, the spraying holes 23 may have other form of distributing, for instance, distributed axially and radially at the same time with multiple layers.

[0031] Furthermore, the spraying device 10 has an interior 30 that is connected to outside of the drying appliance 1 by an air-guiding connection 31, and includes a water line defined by the water inlet tube 19 and the guiding device 21 projecting through the interior 30 and has an opening 32 within the interior 30.

[0032] Referring to Fig.3 and Fig.4, wedge-shaped splitters 25 are formed between each two spraying holes 23. The wedge-shaped splitters 25 connected with each other at bottom ends thereof, and have knife-edges 26 join at a central point 27 such as to form wedge-shaped slots 28 radially distributed and beginning from the point 27. The wedge-shaped slots 28 form a portion of the spraying holes 23. And the point 27 is on the central axis 24 of the spraying head 20. Because of the structure, the water is divided by the knife-edges 26 when it flows to the bottom of the spraying head 20, and is guided to the spraying holes 23 smoothly.

[0033] As shown in Fig. 2, the axis 24 of the spraying head 20 aligned with a central portion 29 of the at least one processing air channel 11. And the spraying device 10 is preferably mounted on a topmost portion of the condensing air-outlet channel 9. Therefore the condensing air-outlet channel 9 can be fully cleaned. It is especially useful for top wall of the condensing air-outlet channel 9 where usually adhered with most fluff and is difficult to be cleaned. In other aspect, if the condensing air-inlet channel 6 is disposed above the processing air channel 11, the spraying device 10 is preferably mounted on a topmost portion of the condensing air-inlet channel 6.

[0034] The foregoing disclosure of preferred embodiments has been set forth merely to illustrate the invention and is not intended to be limiting. Since modifications of the disclosed embodiments incorporating the spirit and substance of the invention may occur to a person skilled in the art, the invention should be construed to include everything within the scope of the appended claims.

Claims

1. A drying appliance, comprising:

a drum (5),
a condensing device (7),
a spraying device (10) associated with the condensing device (7), said spraying device (10) having a water inlet (19) and an end portion (33),
a drying channel (4) for introducing processing air into the drum (5),
wherein the spraying device (10) has a spraying head (20) which is provided on the end portion (33) thereof; and wherein said spraying head (20) is in the form of a cup, and has plurality of spraying holes (23),
characterized in that said condensing device (7) has at least one processing air channel (11) and at least one cooling air channel (12) arranged in heat-exchanging relation to each other.

2. A drying appliance according to claim 1, wherein the spraying holes (23) are oriented in different directions.

3. A drying appliance according to claim 2, wherein the spraying head (20) has an axis (24), around which

the spraying holes (23) are distributed.

4. A drying appliance according to any one of the preceding claims, wherein a respective wedge-shaped splitter (25) disposed between each two spraying holes (23).

5. A drying appliance according to claim 4, comprising a plurality of wedge-shaped splitters (25), wherein the wedge-shaped splitters (25) are connected with each other at bottom ends thereof, and have knife-edges (26) joining at a central point (27) such as to form wedge-shaped slots (28) radially distributed and beginning from the central point (27), wherein the wedge-shaped slots (28) form a portion of the spraying holes (23).

6. A drying appliance according to any one of the preceding claims, wherein the spraying head (20) has a round wall (22) on which the spraying holes (23) are formed.

7. A drying appliance according to any one of the preceding claims, wherein the at least one processing air channel (11) comprises two ends respectively connected to an air-inlet channel (6) and an air-outlet channel (9), said spraying device (10) is mounted on one of the air-inlet channel (6) and the air-outlet channel (9).

8. A drying appliance according to any one of the preceding claims, wherein said at least one processing air channel (11) is substantially vertically disposed, and the spraying device (10) is disposed there above in relation to a direction of gravity.

9. A drying appliance according to claim 8, wherein the spraying device (10) is mounted on a topmost portion of the one of the air-inlet channel (6) and the air-outlet channel (9).

10. A drying appliance according to any one of the preceding claims, wherein said axis (24) of the spraying head (20) is aligned with a central portion (29) of said at least one processing air channel (11).

11. A drying appliance according to any one of the preceding claims, wherein the spraying head (20) is disposed below the water inlet tube (19).

12. A drying appliance according to any one of the preceding claims, wherein the spraying device (10) has an interior (30) that is connected to an outside of the drying appliance by an air-guiding connection (31), and includes a water line (19, 21) projecting through the interior (30) and has an opening (32) within the interior (30).

Patentansprüche

1. Trockner, umfassend:

eine Trommel (5),
eine Kondensationsvorrichtung (7),
eine Sprühvorrichtung (10), die mit der Kondensationsvorrichtung (7) verbunden ist, wobei die Sprühvorrichtung (10) einen Wassereinlass (19) und einen Endabschnitt (33) aufweist,
einen Trocknungskanal (4) zum Einleiten von Prozessluft in die Trommel (5), wobei die Sprühvorrichtung (10) einen Sprühkopf (20) aufweist, der an dem Endabschnitt (33) davon bereitgestellt ist;
und wobei der Sprühkopf (20) in Form eines Bechers vorliegt und mehrere Sprühlöcher (23) aufweist,
dadurch gekennzeichnet, dass die Kondensationsvorrichtung (7) mindestens einen Prozessluftkanal (11) und mindestens einen Kühlluftkanal (12) aufweist, die in wärmetauschender Beziehung zueinander angeordnet sind.

2. Trockner nach Anspruch 1, wobei die Sprühlöcher (23) in unterschiedliche Richtungen ausgerichtet sind.

3. Trockner nach Anspruch 2, wobei der Sprühkopf (20) eine Achse (24) aufweist, um welche die Sprühlöcher (23) verteilt sind.

4. Trockner nach einem der vorherigen Ansprüche, wobei ein entsprechender keilförmiger Teiler (25) zwischen jeweils zwei Sprühlöchern (23) angeordnet ist.

5. Trockner nach Anspruch 4, umfassend mehrere keilförmige Teiler (25), wobei die keilförmigen Teiler (25) an unteren Enden davon miteinander verbunden sind und Messerkanten (26) aufweisen, die sich an einer zentralen Stelle (27) vereinen, um keilförmige Schlitze (28) zu bilden, die radial verteilt sind und an der zentralen Stelle (27) beginnen, wobei die keilförmigen Schlitze (28) einen Abschnitt der Sprühlöcher (23) bilden.

6. Trockner nach einem der vorherigen Ansprüche, wobei der Sprühkopf (20) eine runde Wand (22) aufweist, an der die Sprühlöcher (23) ausgebildet sind.

7. Trockner nach einem der vorherigen Ansprüche, wobei der mindestens eine Prozessluftkanal (11) zwei Enden umfasst, die jeweils mit einem Lufteinlasskanal (6) und einem Luftauslasskanal (9) verbunden sind, wobei die Sprühvorrichtung (10) an einem von Lufteinlasskanal (6) und Luftauslasskanal (9) befestigt ist.

8. Trockner nach einem der vorherigen Ansprüche, wobei der mindestens eine Prozessluftkanal (11) im Wesentlichen vertikal angeordnet ist, und die Sprühvorrichtung (10) darüber in Bezug auf eine Richtung der Schwerkraft angeordnet ist.

9. Trockner nach Anspruch 8, wobei die Sprühvorrichtung (10) an einem obersten Abschnitt entweder des Lufteinlasskanals (6) oder Luftauslasskanals (9) gelagert ist.

10. Trockner nach einem der vorherigen Ansprüche, wobei die Achse (24) des Sprühkopfes (20) mit einem zentralen Abschnitt (29) des mindestens einen Prozessluftkanals (11) ausgerichtet ist.

11. Trockner nach einem der vorherigen Ansprüche, wobei der Sprühkopf (20) unter dem Wassereinlassschlauch (19) angeordnet ist.

12. Trockner nach einem der vorherigen Ansprüche, wobei die Sprühvorrichtung (10) einen Innenraum (30) aufweist, der mit einer Außenseite des Trockners über einen Luftleitungsanschluss (31) verbunden ist und eine Wasserleitung (19, 21) aufweist, die durch den Innenraum (30) ragt und eine Öffnung (32) in dem Innenraum (30) aufweist.

Revendications

1. Séchoir comprenant un tambour (5), un dispositif de condensation (7), un dispositif de pulvérisation (10) lié au dispositif de condensation (7), ledit dispositif de pulvérisation (10) possédant une alimentation en eau (19) et une partie terminale (33), un canal de séchage (4) pour l'introduction d'air de processus dans le tambour (5), dans lequel le dispositif de pulvérisation (10) possède une tête de pulvérisation (20) située sur sa partie terminale (33) et dans lequel ladite tête de pulvérisation (20) a la forme d'une cuvette et possède une pluralité d'orifices de pulvérisation (23), **caractérisé en ce que** ledit dispositif de condensation (7) possède au moins un canal d'air de processus (11) et au moins un canal d'air de refroidissement (12) disposés selon un rapport d'échange de chaleur l'un par rapport à l'autre.

2. Séchoir selon la revendication 1, dans lequel les orifices de pulvérisation (23) sont orientés dans différentes directions.

3. Séchoir selon la revendication 2, dans lequel la tête de pulvérisation (20) possède un axe (24) autour duquel les orifices de pulvérisation (23) sont répartis.

4. Séchoir selon l'une quelconque des revendications précédentes, dans lequel un séparateur cunéiforme respectif est disposé entre tous les couples d'orifices de pulvérisation (23).

5. Séchoir selon la revendication 4, comprenant une pluralité de séparateurs cunéiformes (25), dans lequel les séparateurs en forme de clavettes (25) sont connectés les uns aux autres à leurs extrémités inférieures et présentent des tranchants (26) qui se rejoignent en un point central (27) de manière à former des fentes en forme de clavettes (28) réparties radialement et débutant au point central (27), dans lequel les fentes en forme de clavettes (28) forment une partie des orifices de pulvérisation (23).

6. Séchoir selon l'une quelconque des revendications précédentes, dans lequel la tête de pulvérisation (20) possède une paroi ronde (22) sur laquelle les orifices de pulvérisation (23) sont formés.

7. Séchoir selon l'une quelconque des revendications précédentes, dans lequel l'au moins un canal d'air de processus (11) comprend deux extrémités respectivement reliées à un canal d'entrée d'air (6) et à un canal de sortie d'air (9), ledit dispositif de pulvérisation (10) étant monté sur l'un parmi le canal d'entrée d'air (6) et le canal de sortie d'air (9).

8. Séchoir selon l'une quelconque des revendications précédentes, dans lequel ledit au moins un canal d'air de processus (11) est disposé substantiellement à la verticale et le dispositif de pulvérisation (10) est disposé par-dessus en rapport avec une direction de la gravité.

9. Séchoir selon la revendication 8, dans lequel le dispositif de pulvérisation (10) est monté sur une portion la plus haute de l'un parmi le canal d'entrée d'air (6) et le canal de sortie d'air (9).

10. Séchoir selon l'une quelconque des revendications précédentes, dans lequel ledit axe (24) de la tête de pulvérisation (20) est aligné avec une partie centrale (29) dudit au moins un canal d'air de processus (11).

11. Séchoir selon l'une quelconque des revendications précédentes, dans lequel la tête de pulvérisation (20) est disposée sous le tuyau d'alimentation en eau (19).

12. Séchoir selon l'une quelconque des revendications précédentes, dans lequel le dispositif de pulvérisation (10) possède un intérieur (30) relié à un extérieur du séchoir via une connexion de guidage d'air (31) et comprend une conduite d'eau (19, 21) passant à travers l'intérieur (30) et possède un orifice (32) dans l'intérieur (30).

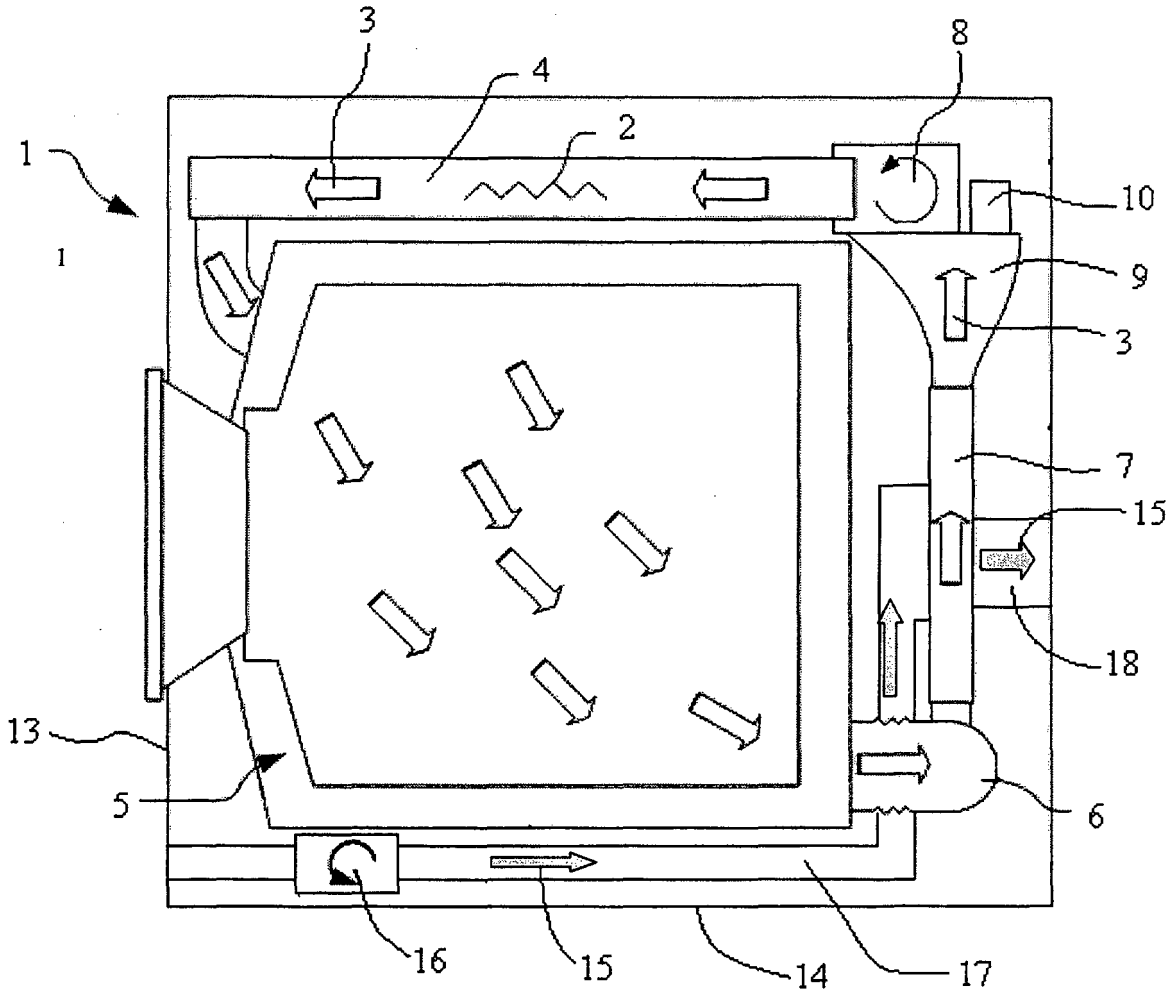

Fig. 1

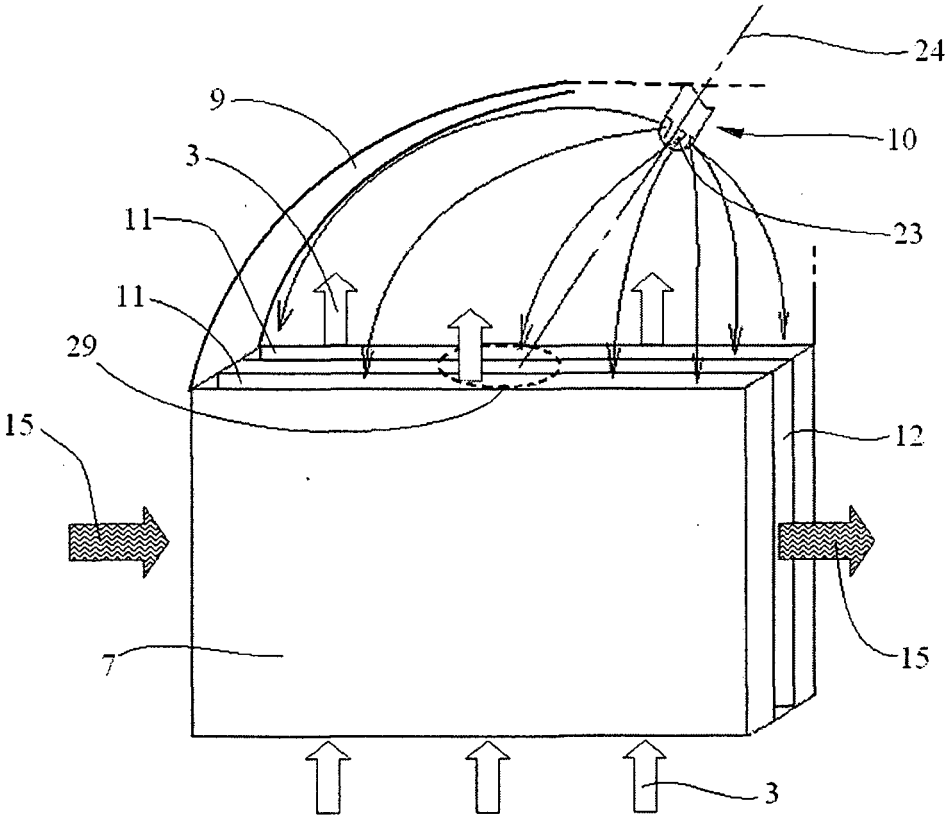

Fig. 2

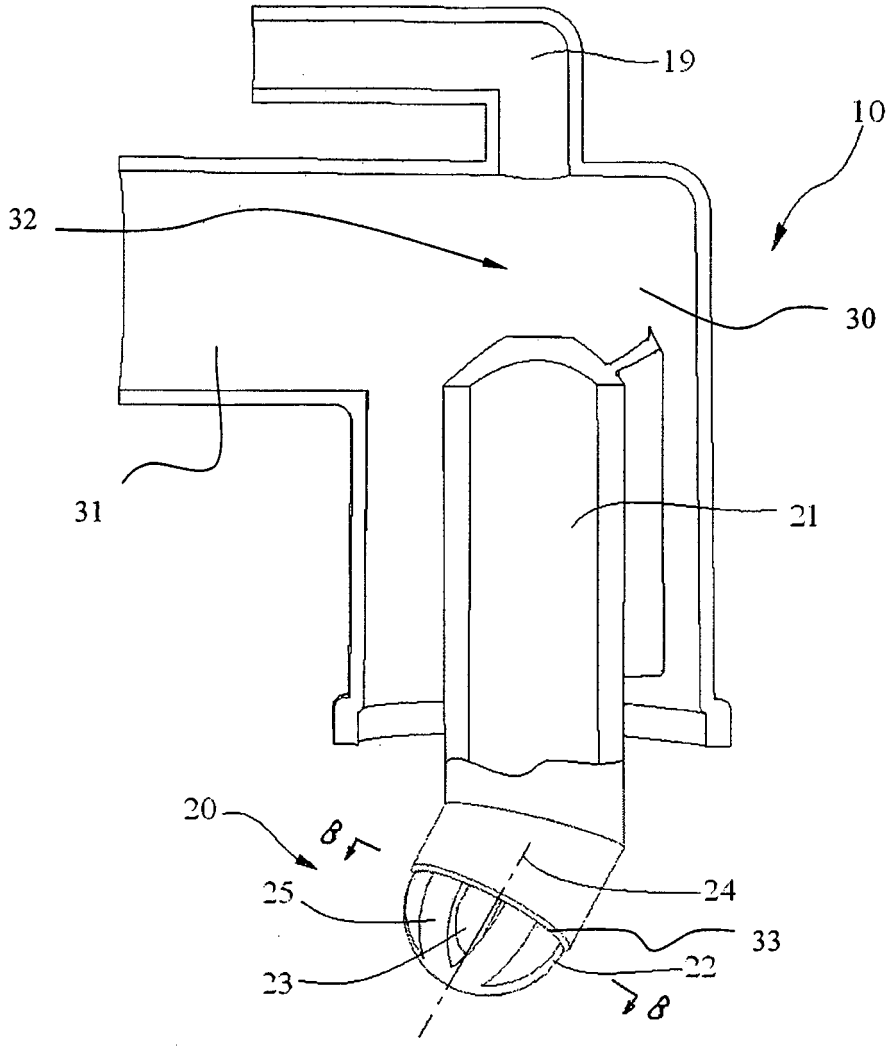

Fig. 3

B - B

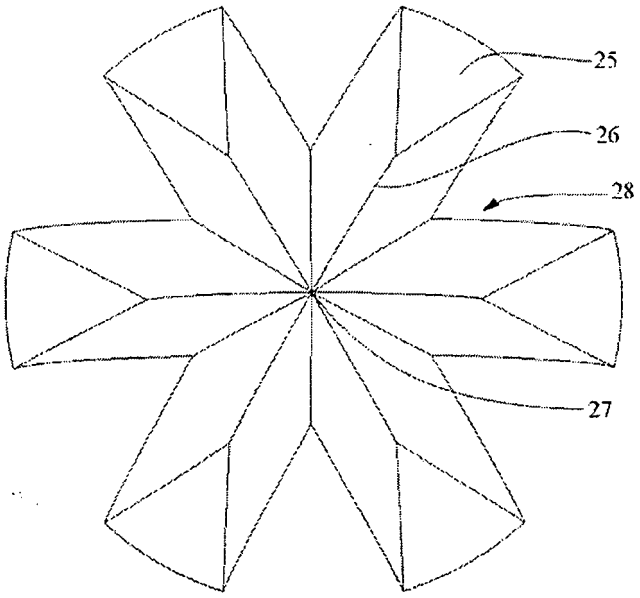

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1524361 A1 **[0002]**
- DE 102006018469 A1 **[0003]**
- EP 0636732 A1 **[0006]**
- DE 3738031 C1 **[0008]**