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(54) **Sucking device**

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Description

[0001] The invention relates to a sucking device, in particular a domestic or industrial vacuum cleaner that sucks a dry or liquid product from surfaces such as floors, furniture, furnishing elements or the like.

[0002] Vacuum cleaners are known comprising a plurality of sucking elements, such as, for example, fans, each driven by a respective motor. Each sucking element comprises a sucking opening through which air is sucked to generate a vacuum in relation to the outside environment. The sucking openings of all the sucking elements are connected to a same sucking pipe of the vacuum cleaner. The vacuum cleaner is able to suck an air flow rate that is substantially the same, less the head losses, as the sum of the air flow rates of the single sucking elements.

[0003] US 6,381,803 B1 discloses a sucking device according to the preamble of claim 1. FR 2733406 discloses a further sucking device.

[0004] A drawback of the vacuum cleaners disclosed above is that although they are able to suck significant air flow rates they are unable to generate great vacuums.

[0005] Vacuum cleaners are further known comprising a multistage aspirating element, such as, for example, a fan, driven by a respective motor.

[0006] A drawback of the vacuum cleaners disclosed above is that, although they generate a high vacuum they are not able to suck great air flow rates, unless driving motors are installed of the multistage sucking element that are very powerful and therefore very costly.

[0007] An object of the invention is to improve known sucking devices.

[0008] Another object of the invention is to provide a sucking device in which the sucked air flow rate and the vacuum can be varied simply.

[0009] According to the invention, there is provided a sucking device, comprising first sucking means having a first sucking opening and second sucking means having a second sucking opening, characterised by further comprising switching means that enables said sucking device to assume alternatively a first operating configuration, in which said first sucking opening and said second sucking opening are both connected to a sucking element of said sucking device arranged for interacting with a product to be sucked and a second operating configuration, in which said first sucking opening is connected to said sucking element and said second sucking opening is connected to a discharging opening of said first sucking means.

[0010] Owing to the invention, it is possible to obtain a sucking device provided with a significant flexibility and, thus, able to adapt to various conditions of use, these conditions being able to depend on the quantity and type of product to be sucked.

[0011] The sucking device can operate according to two distinct operating modes.

[0012] In a first operating mode, the first sucking means and the second sucking means are connected in parallel. In this case, the sucking device enables a large air flow rate to be sucked.

[0013] In a second operating mode, the first sucking means and the second sucking means are connected in series. In this case, the sucking device enables a great vacuum to be generated. In conclusion, the sucking device can pass with extreme simplicity from a work configuration - corresponding to the aforesaid first operating mode - characterised by a preset air flow rate and by a preset vacuum - to a further work configuration - corresponding to the aforesaid second operating mode - characterised by a lesser air flow rate and by a greater vacuum, or vice versa.

[0014] The invention can be better understood and implemented with reference to the attached drawings, which show an embodiment thereof by way of non-limiting example, in which:

Figure 1 is a diagram of a sucking device in an operating configuration;
Figure 2 is a diagram of the sucking device in a further operating configuration.

[0015] Figures 1 and 2 schematically show a sucking device 1, for example a domestic or industrial vacuum cleaner, arranged for sucking a dry and/or wet waste material.

[0016] The sucking device 1 comprises first sucking means 5, for example a fan driven by a corresponding motor, provided with a first sucking opening 6 and with a first discharging opening 22, and second sucking means 20, for example a further fan driven by a corresponding motor, provided with a second sucking opening 19 and with a second discharging opening 23.

[0017] The motors that drive the aforesaid fan and the aforesaid further fan can be single-phase or three-phase electric motors.

[0018] In an embodiment that is not shown, the first sucking means 5 can comprise two or more fans. Similarly, also the second sucking means 20 can comprise two or more fans.

[0019] The sucking device 1 further comprises collecting means 2, configured, for example, as a casing, such as a barrel of a vacuum cleaner intended for receiving the aforesaid waste material removed by the sucking device 1.

[0020] The collecting means 2 is provided with a hole, which is not shown, to which a sucking element is connected with which the sucking device 1 is provided. The sucking element is intended to interact with the aforesaid waste material. The sucking element may comprise a flexible pipe having a first end connected to the aforesaid hole and a second end connected to a cleaning tool, such as a brush, or the like. Inside the collecting means 2 a filtering element can be provided that separates the aforesaid waste material from the current of air generated by the first sucking means 5 and by the second sucking means 20.

[0021] The first sucking opening 6 faces the collecting means 2 directly and is thus connected thereto.

[0022] The first discharging opening 22 leads into a first chamber 12 having an outlet passage 15 that communicates with a discharging conduit 13. The discharging conduit 13 is intended for evacuating into the external environment the air sucked by the sucking device 1. At the outlet passage 15 there is provided first valve means 14 - for example an automatic valve - that enables the air to pass from the first chamber 12 to the discharging conduit 13 and prevents air from passing from the discharging conduit 13 to the first chamber 12.

[0023] The sucking device 1 further comprises a second chamber 11 provided with an inlet passage 8 connected to the collecting means 2. At the inlet passage 8 there is provided second valve means 9 - for example an automatic valve - that enables the air to pass from the collecting means 2 to the second chamber 11 and prevents air from passing from the second chamber 11 to the collecting means 2.

[0024] The second sucking opening 19 faces and is thus connected to the second chamber 11.

[0025] The second discharging opening 23 leads into the discharging conduit 13.

[0026] Between the first chamber 12 and the second chamber 11 switching means 18 is interposed. The switching means 18 comprises a valve 24 - which is drivable by a user - positioned in passage means 25 extending between the first chamber 11 and the second chamber 12. The valve 24 is movable between an open position Y, in which the valve 24 does not obstruct the passage means 25, enabling air to pass from the first chamber 12 to the second chamber 11, and a closed position X, in which the valve 24 obstructs the passage means 25, preventing air from passing from the first chamber 12 to the second chamber 11.

[0027] The switching means 18 allows to pass from an operating configuration A (shown in Figure 1), in which the sucking device 1 sucks a large air flow rate and generates a small vacuum, to a further operating configuration B (shown in Figure 2), in which the sucking device 1 sucks a small air flow rate and generates a great vacuum.

[0028] In the operating configuration A, the first sucking means 5 and the second sucking means 20 are connected parallel. In this case, in fact, both the first sucking opening 6 and the second sucking opening 19, the second sucking opening 19 through the inlet passage 8 (as will be disclosed in greater detail below), are connected to the collecting means 2. Similarly, both the first discharging opening 22, through the outlet passage 15 (as will be disclosed in greater detail below), and the second discharging opening 23 are connected to the discharging conduit 13.

[0029] When the sucking device 1 is in the operating configuration A the valve 24 is in the closed position X.

[0030] In the further operating configuration B, the first sucking means 5 and the second sucking means 20 are connected in series. In this case, in fact, the second sucking opening 19 is connected to the first discharging opening 22, through the first chamber 12 and the second chamber 11.

[0031] When the sucking device 1 is in the further operating configuration B the valve 24 is in the open position Y.

[0032] With reference to Figure 1, when the sucking device 1 is in the operating configuration A, after the first sucking means 5 and the second sucking means 20 have been activated the collecting means 2 is traversed by a flow of air F and waste material coming from a surface to be cleaned.

[0033] The flow F is separated into two flows, i.e. into a first flow F1 sucked by the first sucking means 5 and into a second flow F2 sucked by the second sucking means 20.

[0034] As the valve 24 is in the closed position X, the first flow F1 and the second flow F2 remain separated from one another and do not come into contact, the first flow F1 traversing the first chamber 12 and the second flow F2 traversing the second chamber 11.

[0035] The first flow F1 is sucked by the first sucking means 5 through the first sucking opening 6 and is introduced inside the first chamber 12 through the first discharging opening 22. As the pressure inside the first chamber 12 is greater than the pressure inside the discharging conduit 13, the first valve means 14 moves from a closing configuration K1, shown in Figure 2, to an opening configuration H1, shown in Figure 1. In this manner, the first flow F1 can pass from the first chamber 12 to the discharging conduit 13 through the outlet passage 15.

[0036] As the pressure inside the second chamber 11 is lesser than the pressure inside the collecting means 2, the second valve means 9 moves from a closing configuration K2, shown in Figure 2, to an opening configuration H2, shown in Figure 1. In this manner, the first flow F2 can pass from the collecting means 2 to the second chamber 11 through the inlet passage 8.

[0037] The second flow F2, after traversing the second chamber 11, is sucked by the second sucking means 20 through the second sucking opening 19 and is introduced inside the discharging conduit 13 through the second discharging opening 23.

[0038] With reference to Figure 2, when the sucking device 1 is in the further operating configuration B, after the first sucking means 5 and the second sucking means 20 have been activated, the collecting means 2 is traversed by a flow of air F3 and of waste material coming from a surface to be cleaned.

[0039] As the valve 24 is in the open position Y, the flow F3 is not separated into two flows, as occurs in the operating configuration A, but successively traverses the first sucking means 5 and the second sucking means 20.

[0040] The flow F3 is sucked by the first sucking means 5 through the first sucking opening 6 and is introduced inside the first chamber 12 through the first discharging opening 22. The flow F3 passes from the first chamber

12 to the second chamber 11 traversing the valve 24. As the pressure inside the second chamber 11 is greater than the pressure inside the collecting means 2, the second valve means 9 is maintained in the closing configuration K2.

[0041] The flow F3 is sucked by the second sucking means 20 through the second sucking opening 19 and is introduced inside the discharging conduit 13 through the second discharging opening 23.

[0042] As the pressure inside the discharging conduit 13 is greater than the pressure inside the first chamber 12, the first valve means 14 is maintained in the closing configuration K1.

[0043] As the first valve means 14 is maintained in the closing configuration K1 and the second valve means 9 is maintained in the closing configuration K2, the flow F3 is induced to traverse in succession the first sucking means 5, the first chamber 12, the second chamber 11 and the second sucking means 20 to reach the discharging conduit 13.

[0044] A user, by acting on the switching means 18, can move very simply and rapidly from the operating configuration A to the further operating configuration B, and vice versa.

[0045] The sucking device 1 is consequently very versatile inasmuch as the air flow rate sucked and the vacuum generated can be varied according to requirements, for example to adapt to the various quantities and/or type of waste material that has to be sucked.

Claims

1. Sucking device, comprising first sucking means (5) having a first sucking opening (6) and second sucking means (20) having a second sucking opening (19), further comprising switching means (18) which comprises valve means (24) drivable by a user and interposed between a first chamber (12) and a second chamber (11) wherein said first chamber (12) is connected to a discharging opening (22) and said second chamber (11) is connected to said second sucking opening (19); said switching means (18) enabling said sucking device (1) to assume alternatively a first operating configuration (A), in which said first sucking opening (6) and said second sucking opening (19) are both connected to a sucking element of said sucking device (1) arranged for interacting with a product to be sucked, and a second operating configuration (B), in which said first sucking opening (6) is connected to said sucking element and said second sucking opening (19) is connected to a discharging opening (22) of said first sucking means (5), **characterized in that** said second chamber (11) comprises inlet passage means (8) connected to said sucking element in which there is provided second valve means (9) that enables the air to pass from collecting means (2) of said sucking device (1) to said second chamber (11) and prevents air from passing from said second chamber (11) to said collecting means (2); said second valve means (9) being movable between an opening configuration (H2), in which said second chamber (11) and said sucking element are mutually connected, and a closing configuration (K2), in which said second chamber (11) and said sucking element are not mutually connected, and **in that** said second valve means (9) comprising an automatic valve and assuming said opening configuration (H2) when the pressure inside said sucking element is greater than the pressure inside said second chamber (11) and said closing configuration (K2) when the pressure inside said sucking element is lesser than the pressure inside said second chamber (11).

2. Sucking device according to claim 1, wherein said valve means (24) is commandable by a user.

3. Sucking device according to claim 1 or 2, wherein said valve means (24) is movable between an open position (Y), in which said valve means (24) does not obstruct passage means (25) extending between said first chamber (12) and said second chamber (11), and a closed position (X), in which said valve means (24) obstructs said passage means (25).

4. Sucking device according to any preceding claim, wherein said first chamber (12) comprises outlet passage means (15) connected to a discharging conduit (13) of said sucking device (1).

5. Sucking device according to claim 4, wherein in said outlet passage means (15) there is provided first valve means (14).

6. Sucking device according to claim 5, wherein said first valve means (14) is movable between an opening configuration (H1), in which said first chamber (12) and said discharging conduit (13) are mutually connected, and a closing configuration (K1), in which said first chamber (12) and said discharging conduit (13) are not mutually connected.

7. Sucking device according to claim 6, wherein said first valve means (14) comprises an automatic valve, said first valve means (14) assuming said opening configuration (H1) when the pressure inside said first chamber (12) is greater than the pressure inside said discharging conduit (13) and said closing configuration (K1) when the pressure inside said first chamber (12) is lesser than the pressure inside said discharging conduit (13).

8. Sucking device according to any one of claims 4 to 7, wherein said second sucking means (20) comprises a further discharging opening (23) connected to

said discharging conduit (13).

Patentansprüche

1. Saugvorrichtung, die eine erste Saugeinrichtung (5) mit einer ersten Saugöffnung (6) und eine zweite Saugeinrichtung (20) mit einer zweiten Saugöffnung (19) umfasst, die ferner eine Umschalteinrichtung (18) umfasst, die eine Ventileinrichtung (24) umfasst, die von einem Benutzer antreibbar ist und zwischen eine erste Kammer (12) und eine zweite Kammer (11) eingefügt ist, wobei die erste Kammer (12) mit einer Auslassöffnung (22) verbunden ist und die zweite Kammer (11) mit der zweiten Saugöffnung (19) verbunden ist; wobei die Umschalteinrichtung (18) ermöglicht, dass die Saugvorrichtung (1) abwechselnd eine erste Betriebskonfiguration (A), in der die erste Saugöffnung (6) und die zweite Saugöffnung (19) beide mit einem Saugelement der Saugvorrichtung (1) verbunden sind, das zur Wechselwirkung mit einem zu saugenden Produkt angeordnet ist, und eine zweite Betriebskonfiguration (B), in der die erste Saugöffnung (6) mit dem Saugelement verbunden ist und die zweite Saugöffnung (19) mit einer Auslassöffnung (22) der ersten Saugeinrichtung (5) verbunden ist, annimmt, **dadurch gekennzeichnet, dass** die zweite Kammer (11) eine Einlassdurchgangeinrichtung (8) umfasst, die mit dem Saugelement verbunden ist, in der eine zweite Ventileinrichtung (9) vorgesehen ist, die ermöglicht, dass die Luft von der Sammeleinrichtung (2) der Saugvorrichtung (1) zur zweiten Kammer (11) strömt, und verhindert, dass Luft von der zweiten Kammer (11) zur Sammeleinrichtung (2) strömt; wobei die zweite Ventileinrichtung (9) zwischen einer Öffnungskonfiguration (H2), in der die zweite Kammer (11) und das Saugelement miteinander verbunden sind, und einer Schließkonfiguration (K2), in der die zweite Kammer (11) und das Saugelement nicht miteinander verbunden sind, beweglich ist, und dass die zweite Ventileinrichtung (9) ein automatisches Ventil umfasst und die Öffnungskonfiguration (H2), wenn der Druck innerhalb des Saugelements größer ist als der Druck innerhalb der zweiten Kammer (11), und die Schließkonfiguration (K2), wenn der Druck innerhalb des Saugelements geringer ist als der Druck innerhalb der zweiten Kammer (11), annimmt.

2. Saugvorrichtung nach Anspruch 1, wobei die Ventileinrichtung (24) durch einen Benutzer kontrollierbar ist.

3. Saugvorrichtung nach Anspruch 1 oder 2, wobei die Ventileinrichtung (24) zwischen einer offenen Position (Y), in der die Ventileinrichtung (24) die Durchgangseinrichtung (25), die sich zwischen der ersten Kammer (12) und der zweiten Kammer (11) erstreckt, nicht versperrt, und einer geschlossenen Position (X), in der die Ventileinrichtung (24) die Durchgangseinrichtung (25) versperrt, beweglich ist.

4. Saugvorrichtung nach einem vorangehenden Anspruch, wobei die erste Kammer (12) eine Auslassdurchgangseinrichtung (15) umfasst, die mit einem Auslasskanal (13) der Saugvorrichtung (1) verbunden ist.

5. Saugvorrichtung nach Anspruch 4, wobei in der Auslassdurchgangseinrichtung (15) eine erste Ventileinrichtung (14) vorgesehen ist.

6. Saugvorrichtung nach Anspruch 5, wobei die erste Ventileinrichtung (14) zwischen einer Öffnungskonfiguration (H1), in der die erste Kammer (12) und der Auslasskanal (13) miteinander verbunden sind, und einer Schließkonfiguration (K1), in der die erste Kammer (12) und der Auslasskanal (13) nicht miteinander verbunden sind, beweglich ist.

7. Saugvorrichtung nach Anspruch 6, wobei die erste Ventileinrichtung (14) ein automatisches Ventil umfasst, wobei die erste Ventileinrichtung (14) die Öffnungskonfiguration (H1), wenn der Druck innerhalb der ersten Kammer (12) größer ist als der Druck innerhalb des Auslasskanals (13), und die Schließkonfiguration (K1), wenn der Druck innerhalb der ersten Kammer (12) geringer ist als der Druck innerhalb des Auslasskanals (13), annimmt.

8. Saugvorrichtung nach einem der Ansprüche 4 bis 7, wobei die zweite Saugeinrichtung (20) eine weitere Auslassöffnung (23) umfasst, die mit dem Auslasskanal (13) verbunden ist.

Revendications

1. Dispositif d'aspiration, comprenant de premiers moyens d'aspiration (5) ayant une première ouverture d'aspiration (6) et de seconds moyens d'aspiration (20) ayant une seconde ouverture d'aspiration (19), comprenant en outre des moyens de commutation (18) qui comprennent des moyens de vanne (24) pouvant être pilotés par un utilisateur et interposés entre une première chambre (12) et une seconde chambre (11), dans lequel ladite première chambre (12) est reliée à une ouverture d'évacuation (22) et ladite seconde chambre (11) est reliée à ladite seconde ouverture d'aspiration (19); lesdits moyens de commutation (18) permettant audit dispositif d'aspiration (1) de prendre alternativement une première configuration de fonctionnement (A) dans laquelle ladite première ouverture d'aspiration (6) et ladite seconde ouverture d'aspiration (19) sont toutes deux reliées à un élément d'aspiration dudit dispositif d'as-

piration (1) agencé pour interagir avec un produit devant être aspiré, et une seconde configuration de fonctionnement (B) dans laquelle ladite première ouverture d'aspiration (6) est reliée audit élément d'aspiration et ladite seconde ouverture d'aspiration (19) est reliée à une ouverture d'évacuation (22) desdits premiers moyens d'aspiration (5), **caractérisé en ce que** ladite seconde chambre (11) comprend des moyens de passage d'entrée (8) reliés audit élément d'aspiration dans lequel sont agencés de seconds moyens de vanne (9) qui permettent à de l'air de passer de moyens de collecte (2) dudit dispositif d'aspiration (1) à ladite seconde chambre (11) et empêchent de l'air de passer de ladite second chambre (11) auxdits moyens de collecte (2); lesdits seconds moyens de vanne (9) étant mobiles entre une configuration d'ouverture (H2) dans laquelle ladite seconde chambre (11) et ledit élément d'aspiration sont mutuellement reliés, et une configuration de fermeture (K2) dans laquelle ladite second chambre (11) et ledit élément d'aspiration ne sont pas mutuellement reliés, et **en ce que** lesdits seconds moyens de vanne (9) comprennent une vanne automatique et prennent ladite configuration d'ouverture (H2) lorsque la pression à l'intérieur dudit élément d'aspiration est supérieure à la pression à l'intérieur de ladite seconde chambre (11) et ladite configuration de fermeture (K2) lorsque la pression à l'intérieur dudit élément d'aspiration est inférieure à la pression à l'intérieur de ladite seconde chambre (11).

2. Dispositif d'aspiration selon la revendication 1, dans lequel lesdits moyens de vanne (24) peuvent être commandés par un utilisateur.

3. Dispositif d'aspiration selon la revendication 1 ou 2, dans lequel lesdits moyens de vanne (24) sont mobiles entre une position ouverte (Y) dans laquelle lesdits moyens de vanne (24) n'obstruent pas des moyens de passage (25) s'étendant entre ladite première chambre (12) et ladite seconde chambre (11), et une position fermée (X) dans laquelle lesdits moyens de vanne (24) obstruent lesdits moyens de passage (25).

4. Dispositif d'aspiration selon l'une quelconque des revendications précédentes, dans lequel ladite première chambre (12) comprend des moyens de passage de sortie (15) reliés à un conduit d'évacuation (13) dudit dispositif d'aspiration (1).

5. Dispositif d'aspiration selon la revendication 4, dans lequel dans lesdits moyens de passage de sortie (15) sont agencés de premiers moyens de vanne (14).

6. Dispositif d'aspiration selon la revendication 5, dans lequel lesdits premiers moyens de vanne (14) sont mobiles entre une configuration d'ouverture (H1) dans laquelle ladite première chambre (12) et ledit conduit d'évacuation (13) sont mutuellement reliés, et une configuration de fermeture (K1) dans laquelle ladite première chambre (12) et ledit conduit d'évacuation (13) ne sont pas mutuellement reliés.

7. Dispositif d'aspiration selon la revendication 6, dans lequel lesdits moyens de vanne (14) comprennent une vanne automatique, lesdits premiers moyens de vanne (14) prenant ladite configuration d'ouverture (H1) lorsque la pression à l'intérieur de ladite première chambre (12) est supérieure à la pression à l'intérieur dudit conduit d'évacuation (13) et ladite configuration de fermeture (K1) lorsque la pression à l'intérieur de ladite première chambre (12) est inférieure à la pression à l'intérieur dudit conduit d'évacuation (13).

8. Dispositif d'aspiration selon l'une quelconque des revendications 4 à 7, dans lequel lesdits seconds moyens d'aspiration (20) comprennent une ouverture d'évacuation supplémentaire (23) reliée audit conduit d'évacuation (13).

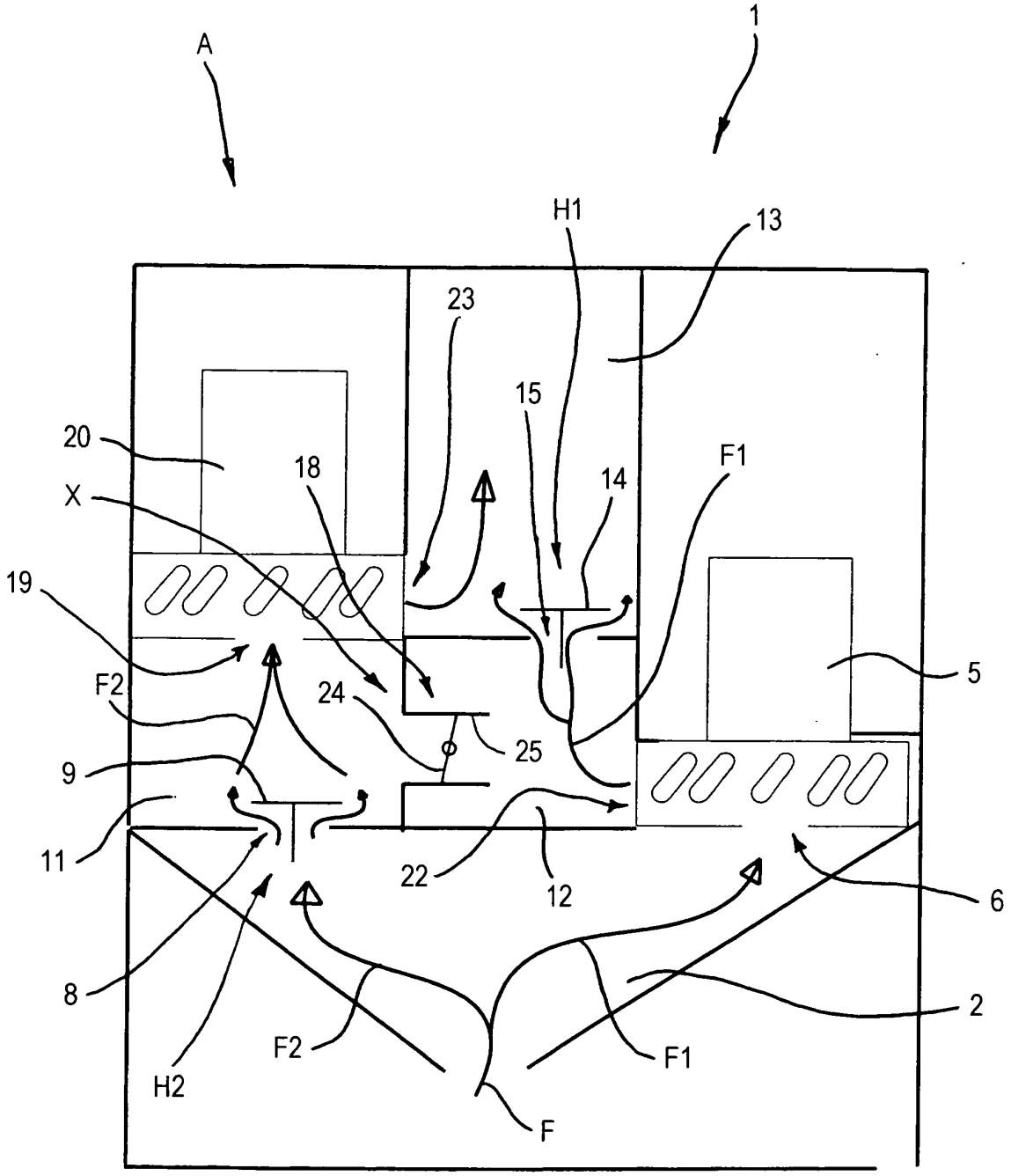


Fig. 1

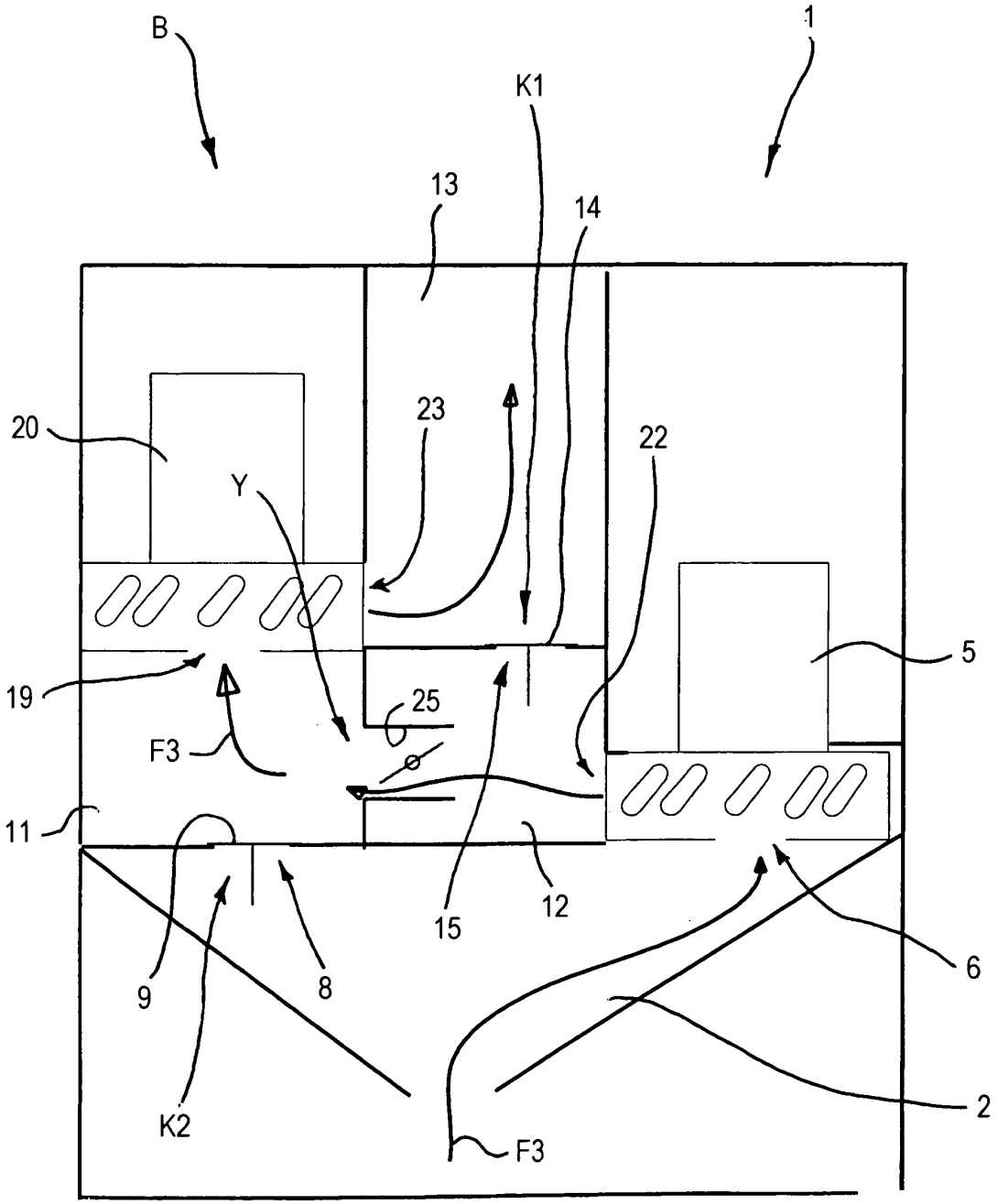


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6381803 B1 **[0003]**
- FR 2733406 **[0003]**