



(11)

EP 2 019 163 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
28.02.2018 Bulletin 2018/09

(51) Int Cl.:
D06F 58/24 ^(2006.01)

(21) Application number: **07425472.3**

(22) Date of filing: **26.07.2007**

(54) **Washer dryer machine**

Wasch- und Trocknungsmaschine

Machine lavante/séchante

(84) Designated Contracting States:
DE GB IT

(43) Date of publication of application:
28.01.2009 Bulletin 2009/05

(73) Proprietor: **Candy S.p.A.**
20052 Monza (MI) (IT)

(72) Inventor: **Fumagalli, Silvano**
20052 Monza (MI) (IT)

(74) Representative: **Leihkauf, Steffen Falk et al**
Jacobacci & Partners S.p.A.
Via Senato 8
20121 Milano (IT)

(56) References cited:
EP-A- 0 344 549 WO-A-01/11134
WO-A-2005/059230 WO-A1-2005/034716

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 019 163 B1

Description

[0001] The present invention relates to a household washer dryer machine which provides for washing and drying laundry.

[0002] As known, household washer dryer machines comprise a support and housing structure, wherein there is housed a washing tank provided with a front opening closable by a porthole hinged at the front to the housing. Inside the washing tank there is housed, turnably around a horizontal or inclined axis, a drum for receiving laundry to be washed and/or dried. Also the drum delimits a front opening arranged at the opening of the washing tank, in order to load and unload the laundry.

[0003] The washing tank is suitable for containing the washing liquid during the laundry washing steps and for constituting a portion of the drying circuit during the laundry drying step.

[0004] A washing water feeding system connectable to the water mains is provided for allowing the loading of the tank with water from the mains and detergent substances and additives. Such washing water feeding system comprises a plurality of electrovalves suitable for selectively regulating the feeding of a plurality of flow paths that extend downstream of such electrovalves through respective compartments of a detergent tray down into the washing tank. A discharge duct with associated discharge pump is provided on the bottom of the washing tank which provides for the removal of the washing liquid from the tank and which controls, together with the feeding electrovalves, the liquid level inside the tank. An electrical resistor arranged inside the tank into the air space between the tank wall and the laundry drum is provided for heating the washing liquid contained into the tank.

[0005] The drying circuit of the washer dryer machines of the prior art typically comprises a suction unit, a heat exchanger and a heating unit with electrical resistors communicating with each other through a drying duct.

[0006] In such closed circuit, the air flow caused by the suction unit is heated by the electrical resistors and conveyed into the drum, where crossing the wet laundry, causes the evaporation of the water contained into the fabric. In the heat exchanger, generally a container separate from the washing tank and provided with a spraying nozzle, the wet air is cooled by a cold water spray. By the effect of cooling, the steam condensates and is collected and discharged together with the cooling water. The dehumidified air is then sucked in again by the suction unit and made to recirculate.

[0007] The heat exchanger feeding with cooling water usually takes place through a cooling duct with a dedicated electrovalve that regulates the main water loading into the heat exchanger (condenser).

[0008] While the drying devices of the prior art are satisfactory from many points of view, they exhibit a very complex structure, due to the condensation chamber and to the three distinct circuits:

- washing water feeding,
- cooling water feeding to the heat exchanger,
- drying air circuit,

5 which also require a large number of hydraulic components.

[0009] The structural complexity of known washer dryer machines and a high consumption of cooling water during the drying step are some of the causes of high production and operating costs of this type of household appliance.

10 WO-A-2005059230 discloses a washer dryer having features of the preamble of claim 1.

[0010] The object of the present invention therefore is to provide a washer dryer machine, having such features as to obviate at least some of the disadvantages mentioned with reference to the prior art.

15 **[0011]** Within the general aim, a further object of the present invention is to provide a washer dryer machine having such features as to reduce water and energy consumptions during the laundry drying step.

20 **[0012]** This and other objects are achieved by a washer dryer machine according to claim 1. Advantageous embodiments are the subject of the dependent claims. According to the invention, the washer dryer machine comprises:

30 a washing tank suitable for containing the washing liquid; a drum suitable for receiving the laundry and turnably supported inside the washing tank; a closed drying circuit with a suction unit, a heat exchanger consisting of a tubular suction duct without active cooling and a heating unit communicating with each other through a drying duct, said closed drying circuit being suitable for conveying a drying air flow, in a manner substantially separated from the environment, across said drum, wherein the tubular suction duct comprises a heat dispersion wall made of a thermal conductivity material, wherein the washing tank is made of plastic material and the tubular suction duct consists of a wall portion of the washing tank and a separately made cover of metal material, such as stainless steel, connected to the wall portion on the outer side of tank and forming said heat dispersion wall; and

- said washer dryer machine is configured so that during the running of a drying program,

50 A) only said drying air flow is conveyed along said closed drying circuit; and

B) heating means is activated, which actively heats said drying air flow upstream of the laundry drum; and

55 C) the active feeding of liquid or other cooling means to the tank or to said suction duct is prevented; and

D) the condensate formed into said tubular

suction duct is discharged,

so that the condensation of humidity contained in the drying air takes place into the tubular suction duct only by the difference in temperature between the laundry contained in the drum and said tubular suction duct not actively cooled.

[0013] In fact, experimental tests have proved that the "natural" temperature drop into the closed drying circuit between the laundry and the suction duct not actively cooled is sufficient for causing the condensation of humidity and thus, for drying the laundry.

[0014] According to the invention, the tubular suction duct comprises a heat dispersion wall made of a high thermal conductivity material, for example as metal, preferably stainless steel.

[0015] Thanks to the high thermal conductivity of the metal dispersion wall, a further local increase of the thermal gradient and thus an increase of the condensation is obtained.

[0016] According to the invention, the washing tank is of plastic material and the tubular suction duct consists of a portion of wall of the washing tank and a cover separately made of metal material and then connected to said wall portion on the outer side of the tank.

[0017] This advantageously allows maintaining a very hot environment inside the tank and the drum and a comparably cold and more heat-dispersing environment into the suction duct outside the washing tank.

[0018] The inventive step of providing the washer dryer machine with a closed drying and condensation circuit totally without active cooling implies a considerable water saving and allows obviating a dedicated feeding circuit for feeding the condenser as well as simplifying the control programs that pilot the feeding electrovalves.

[0019] To better understand the invention and appreciate its advantages, some exemplary non-limiting embodiments thereof will now be described with reference to the appended figures, wherein:

- figure 1 is a side section view of a washer dryer machine according to an embodiment of the invention;
- figure 2 is a front section view of the washer dryer machine of figure 1;
- figure 3 is a top view of the washer dryer machine of figure 1 with the housing partly removed;
- figure 4 is a perspective view of a washing tank for a washer dryer machine according to an embodiment of the invention, wherein a heat dispersion cover is removed;
- figure 5 shows the washing tank of figure 4, wherein the heat dispersion cover is mounted on the tank.

[0020] With reference to the figures, a washer dryer machine 1 comprises a support and housing structure 2, wherein there is housed a washing tank 3 provided with a front opening closable by a porthole 4 hinged at the

front to housing 2. Inside the washing tank 3 there is housed, turnably around a horizontal or inclined axis, a drum 5 for receiving the laundry to be washed and/or dried. Also drum 5 delimits a front opening arranged at the opening of the washing tank 3, in order to load and unload the laundry.

[0021] The washing tank 3 is suitable for containing the washing liquid during the laundry washing steps and for constituting a portion of the drying circuit during the laundry drying step.

[0022] A washing water feeding system connectable to the water mains is provided for allowing the loading of tank 3 with water from the mains and detergent substances and additives. Such washing water feeding system comprises a plurality of washing flow paths that extend for example from two feeding electrovalves 6, 7 through corresponding compartments 8, 9, 10 of a detergent tray 12, down into the washing tank 3.

[0023] A discharge duct 14 with associated discharge pump 15 is provided on bottom 13 of the washing tank 3 which provides for the removal of the washing liquid from tank 3 and which controls, together with the feeding electrovalves 6, 7 the liquid level inside tank 3.

[0024] A coil electrical resistor 11 arranged inside tank 3, in particular on bottom 13 of the latter, in the space between the wall of tank 3 and the laundry drum 5, is provided for heating the washing liquid contained in tank 3.

[0025] The washer dryer machine 1 further comprises a closed drying circuit with a suction unit, for example an impeller of a fan 17 actuated by an electrical motor 18, a heat exchanger, as well as a heating unit with electrical resistor 21 communicating with each other by a drying duct 16.

[0026] In such closed circuit, the air flow 22 caused by the suction unit 17, 18 is heated by the electrical resistor 21 and conveyed into drum 5, where, crossing the wet laundry, it causes the evaporation of the water contained in the fabric. The heat exchanger is arranged downstream of the laundry drum 5 (with reference to the drying air flow direction 22) and provides for the condensation of a part of the humidity contained in air 22 coming from drum 5.

[0027] The condensate is collected and discharged. The dehumidified air is then sucked in again by the suction unit 17, 18 and made to recirculate.

[0028] According to an aspect of the invention, the drying circuit is in se closed and substantially separated from the environment and the heat exchanger consists of a tubular suction duct 26 that is part of the drying duct 16 and which is arranged downstream of the laundry drum 5 and upstream of the suction unit 17, 18. In particular, such closed drying circuit consists of a closed ring tubular conduction system that extends from the suction unit 17, 18 to which a top tubular duct 19 connects, which houses the electrical resistor 21 and optionally a temperature sensor 20. The top duct 19 is in communication with the interior of drum 5, preferably through the front opening

of drum 5. Drum 5 is in turn in flow communication with the washing tank 3 both through the perforation of the side cylindrical wall of the drum and through the front opening thereof. The interior of the washing tank 5 is substantially isolated from the environment. A suction opening 23 is formed in the lower portion of the washing tank 3 which connects the interior of tank 5 with the above tubular suction duct 26. The suction duct 26 preferably extends along the back wall 24 of the washing tank 5 from the suction opening 24 upwards up to the suction unit 17, 18. In this way, the entire annular drying circuit is substantially isolated from the environment.

[0029] According to the invention, the washer dryer machine is configured so that during the running of a drying program,

- A) only the drying air flow 22 is conveyed along the closed drying circuit; and
- B) electrical resistor 21 is activated, which actively heats the drying air flow 22 upstream of the laundry drum 5; and
- C) the feeding of liquid or other cooling means to tank 3 or to the suction duct 26 is prevented; and
- D) the condensate formed in the suction duct 26 is discharged,

so that the condensation of humidity contained in the drying air 22 takes place in the tubular suction duct 26 only by the difference in temperature between the laundry contained in drum 5 and the tubular suction duct 26 not actively cooled.

[0030] According to the invention, the tubular suction duct 26 comprises a heat dispersion wall 25 made of a high thermal conductivity material, for example metal, preferably stainless steel. Thanks to the high thermal conductivity of the metal dispersion wall, a further local increase of the thermal gradient and thus an increase of the condensation is obtained. By a targeted selection of the colour (for example brown or black) and of the roughness of the outer surface of the heat dispersion wall 25 it is possible to further increase the heat dispersions in the suction duct 26, without the need of carrying out an active cooling of the heat exchanger thus configured.

[0031] According to the invention, the washing tank 3 is made of plastic material and the tubular suction duct 26 consists of a wall portion 27 of the washing tank 3 and a cover 28 separately made (for example of metal material, preferably stainless steel) and then connected to the wall portion 27 on the outer side of tank 3.

[0032] This allows maintaining, during the drying cycle, a very hot and substantially heat isolated environment inside tank 3 and the drum and a comparably cold and more heat-dispersing environment in the suction duct 26 outside the washing tank 3. In this way, the extraction of humidity from the laundry and the condensation thereof in the suction duct 26 are further favoured.

[0033] Preferably, the suction duct 26 extends from the suction opening 23 (arranged in the proximity of the tank

bottom 13) along an arched path adjacent the outer circumference of the washing tank 3 up to the top zone thereof where the suction duct 26 connects to the suction unit 17, 18. In this way, an extended heat dispersion and condensation path is obtained.

[0034] According to an embodiment, the suction duct 26 is arranged at least partly in the space occupied by a system of stiffening ribs 30 formed on the outer side of the back wall 24 of the washing tank 3. Thanks to the possible presence of tabs 29 formed integrally with the back wall 24 and protruding into the suction duct 26, as well as to the connection of cover 28 to the back wall 24, the suction duct 26 makes an integral part of the stiffening rib system 30.

[0035] With reference to the embodiment illustrated in figures 4 and 5, the suction duct 26 comprises a longitudinal tab that divides the duct itself longitudinally in two channels and increases the overall condensation surface thereof.

[0036] Cover 28 may be substantially plate shaped and arched complementary to the arched shape of the wall portion 27 and connected to the latter by gluing, welding (for example ultrasound or laser), screwing or by a snap-wise connection.

[0037] Advantageously, also cover 28 may comprise tabs that increase both the condensation surface (inner tabs) and the heat dispersion surface (outer tabs).

[0038] The washer dryer machine according to the invention exhibits several advantages.

[0039] Thanks to the complete absence of an active cooling of the air flow in the heat exchanger, a considerable water saving is obtained in the drying step.

[0040] Moreover, thanks to the configuration of the drying circuit as annular closed circuit without flow connection with the external environment, a considerable electrical energy saving is obtained for heating the drying air and the laundry to be dried.

[0041] Thanks to the absence of the active cooling function, moreover, a dedicated duct for feeding the heat exchanger is avoided. This implies the elimination of at least one electrovalve dedicated to the heat exchanger, of the relevant spraying nozzles and cooling ducts.

[0042] The difference of the materials of the washing tank (preferably of heat insulating material, for example plastic) and of the heat dispersion wall 25 (preferably of high thermal conductivity material, for example stainless steel) further contributes to the removal of humidity from the laundry and to the condensation in the suction duct, without an active cooling.

[0043] In conclusion, the inventive concept of providing a closed heating and condensing circuit without active cooling differs:

- from the known concept of closed condensing circuit for the absence of an active cooling, that is, for the control of the drying cycle so as to prevent the feeding of a cooling fluid to the heat exchanger (implying considerable saving in terms of water consumption)

- and
- from the known concept of closed circuit with AIR/AIR heat exchange for the absence of a cooling circuit that withdraws air from the environment (implying saving in terms of energy consumption of the secondary impeller that conveys the cooling air) and
- from the known concept of open drying circuit for the closed annular configuration of the drying circuit and the recirculation of the drying air (implying energy saving in terms of consumption of the electrical resistor).

[0044] It is clear that a man skilled in the art may make several changes and variations to the washer dryer machine according to the present invention in order to meet specific and incidental needs, all falling within the scope of protection of the invention as defined in the following claims.

Claims

1. Washer dryer machine (1) for washing and drying laundry comprising:

- a washing tank (3) suitable for containing the washing liquid;
- a drum (5) suitable for receiving the laundry and turnably supported inside the washing tank (3);
- a closed drying circuit (16, 17, 18, 19, 20, 21, 5, 3, 26, 27, 28) with a suction unit (17, 18), a heat exchanger (26, 27, 28) consisting of a tubular suction duct (26) without active cooling and a heating unit (21) communicating with each other through a drying duct (16), said closed drying circuit being suitable for conveying a drying air flow (22), in a manner substantially separated from the environment, across said drum (5),

characterised in that

the tubular suction duct (26) comprises a heat dispersion wall (25) made of a thermal conductivity material, wherein the washing tank (3) is made of plastic material and the tubular suction duct (26) consists of a wall portion (27) of the washing tank (3) and a separately made cover (28) of metal material, such as stainless steel, connected to the wall portion (27) on the outer side of tank (3) and forming said heat dispersion wall (25).

2. Washer dryer machine (1) according to claim 1, wherein

- said washer dryer machine (1) is configured so that during the running of a drying program,

A) only said drying air flow (22) is conveyed along said closed drying circuit; and

- B) the heating unit (21) is activated, which actively heats said drying air flow (22) upstream of the drum (5); and
- C) the condensate formed in said tubular suction duct (26) is discharged,

so that the condensation of humidity contained in the drying air (22) takes place in the tubular suction duct (26) only by the difference in temperature between the laundry contained in drum (5) and said tubular suction duct (26).

3. Washer dryer machine (1) according to any one of the previous claims, wherein the suction duct (26) extends from a suction opening (23) arranged in the proximity of the tank bottom (13) along an arched path adjacent the outer circumference of the washing tank (3) up to the top zone thereof where the suction duct (26) connects to the suction unit (17, 18).

4. Washer dryer machine (1) according to any one of the previous claims, wherein the suction duct (26) is arranged at least partly in the space occupied by a system of stiffening ribs (30) formed on the outer side of the back wall (24) of the washing tank (3).

5. Washer dryer machine (1) according to any one of the previous claims, comprising one or more tabs (29) protruding into the suction duct (26).

6. Washer dryer machine (1) according to any one of the preceding claims, wherein the cover (28) comprises tabs that increase the condensation surface (inner tabs) and/or the heat dispersion surface (outer tabs).

Patentansprüche

1. Waschtrocknermaschine (1) zum Waschen und Trocknen von Wäsche umfassend:

- einen Waschtank (3) geeignet zum Beinhaltenden der Waschflüssigkeit;
- eine Trommel (5) geeignet zum Aufnehmen der Wäsche und drehbar innerhalb des Waschtanks (3) gehalten;
- einen geschlossenen Trockenkreislauf (16, 17, 18, 19, 20, 21, 5, 3, 26, 27, 28) mit einer Saugereinheit (17, 18), einem Wärmetauscher (26, 27, 28) bestehend aus einer röhrenförmigen Saugleitung (26) ohne aktive Kühlung und einer Heizeinheit (21), die miteinander durch eine Trockenleitung (16) kommunizieren, wobei der geschlossene Trockenkreislauf geeignet ist zum Befördern eines trocknenden Luftstroms (22) in einer Weise im Wesentlichen separiert von der Umgebung durch die Trommel (5),

dadurch gekennzeichnet, dass

die röhrenförmige Saugleitung (26) eine Hitzeverteilungswand (25) umfasst hergestellt aus einem thermisch leitenden Material, wobei der Waschtank (3) aus einem Plastikmaterial hergestellt ist und wobei die röhrenförmige Saugleitung (26) aus einem Wandbereich (27) des Waschtanks (3) und einer separat hergestellten Abdeckung (28) aus Metallmaterial, beispielsweise rostfreiem Stahl, besteht verbunden zu dem Wandbereich (27) an der anderen Seite des Tanks (3) und ausbildend die Hitzeverteilungswand (25).

2. Waschtrocknermaschine (1) nach Anspruch 1, wobei

- die Waschtrocknermaschine (1) ausgelegt ist, so dass während des Laufens eines Trockenprogramms,

A) nur der trocknende Luftstrom (22) entlang des geschlossenen Trockenkreislaufs befördert wird; und

B) die Heizeinheit (21) aktiviert ist, die aktiv den trocknenden Luftstrom (22) stromaufwärts der Trommel (5) heizt; und

C) das Kondensat, das in der röhrenförmigen Saugleitung (26) ausgebildet wird, abgelassen wird,

so dass die Kondensation von Feuchtigkeit, die in der trocknenden Luft (22) enthalten ist, in der röhrenförmigen Saugleitung (26) stattfindet nur durch den Unterschied in Temperatur zwischen der Wäsche, die in der Trommel (5) enthalten ist, und der röhrenförmigen Saugleitung (26).

3. Waschtrocknermaschine (1) nach irgendeinem der vorhergehenden Ansprüche, wobei sich die Saugleitung (26) von einer Saugöffnungen (23), die in der Nähe des Bodens (13) des Tanks angeordnet ist, entlang eines gekrümmten Pfads benachbart zu dem äußeren Umfang des Waschtanks (3) und hoch zu dem oberen Bereich davon erstreckt, wo die Saugleitung (26) mit der Saugereinheit (17, 18) verbunden ist.

4. Waschtrocknermaschine (1) nach irgend einem der vorhergehenden Ansprüche, wobei die Saugleitung (26) wenigstens teilweise in dem Raum angeordnet ist, der durch ein System von versteifenden Rippen (30) besetzt ist, die an der äußeren Seite der hinteren Wand (24) des Waschtanks (3) ausgebildet sind.

5. Waschtrocknermaschine (1) nach irgendeinem der vorhergehenden Ansprüche umfassend einen oder mehrere Streifen (29) vorstehend in die Saugleitung (26).

6. Waschtrocknermaschine (1) nach irgendeinem der vorhergehenden Ansprüche, wobei die Abdeckung (28) Streifen umfasst, die die Kondensationsfläche (innere Streifen) und/oder die Hitzeverteilungsfläche (äußere Streifen) vergrößern.

Revendications

1. Machine lavante/séchante (1) pour le lavage et le séchage de linge comprenant :

- une cuve de lavage (3) adaptée pour contenir le liquide de lavage ;

- un tambour (5) adapté pour recevoir le linge et supporté de manière rotative dans la cuve de lavage (3) ;

- un circuit de séchage fermé (16, 17, 18, 19, 20, 21, 5, 3, 26, 27, 28) avec une unité d'aspiration (17, 18), un échangeur de chaleur (26, 27, 28) composé d'un conduit d'aspiration tubulaire (26) sans refroidissement actif et une unité de chauffage (21) communiquant les uns avec les autres au travers d'un conduit de séchage (16), ledit circuit de séchage fermé étant adapté pour transporter un flux d'air de séchage (22), de manière sensiblement séparée de l'environnement, à travers ledit tambour (5),

caractérisée en ce que

le conduit d'aspiration tubulaire (26) comprend une paroi de dispersion de chaleur (25) faite d'un matériau à conductivité thermique,

dans laquelle la cuve de lavage (3) est faite de matériau plastique et le conduit d'aspiration tubulaire (26) comprend une partie de paroi (27) de la cuve de lavage (3) et un couvercle (28) fabriqué séparément de matériau métallique, tel que de l'acier inoxydable, raccordé à la partie de paroi (27) sur le côté extérieur du réservoir (3) et formant ladite paroi de dispersion de chaleur (25).

2. Machine lavante/séchante (1) selon la revendication 1, dans laquelle

- ladite machine lavante/séchante (1) est configurée de sorte que pendant l'exécution d'un programme de séchage,

A) seul ledit flux d'air de séchage (22) soit transporté le long dudit circuit de séchage fermé ; et

B) l'unité de chauffage (21) soit activée, laquelle chauffe activement ledit flux d'air de séchage (22) en amont du tambour (5) ; et
C) le condensat formé dans ledit conduit d'aspiration tubulaire (26) est déchargé,

de sorte que la condensation d'humidité contenue dans l'air de séchage (22) ait lieu dans le conduit d'aspiration tubulaire (26) seulement par la différence de température entre le linge contenu dans le tambour (5) et ledit conduit d'aspiration tubulaire (26). 5

3. Machine lavante/séchante (1) selon l'une quelconque des revendications précédentes, dans laquelle le conduit d'aspiration (26) s'étend depuis une ouverture d'aspiration (23) agencée à proximité du fond de cuve (13) le long d'une voie arquée adjacente à la circonférence extérieure de la cuve de lavage (3) jusqu'à la zone supérieure de celle-ci où le conduit d'aspiration (26) est relié à l'unité d'aspiration (17, 18). 10 15
4. Machine lavante/séchante (1) selon l'une quelconque des revendications précédentes, dans laquelle le conduit d'aspiration (26) est agencé au moins partiellement dans l'espace occupé par un système de nervures de renforcement (30) formées sur le côté extérieur de la paroi arrière (24) de la cuve de lavage (3). 20 25
5. Machine lavante/séchante (1) selon l'une quelconque des revendications précédentes, comprenant une ou plusieurs pattes (29) faisant saillie dans le conduit d'aspiration (26). 30
6. Machine lavante/séchante (1) selon l'une quelconque des revendications précédentes, dans laquelle le couvercle (28) comprend des pattes qui augmentent la surface de condensation (pattes intérieures) et/ou la surface de dispersion de chaleur (pattes extérieures). 35

40

45

50

55

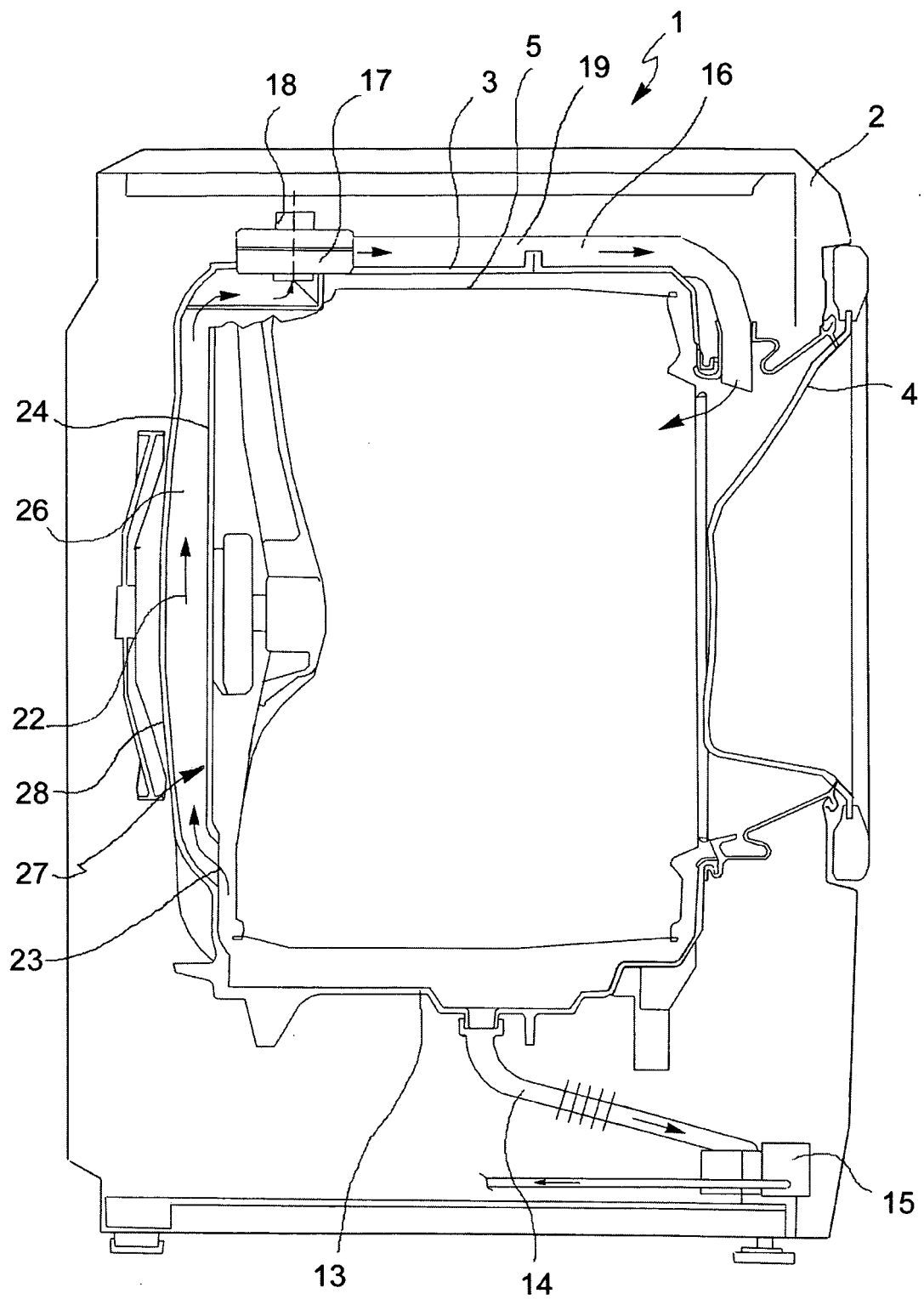


FIG. 1

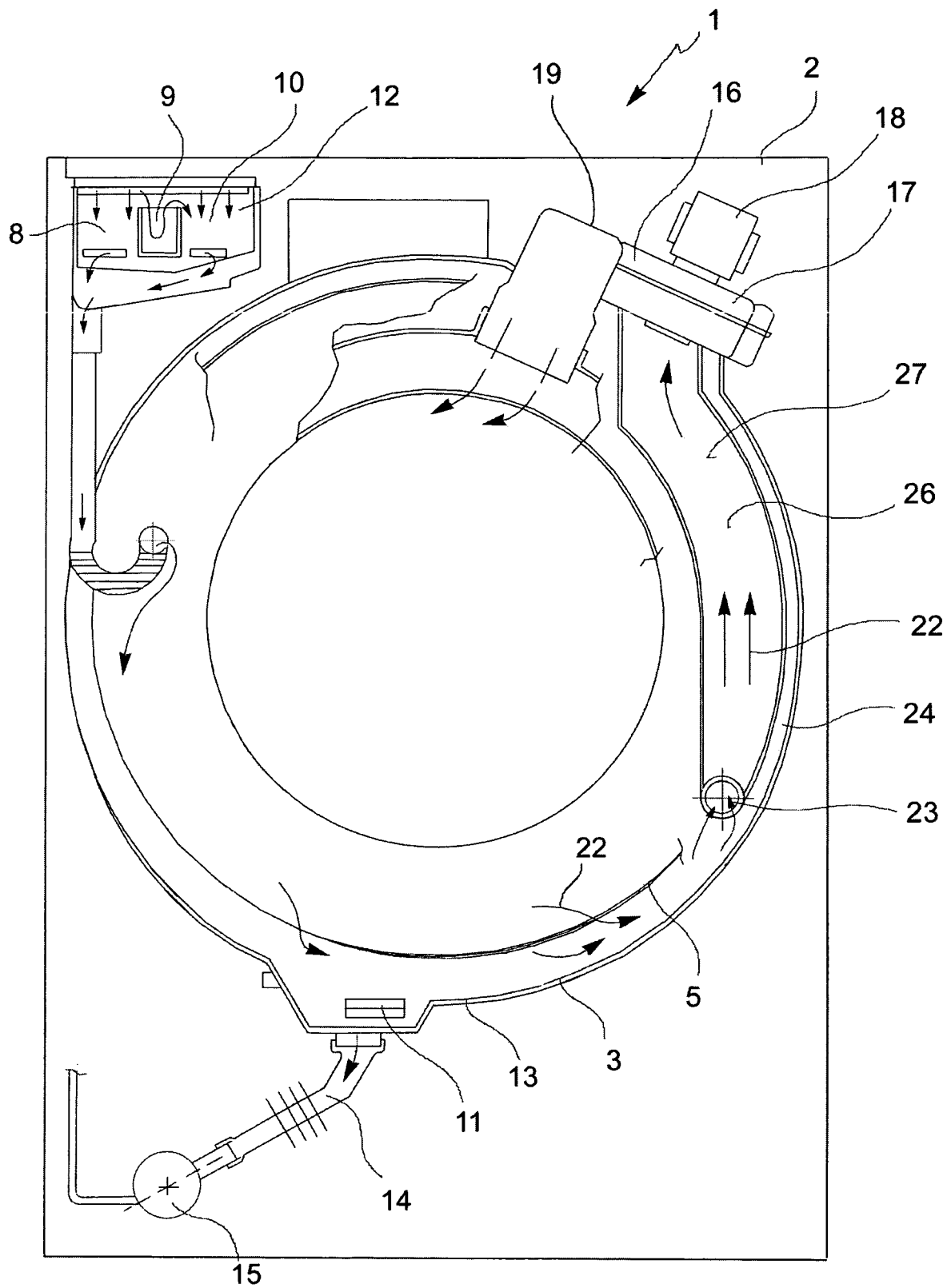


FIG. 2

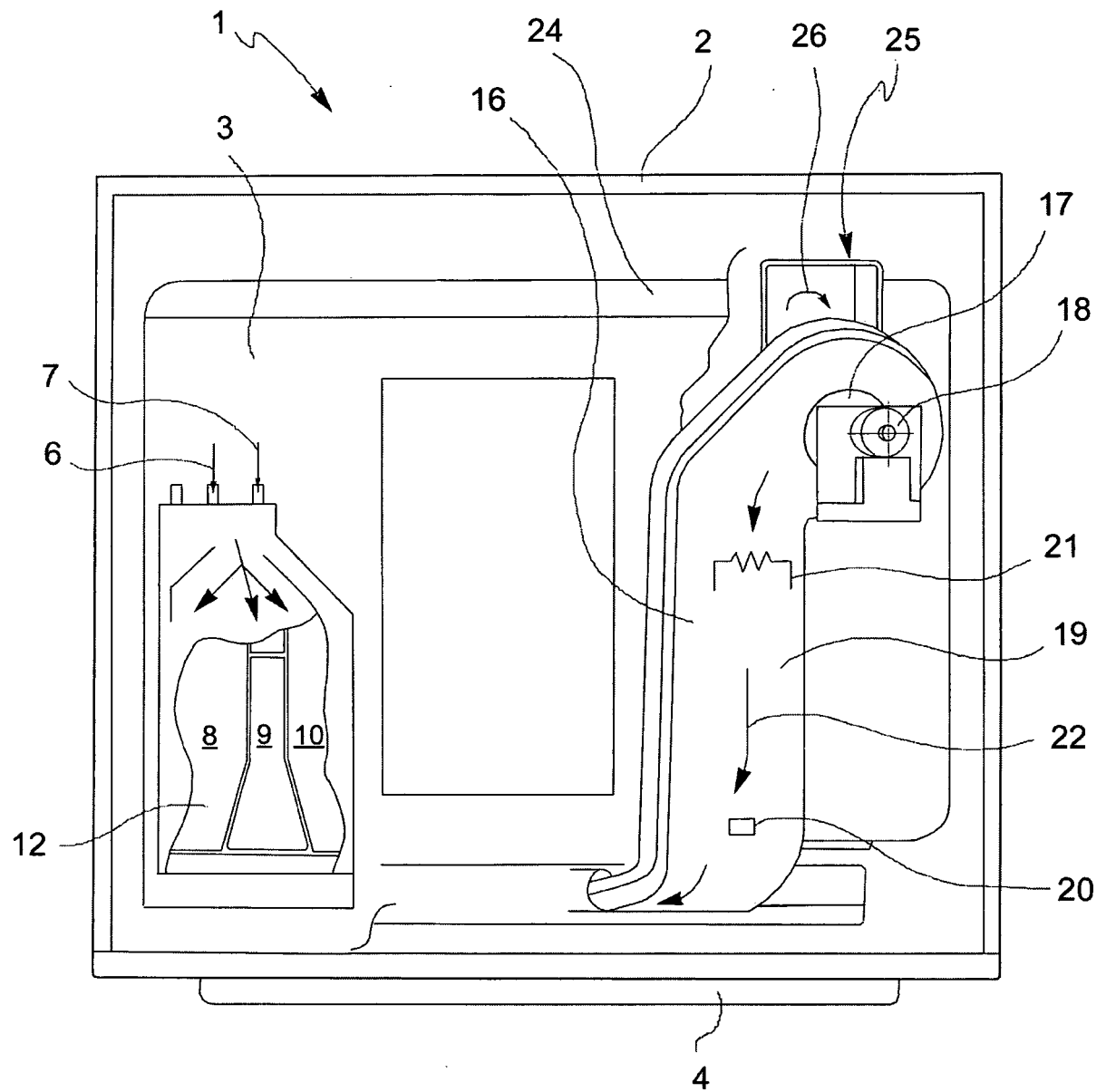


FIG. 3

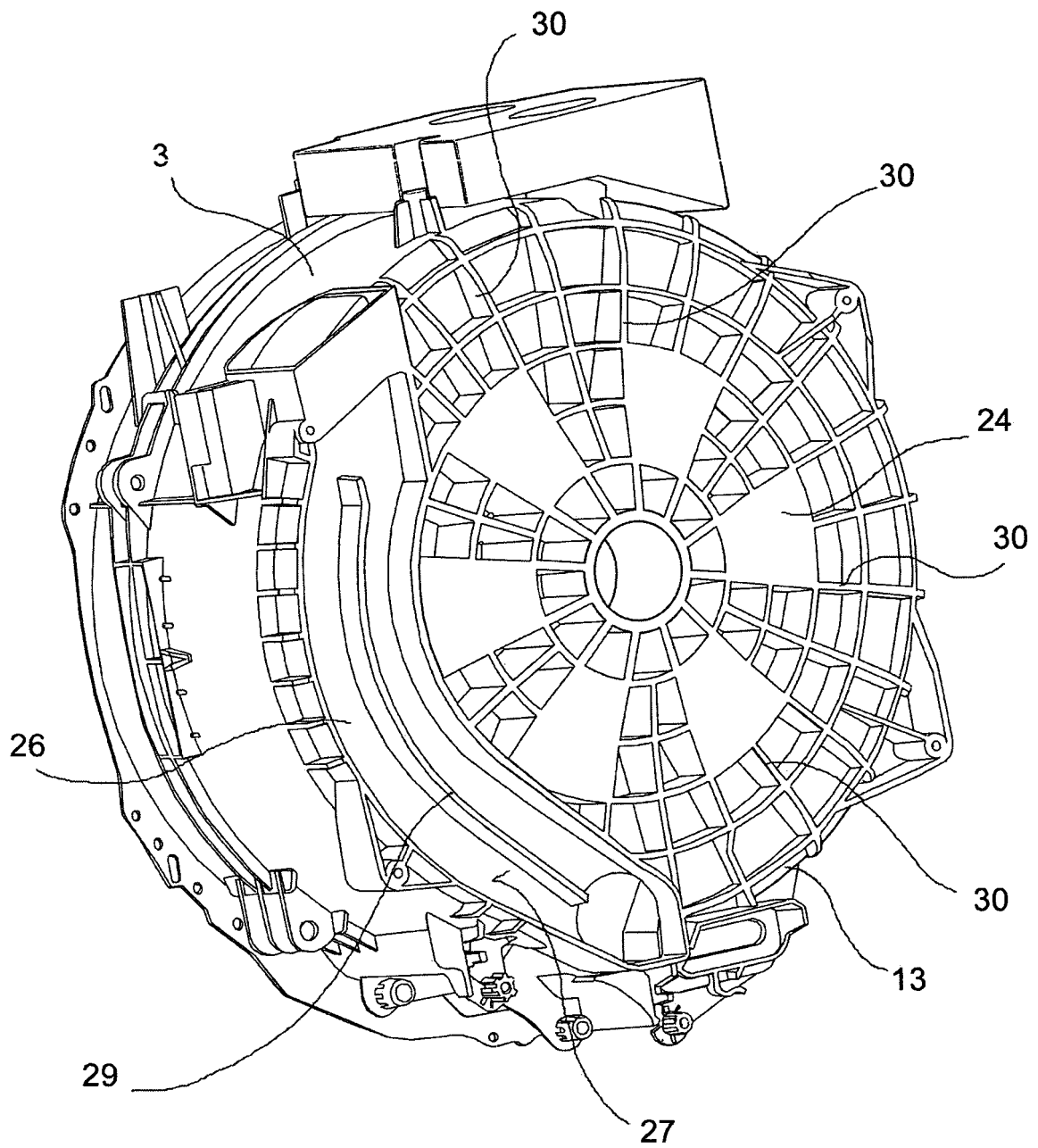


FIG. 4

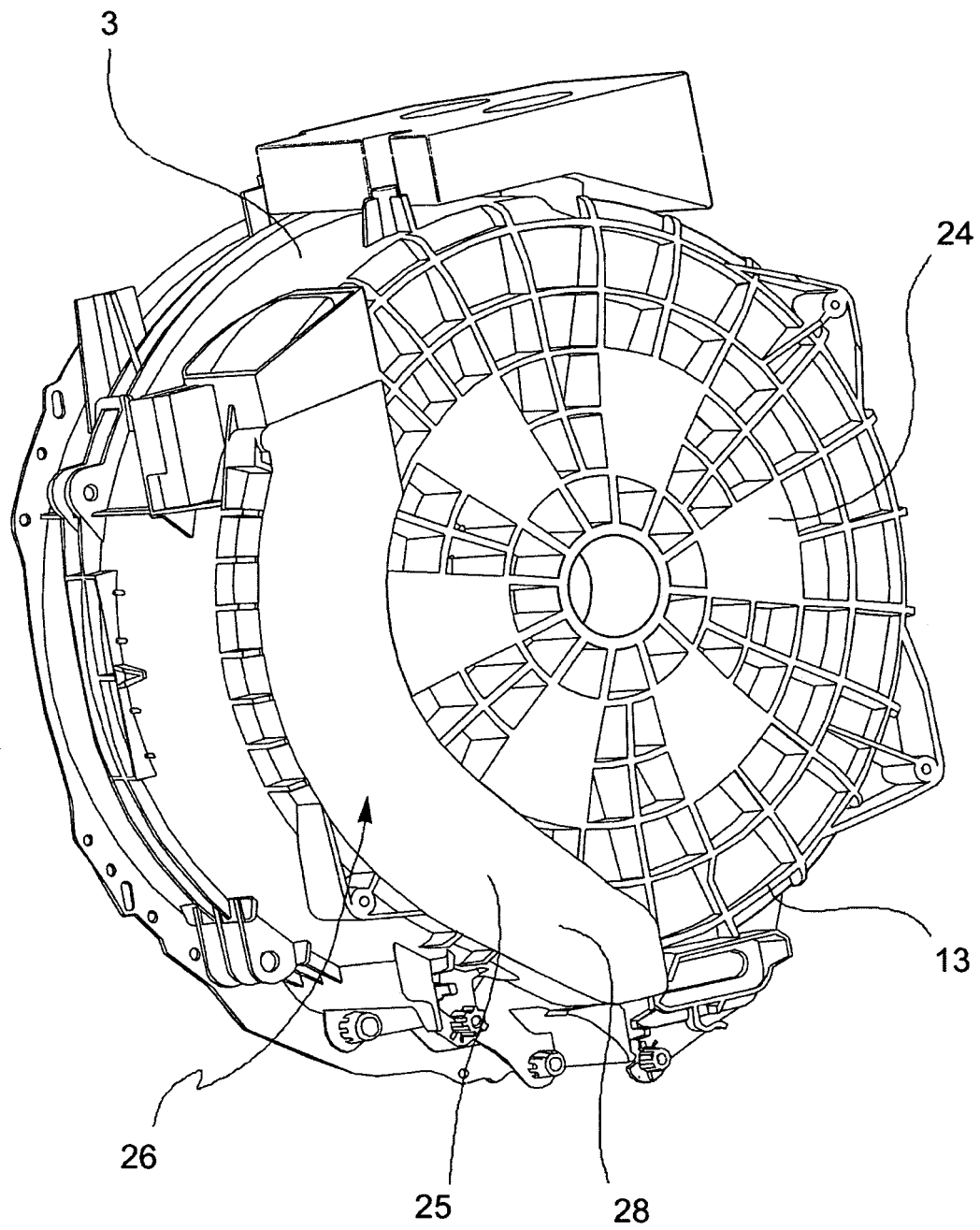


FIG. 5

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2005059230 A [0009]