



EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.06.2017 Bulletin 2017/23

(51) Int Cl.:
D06F 58/24 ^(2006.01) **D06F 25/00** ^(2006.01)
D06F 37/26 ^(2006.01) **D06F 58/20** ^(2006.01)

(21) Application number: **16200446.9**

(22) Date of filing: **24.11.2016**

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

- **LU, Song**
Wuxi, Jiangsu 214028 (CN)
- **ZHU, Chunyu**
Wuxi, Jiangsu 214028 (CN)
- **YOU, Huiqin**
Wuxi, Jiangsu 214028 (CN)
- **LIN, Guangfang**
Wuxi, Jiangsu 214028 (CN)
- **SHI, Xubin**
Wuxi, Jiangsu 214028 (CN)
- **MIAO, Yulai**
Wuxi, Jiangsu 214028 (CN)

(30) Priority: **04.12.2015 CN 201520998733 U**
04.12.2015 CN 201510885611

(71) Applicant: **Wuxi Little Swan Co., Ltd.**
New District
Wuxi
Jiangsu 214028 (CN)

(74) Representative: **Maiwald Patentanwalts GmbH**
Engineering
Elisenhof
Elisenstrasse 3
80335 München (DE)

(72) Inventors:
• **QIAN, Wei**
Wuxi, Jiangsu 214028 (CN)

(54) **WASHING-DRYING MACHINE**

(57) The present disclosure provides a washing-drying machine including: a cabinet; an inner drum (10) rotatably disposed in the cabinet and defining an accommodating cavity (11) therein, in which the inner drum (10) has an air outlet (12) communicating with the accommodating cavity (11) and a condensation air channel disposed in a bottom wall thereof, the condensation air channel is communicated with the accommodating cavity (11) and the air outlet (12) respectively; and a heat exchanger disposed in the cabinet and configured to exchange heat with wet air in the condensation air channel.

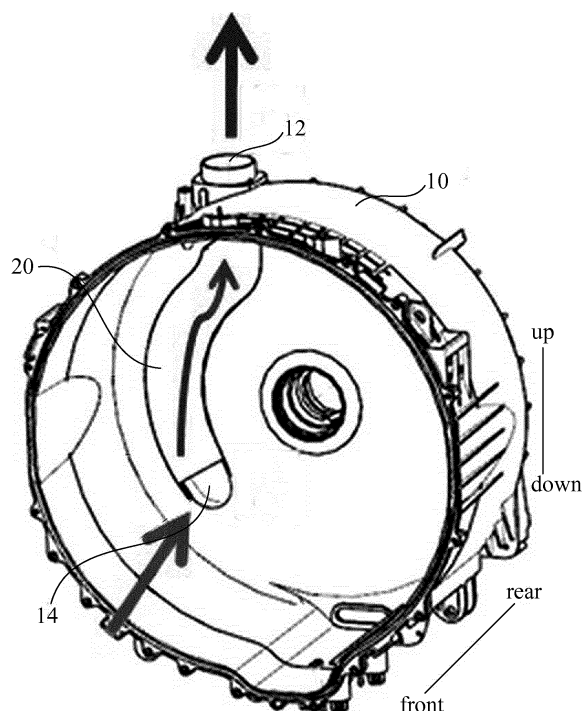


Fig. 1

Description

FIELD

[0001] The present disclosure relates to a technical field of laundry machine, especially to a washing-drying machine.

BACKGROUND

[0002] A drying-condensing system of the front-loading washing-drying machine in the art is designed with an external condensation air channel, in which a condenser is fixed to the outside of the rear tub by a bolt, the flowing air enters the condensation air channel through air vents in the back of the rear tub, and then a ventilation cycle is generated through other components, thus realizing the function of drying clothes. But with this kind of design, the components are large in amount and a structure of the external condensation air channel occupies a relatively large space, and when designing the structure, the condenser occupies the position where a stiffener on the back of the rear tub is located, thus making the stiffener on the back of the rear tub complicated in design.

SUMMARY

[0003] The present disclosure aims to solve one of the technical problems in the related art to at least some extent. Accordingly, the present disclosure provides a washing-drying machine which has a simple and compact structure, a high utilization ratio of space, a small amount of components and a low cost.

[0004] The washing-drying machine according to embodiments of the present disclosure includes: a cabinet; an inner drum rotatably disposed in the cabinet and defines an accommodating cavity therein, in which the inner drum has an air outlet communicated with the accommodating cavity and a condensation air channel disposed in a bottom wall thereof, the condensation air channel is communicated with the accommodating cavity and the air outlet respectively; and a heat exchanger disposed in the cabinet and configured to exchange heat with wet air in the condensation air channel.

[0005] In the washing-drying machine according to embodiments of the present disclosure, by providing the condensation air channel in the bottom wall of the inner drum 10, a space occupation of a partial assembling of the washing-drying machine is reduced, a utilization ratio of space in the cabinet is improved considerably, the amount of components of the drying system of the washing-drying machine is decreased and thus a corresponding cost is reduced. Compared with a washing-drying machine in the related art, the washing-drying machine according to embodiments of the present disclosure does not need an external condensation air channel any more, and thus has a simple and compact structure and a high production efficiency.

[0006] In addition, the washing-drying machine according to embodiments of the present disclosure may have the following additional technical features.

[0007] According to an embodiment of the present disclosure, the washing-drying machine further includes an air channel cover plate, and the air channel cover plate is connected with the bottom wall of the inner drum to define the condensation air channel.

[0008] According to an embodiment of the present disclosure, the bottom wall of the inner drum is provided with a relief groove protruding outwards along an axial direction of the inner drum, the relief groove is communicated with the air outlet, and the air channel cover plate is fitted with the relief groove to define the condensation air channel.

[0009] According to an embodiment of the present disclosure, the condensation air channel has an air channel inlet communicated with the accommodating cavity and the condensation air channel respectively.

[0010] According to an embodiment of the present disclosure, the air channel inlet is formed at an end of the condensation air channel.

[0011] According to an embodiment of the present disclosure, a projected area of the air channel cover plate on a plane vertical to the axial direction of the inner drum is smaller than a projected area of the relief groove on the plane, so as to define the air channel inlet.

[0012] According to an embodiment of the present disclosure, the air channel cover plate is connected with the inner drum by a bolt.

[0013] According to an embodiment of the present disclosure, the air channel cover plate is connected with the inner drum adhesively.

[0014] According to an embodiment of the present disclosure, the air channel cover plate is flush with the bottom wall of the inner drum.

[0015] According to an embodiment of the present disclosure, the relief groove is formed integrally when the inner drum is molded.

[0016] Additional aspects and advantages of the present disclosure will be given in part in the following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a perspective view of an inner drum and an air channel cover plate of a washing-drying machine according to an embodiment of the present disclosure, in which the inner drum and the air channel cover plate are assembled;

Fig. 2 is an exploded view of the structure shown in Fig. 1;

Fig. 3 is a front view of the structure shown in Fig. 1;

Fig. 4 is a rear view of the structure shown in Fig. 1;

and

Fig. 5 is a side view of the structure shown in Fig. 1;

[0018] Reference numerals:

inner drum 10; accommodating cavity 11; air outlet 12; relief groove 13; air channel inlet 14; air channel cover plate 20.

DETAILED DESCRIPTION

[0019] Embodiments of the present disclosure will be described in detail. Examples of the embodiments are shown in the drawings. The embodiments described herein with reference to drawings are explanatory, and used to generally understand the present disclosure, and shall not be construed to limit the present disclosure.

[0020] In the following, a washing-drying machine according to embodiments of the present disclosure will be described with reference to Figs. 1-5.

[0021] As shown in Fig. 1, the washing-drying machine according to embodiments of the present disclosure includes a cabinet (not shown), an inner drum 10 and a heat exchanger (not shown). Specifically, the inner drum 10 is rotatably disposed in the cabinet and has an accommodating cavity 11 therein, in which the inner drum 10 has an air outlet 12 communicated with the accommodating cavity 11 and also has a condensation air channel disposed in a bottom wall thereof. The condensation air channel is communicated with the accommodating cavity 11 and the air outlet 12 respectively, and the heat exchanger is disposed in the cabinet and configured to exchange heat with wet air in the condensation air channel.

[0022] In other words, the washing-drying machine mainly includes the cabinet, an outer tub (not shown), the inner drum 10 and the heat exchanger. The cabinet extends along a vertical direction, the outer tub is disposed fixedly in the cabinet, and the inner drum 10 is rotatably disposed in the outer tub, in which a gap is formed between an external circumferential wall of the inner drum 10 and an internal circumferential wall of the outer tub. The inner drum 10 has the accommodating cavity 11 configured to accommodate clothes therein and also has an air inlet (not shown) and the air outlet 12 communicated with the accommodating cavity 11 respectively.

[0023] Optionally, the inner drum 10 and the outer tub extend along a front and rear direction respectively and disposed coaxially. The bottom wall of the inner drum 10 is provided with the condensation air channel, the condensation air channel is communicated with the accommodating cavity 11 and the air outlet 12 respectively, and the heat exchanger may be disposed adjacent to the condensation air channel. When a drying program of the washing-drying machine starts running, a drying system guides high-temperature air into the accommodating cavity 11 through the air inlet so as to dry the clothes in

the accommodating cavity 11. Then, wet air of the clothes is brought into the condensation air channel, and the heat exchanger condenses the wet air in the condensation air channel. Consequently, a condensed water is discharged out of the inner drum 10, and relatively dry air is obtained, discharged out of the air outlet 12 and then enters subsequent components, and so on.

[0024] Thus, in the washing-drying machine according to embodiments of the present disclosure, by providing the condensation air channel in the bottom wall of the inner drum 10, a space occupation of a partial assembling of the washing-drying machine is reduced, a utilization ratio of space in the cabinet is improved considerably, the amount of components of the drying system of the washing-drying machine is decreased and thus a corresponding cost is reduced. Compared with a washing-drying machine in the related art, the washing-drying machine according to embodiments of the present disclosure does not need an external condensation air channel any more, and thus has a simple and compact structure and a high production efficiency.

[0025] According to an embodiment of the present disclosure, the washing-drying machine further includes an air channel cover plate 20, and the air channel cover plate 20 is connected with the bottom wall of the inner drum 10 to define the condensation air channel. Optionally, the air channel cover plate 20 may be detachably connected or fixedly connected with the bottom wall of the inner drum 10. The air channel cover plate 20 and the inner drum 10 define the condensation air channel therebetween, and the condensation air channel is communicated with the air outlet 12 and the accommodating cavity 11 respectively. Accordingly, the condensation air channel is defined by the bottom wall of the inner drum 10 and the air channel cover plate 20, which provides a simple and compact structure, needs a small amount of components, and thus facilitates assembling and disassembling.

[0026] As shown in Fig. 2, according to an embodiment of the present disclosure, the bottom wall of the inner drum 10 is provided with an relief groove 13 protruding outwards along an axial direction of the inner drum 10, the relief groove 13 is communicated with the air outlet 12, and the air channel cover plate 20 is fitted with the relief groove 13 to define the condensation air channel.

[0027] Specifically, at least a part of the bottom wall of the inner drum 10 extends backwards along the axial direction of the inner drum 10 (i.e. the front and rear direction shown in Fig. 2) so as to form the relief groove 13 in the bottom wall of the inner drum 10. The relief groove 13 is recessed downwards relative to an inner surface of the bottom wall of the inner drum 10 and is communicated with the accommodating cavity 11 and the air outlet 12 respectively. That is, a side (a front side shown in Fig. 2) of the relief groove 13 is open, an inner wall of the relief groove 13 is provided with the air outlet 12, and the air channel cover plate 20 is mounted on the bottom wall of the inner drum 10 and connected with the

bottom wall of the inner drum 10 to enclose at least a part of an opening of the relief groove 13, thus defining the condensation air channel. Optionally, a projected shape of the air channel cover plate 20 on a plane vertical to the axial direction of the inner drum 10 is substantially the same with a projected shape of the relief groove 13 on the plane vertical to the axial direction of the inner drum 10.

[0028] Accordingly, the relief groove 13 may be formed integrally in the bottom wall of the inner drum 10 when the inner drum 10 is molded, which provides a simple manufacturing procedure and a convenient molding, and then the air channel cover plate 20 may be directly mounted to the bottom wall of the inner drum 10 to form the condensation air channel, so that a small amount of components are needed, thus resulting in a low cost, a simple operation and a high assembly efficiency.

[0029] According to an embodiment of the present disclosure, the condensation air channel has an air channel inlet 14, and the air channel inlet 14 is communicated with the accommodating cavity 11 and the condensation air channel respectively, i.e. the air channel inlet 14 communicates the accommodating cavity 11 with the condensation air channel. For example, an outer edge of the air channel cover plate 20 is connected with the bottom wall of the inner drum 10, and the air channel cover plate 20 is provided with the air channel inlet 14 communicated with the accommodating cavity 11, so as to facilitate guiding the wet air in the accommodating cavity 11 of the inner drum 10 to the condensation air channel. Of course, the present disclosure is not limited to this, i.e., the air channel inlet 14 may be provided in the air channel cover plate 20 or defined by the outer edge of the air channel cover plate 20 and the bottom wall of the inner drum 10.

[0030] When the drying program of the washing-drying machine starts running, the drying system guides the high-temperature air into the accommodating cavity 11 through the air inlet so as to dry the clothes in the accommodating cavity 11, then the wet air of the clothes is brought into the condensation air channel through the air channel inlet 14, and the heat exchanger condenses the wet air in the condensation air channel. The condensed water is discharged out of the inner drum 10, and the relatively dry air is obtained and discharged out of the air outlet 12.

[0031] Preferably, according to an embodiment of the present disclosure, the air channel inlet is formed at an end of the condensation air channel. Specifically, as shown in Fig. 3, a length direction of the relief groove 13 extends along a circumferential direction of the bottom wall of the inner drum 10, i.e. an outer contour line of the relief groove 13 is configured to have an arc shape. Correspondingly, an outer contour line of the air channel cover plate 20 is also configured to have an arc shape and a length of the air channel cover plate 20 in the circumferential direction of the bottom wall of the inner drum 10 is smaller than a length of the relief groove 13. A first end of the air channel cover plate 20 is connected with the

bottom wall of the inner drum 10 to enclose a side of the opening of the relief groove 13, and a second end of the air channel cover plate 20 and the bottom wall of the inner drum 10 define the air channel inlet 14. The air channel inlet 14 and the air outlet 12 are located at two ends of the condensation air channel respectively.

[0032] Accordingly, by providing the air channel inlet 14 at the end of the condensation air channel, a flowing time of the wet air in the condensation air channel is increased, and thus the heat-exchange time of the heat exchanger and the wet air is prolonged, so that the wet air is condensed sufficiently, the heat exchange effect is improved, and the drying efficiency of the washing-drying machine is further enhanced.

[0033] As shown in Fig. 3, according to an embodiment of the present disclosure, a projected area of the air channel cover plate 20 on a plane vertical to the axial direction of the inner drum 10 is smaller than a projected area of the relief groove 13 on the plane so as to define the air channel inlet. Accordingly, the inner drum 10 and the air channel cover plate 20 of the washing-drying machine define the condensation air channel and the air channel inlet 14 through a structural fit therebetween, which thus provides the simple and compact structure, the convenient assembling and disassembling, the easy manufacturing and the low cost.

[0034] In some specific embodiments of the present disclosure, the air channel cover plate 20 is connected with the inner drum 10 by a bolt. Specifically, the air channel cover plate 20 is provided with a plurality of threaded holes arranged in a circumferential direction of the air channel cover plate 20 and spaced apart from one another, which thus can guarantee the air channel cover plate 20 to be fixedly connected with the bottom wall of the inner drum 10, and ensure the sealing property of the condensation air channel as well. Correspondingly, multiple bolts are provided and fitted in the plurality of threaded holes respectively. It is to be noted that, the sealing property of the condensation air channel is a relative term, i.e. the condensation air channel has the sealing property in other positions except where the air channel inlet 14 and the air outlet 12 are. Accordingly, the air channel cover plate 20 is connected with the inner drum 10 by the bolts, thus causing the convenient assembling and disassembling and the easy repair thereof.

[0035] In some other specific embodiments of the present disclosure, the air channel cover plate 20 is connected with the inner drum 10 adhesively. Thus, the outer edge of the air channel cover plate 20 is closely fitted with the bottom wall of the inner drum 10, which can guarantee a great sealing property of the condensation air channel, therefore improving the heat exchange effect on the wet air and further increasing the drying efficiency of the washing-drying machine.

[0036] Preferably, according to an embodiment of the present disclosure, the air channel cover plate 20 is flush with the bottom wall of the inner drum 10. In other words, when the air channel cover plate 20 is assembled togeth-

er with the inner drum 10, a side of the air channel cover plate 20 facing towards an opening of the inner drum 10 is flush with the inner surface of the bottom wall of the inner drum 10, so that the inner surface of the bottom wall of the inner drum 10 is beautiful and smooth, and also the outer edge of the air channel cover plate 20 is prevented from lacerating clothes, thus providing a good user experience.

[0037] In addition, according to an embodiment of the present disclosure, the relief groove 13 is formed integrally when the inner drum 10 is molded. For example, the relief groove 13 may be formed in the bottom wall of the inner drum 10 when the inner drum 10 is molded by injection molding. Accordingly, the integrally formed structure guarantees the structural stability and the performance stability of the washing-drying machine, and also is convenient to mold and easy to manufacture, so that redundant assembling components and connection procedures are omitted, thus improving the assembling efficiency of the washing-drying machine considerably and ensuring the connection reliability of the inner drum 10. Furthermore, the integrally formed structure has high overall strength and stability along with a long service life, and is more convenient to assemble.

[0038] Other configurations and operations of the washing-drying machine according to embodiments of the present disclosure are known for those skilled in the art, and thus will not be described in detail herein.

[0039] In the specification, it is to be understood that terms such as "central," "longitudinal," "lateral," "length," "width," "thickness," "upper," "lower," "front," "rear," "left," "right," "vertical," "horizontal," "top," "bottom," "inner," "outer," "clockwise," "counterclockwise," "an axial direction," "a radical direction," and "a circumferential direction," should be construed to refer to the orientation as then described or as shown in the drawings under discussion. These relative terms are for convenience of description and do not require that the present disclosure be constructed or operated in a particular orientation.

[0040] In addition, terms such as "first" and "second" are used herein for purposes of description and are not intended to indicate or imply relative importance or significance or to imply the number of indicated technical features. Thus, the feature defined with "first" and "second" may comprise one or more of this feature. In the description of the present disclosure, "a plurality of" means two or more than two, unless specified otherwise.

[0041] In the present disclosure, unless specified or limited otherwise, the terms "mounted," "connected," "coupled," "fixed" and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections; may also be mechanical or electrical connections or be communicated with each other; may also be direct connections or indirect connections via intervening structures; may also be inner communications or interaction of two elements, which can be understood by those skilled in the art according to specific situations.

[0042] In the present disclosure, unless specified or limited otherwise, a structure in which a first feature is "on" or "below" a second feature may include an embodiment in which the first feature is in direct contact with the second feature, and may also include an embodiment in which the first feature and the second feature are not in direct contact with each other, but are contacted via an intervening structures. Furthermore, a first feature "on," "above," or "on top of" a second feature may include an embodiment in which the first feature is right or obliquely "on," "above," or "on top of" the second feature, or just means that the first feature is at a height higher than that of the second feature; while a first feature "below," "under," or "on bottom of" a second feature may include an embodiment in which the first feature is right or obliquely "below," "under," or "on bottom of" the second feature, or just means that the first feature is at a height lower than that of the second feature.

[0043] Reference throughout this specification to "an embodiment," "some embodiments," "an example," "a specific example," or "some examples," means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the appearances of the phrases in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples. Furthermore, different embodiments or examples in this specification can be jointed and combined by those skilled in the art without mutual contradiction.

[0044] Although embodiments have been shown and described, it would be appreciated that the embodiments above are explanatory and cannot be construed to limit the present disclosure, and changes, alternatives, transformation and modifications to the embodiments above can be made by those skilled in the art in the scope of the present disclosure.

Claims

1. A washing-drying machine, comprising:

a cabinet;
an inner drum (10) rotatably disposed in the cabinet and defines an accommodating cavity (11) therein, wherein the inner drum (10) has an air outlet (12) communicated with the accommodating cavity (11) and a condensation air channel disposed in a bottom wall thereof, the condensation air channel is communicated with the accommodating cavity (11) and the air outlet (12) respectively; and
a heat exchanger disposed in the cabinet and

configured to exchange heat with wet air in the condensation air channel.

2. The washing-drying machine according to claim 1, further comprising an air channel cover plate (20), wherein the air channel cover plate (20) is connected with the bottom wall of the inner drum (10) to define the condensation air channel. 5

3. The washing-drying machine according to claim 2, wherein the bottom wall of the inner drum (10) is provided with a relief groove (13) protruding outwards along an axial direction of the inner drum (10), the relief groove (13) is communicated with the air outlet (12), and the air channel cover plate (20) is fitted with the relief groove (13) to define the condensation air channel. 10 15

4. The washing-drying machine according to claim 3, wherein the condensation air channel has an air channel inlet (14) communicated with the accommodating cavity (11) and the condensation air channel respectively. 20

5. The washing-drying machine according to claim 4, wherein the air channel inlet (14) is formed at an end of the condensation air channel. 25

6. The washing-drying machine according to claim 5, wherein a projected area of the air channel cover plate (20) on a plane vertical to the axial direction of the inner drum (10) is smaller than a projected area of the relief groove (13) on the plane, so as to define the air channel inlet (14). 30 35

7. The washing-drying machine according to any one of claims 2-6, wherein the air channel cover plate (20) is connected with the inner drum (10) by a bolt.

8. The washing-drying machine according to any one of claims 2-6, wherein the air channel cover plate (20) is connected with the inner drum (10) adhesively. 40

9. The washing-drying machine according to any one of claims 2-6, wherein the air channel cover plate (20) is flush with the bottom wall of the inner drum (10). 45

10. The washing-drying machine according to any one of claims 3-6, wherein the relief groove (13) is formed integrally when the inner drum (10) is molded. 50

55

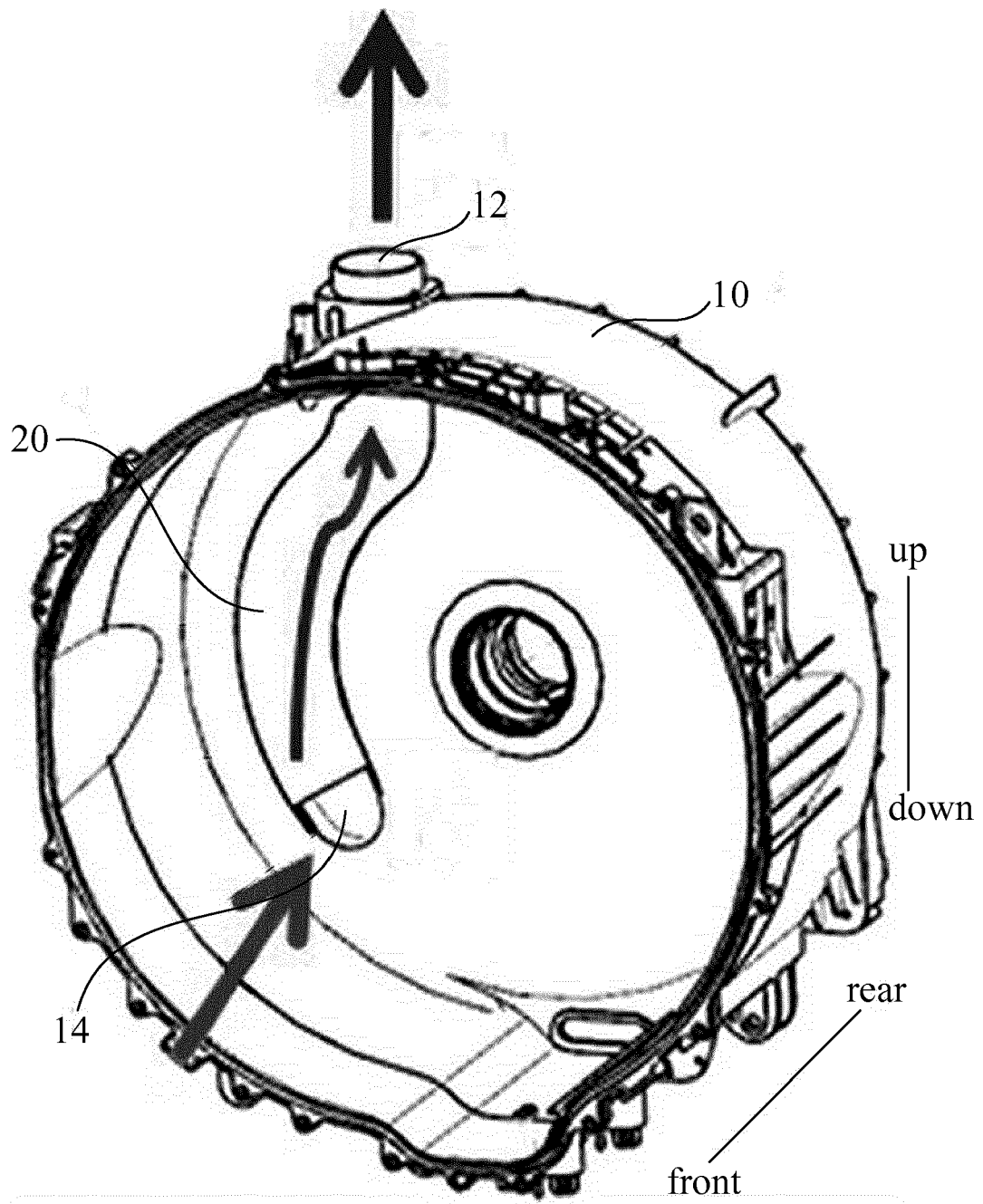


Fig. 1

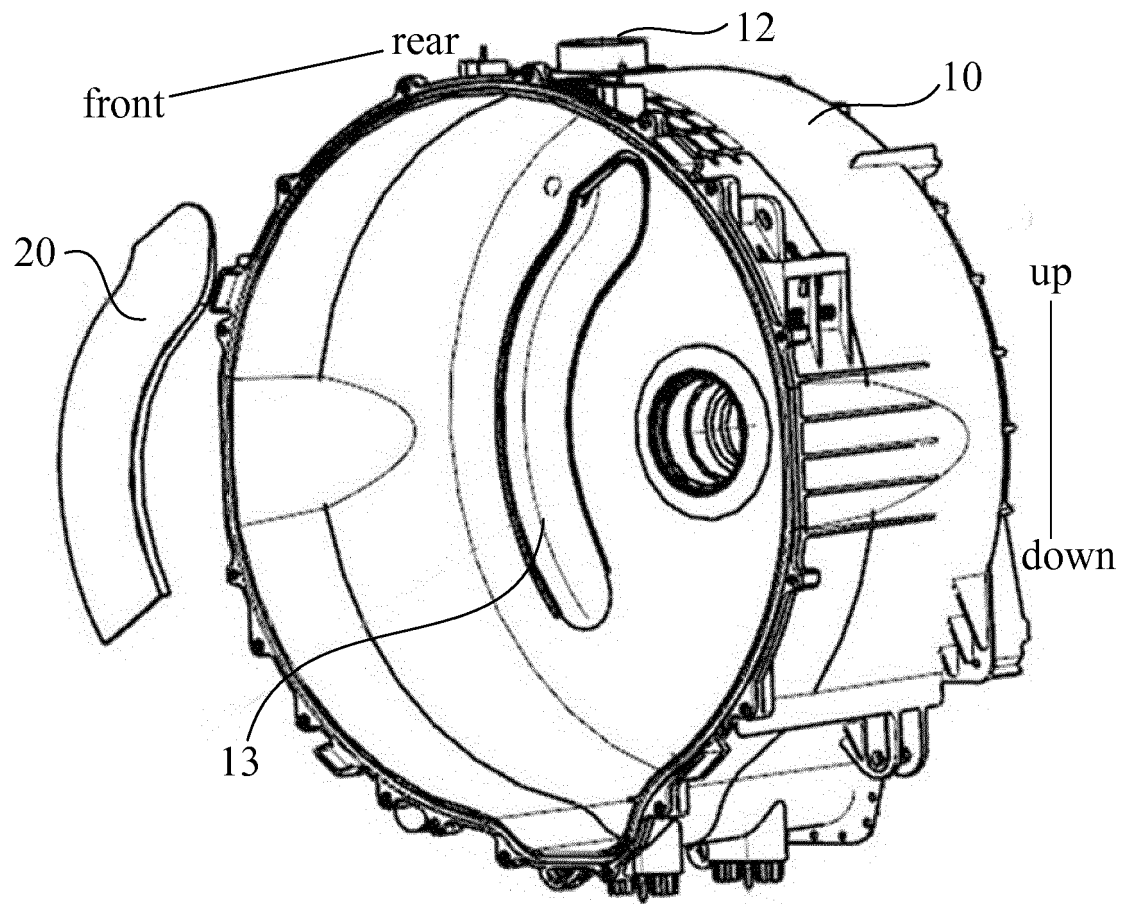


Fig. 2

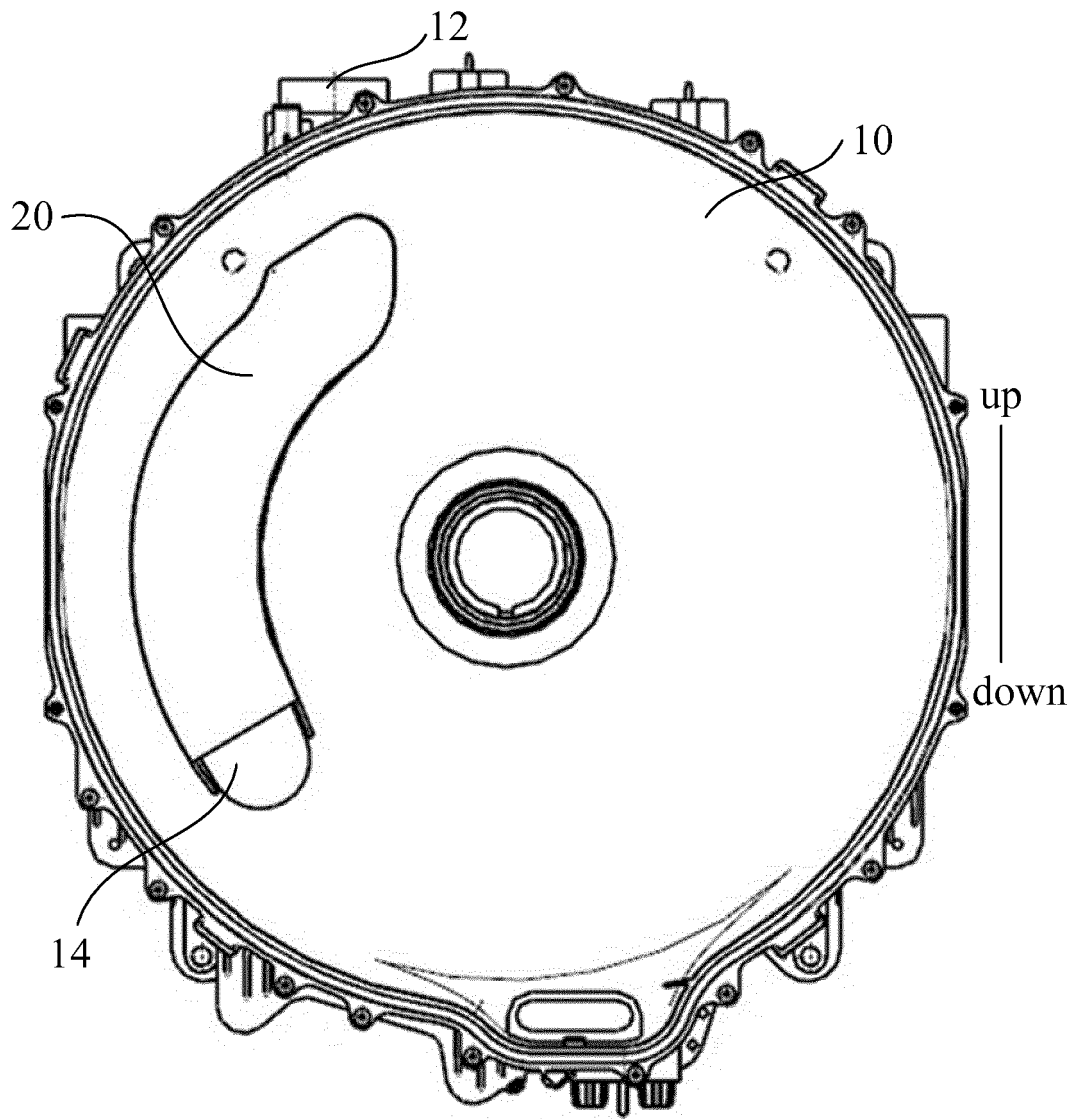


Fig. 3

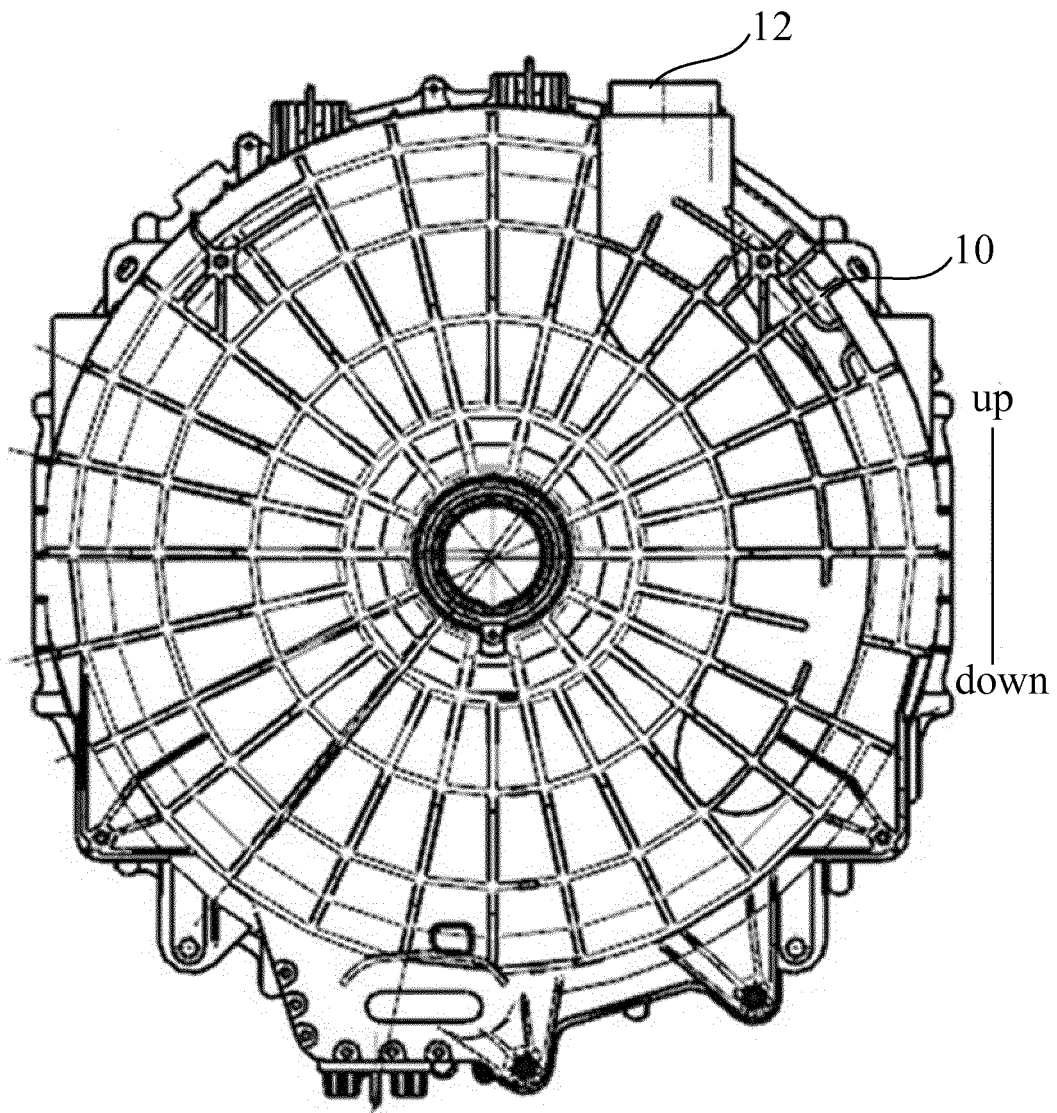


Fig. 4

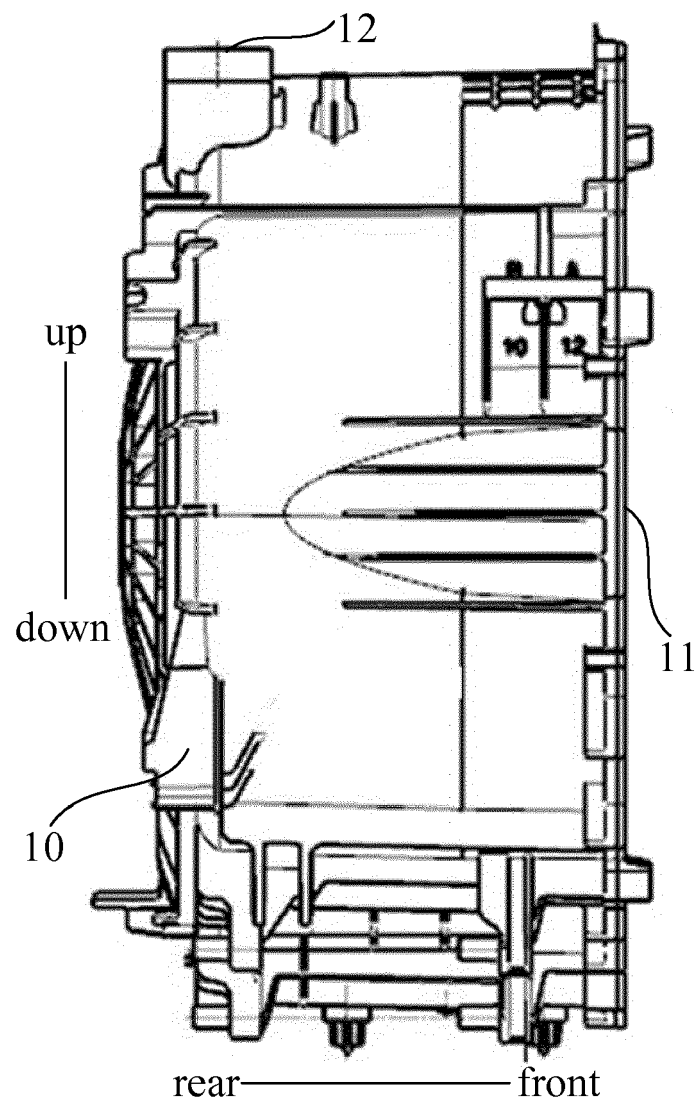


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 16 20 0446

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 202 865 651 U (SUZHOU SAMSUNG ELECTRONICS CO; SAMSUNG ELECTRONICS CO LTD) 10 April 2013 (2013-04-10) * paragraphs [0044] - [0074] * * figures 1-7 *	1-10	INV. D06F58/24
X	CN 104 294 567 A (SUZHOU SAMSUNG ELECTRONICS CO; SAMSUNG ELECTRONICS CO LTD) 21 January 2015 (2015-01-21) * paragraphs [0021] - [0040]; figures 1-6 *	1-10	ADD. D06F25/00 D06F37/26 D06F58/20
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 February 2017	Examiner Bermejo, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 20 0446

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-02-2017

10

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 202865651	U	10-04-2013	NONE	

CN 104294567	A	21-01-2015	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82