



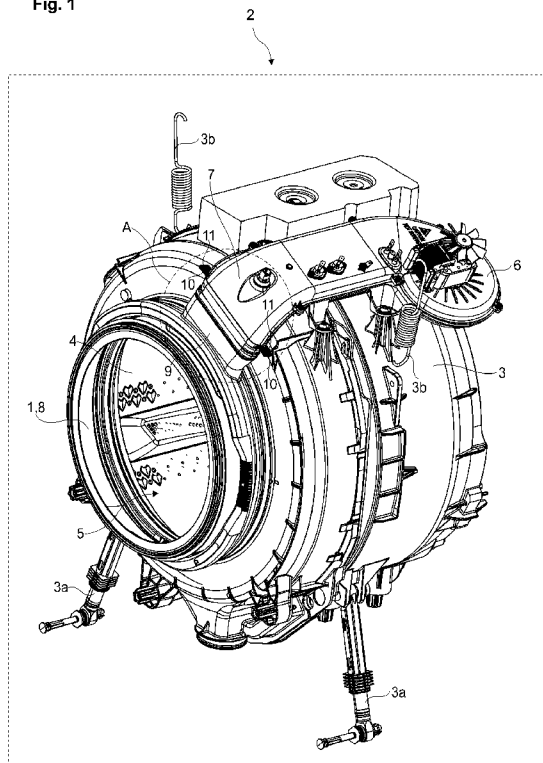
- (51) International Patent Classification:
D06F 37/26 (2006.01) *D06F 25/00* (2006.01)
- (21) International Application Number:
PCT/EP2015/065506
- (22) International Filing Date:
7 July 2015 (07.07.2015)
- (25) Filing Language: English
- (26) Publication Language: English
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

- (54) Title: DOOR BOOT GASKET FOR LAUNDRY WASHER-DRYER

Fig. 1



- (57) Abstract: The present invention relates to a flexible door boot gasket (1) for use in a laundry washer-dryer (2) which comprises a housing; a tub (3); a drum (4); a drying unit (6) which has a duct (7) for circulating hot air through the drum (4). The gasket (1) comprises: a collar (8) for leak-tightly connecting the tub (3) to the housing and a sleeve (9) for circulating the hot air through the drum (4). The sleeve (9) is formed into the collar (8) and fits around at least one of the outlet and inlet ports (7a, 7b) of the duct (7). The gasket (1) of the present invention comprises one or more handles (10) each disposed onto the sleeve (9) and each having a gripping surface (11) which is accessible to the assembly operator and suitable to be gripped by the assembly operator when fitting the sleeve (9) around the respective port (7a;7b).



Published:

— *with international search report (Art. 21(3))*

Description**DOOR BOOT GASKET FOR LAUNDRY WASHER-DRYER**

[0001] The present invention relates to a laundry washing/drying machine. The present invention more particularly relates to the flexible door boot gasket that leak-tightly seals the interfaces between the tub, the housing and the door of the laundry washer-dryer.

[0002] In order to increase the user-convenience, the household appliance manufacturers commonly provide a laundry washing machine with a laundry drying unit which dries the laundry by means of hot air. Such an appliance is commonly referred to as a laundry washer-dryer. Laundry washer-dryers are commonly known in the art. The laundry drying unit generally comprises a duct that circulates hot air through the drum. The duct commonly includes an electrical heater and an impeller. The air inside the drum is sucked by the impeller via the inlet port into the duct and subsequently heated and discharged via the outlet port again into the drum. The humidity of the hot air inside the duct is condensed and drained. The flexible gasket is commonly provided with a sleeve that fits around the outlet port of the duct and circulates the hot air through the drum. The sleeve is commonly formed into the flexible gasket, in particular into the collar which leak-tightly connects the tub to the housing of the appliance, whereas the inlet port of the duct commonly opens directly into the tub, in particular into a rear part of the tub.

[0003] US 2005/0178170 A1 discloses a laundry washer-dryer.

[0004] A common problem with the prior art laundry washer-dryers is that the assemblage of the sleeve onto the outlet port is generally difficult for the assembly operator since the outlet port and the sleeve have closely matching surfaces and thus only a very narrow gap is provided in-between the two. The provision of a larger gap would make the assemblage easier for the assembly operator; however, this could jeopardize the leak-tightness of the connection and consequently reduce the drying performance.

[0005] An objective of the present invention is to provide a flexible gasket and a laundry washer-dryer having the same which solves the problems of the

prior art in a cost effective way and which enables a reliable and easy assemblage thereof.

[0006] This objective has been achieved by the flexible gasket as defined in claim 1 and the laundry washer-dryer as defined in claim 11. Additional achievements have been attained by the subject-matters as defined in the dependent claims respectively.

[0007] The flexible gasket of the present invention comprises one or more handles which are each disposed onto the sleeve. Each handle has a respective gripping surface which is accessible to the assembly operator and suitable to be gripped by the assembly operator when fitting the sleeve of the gasket around the respective port of the duct.

[0008] A major advantageous effect of the present invention is that by virtue of the handles, the sleeve of the gasket has been rendered ergonomic for the assembly operator. Thereby, the assembly operator can easily manipulate the sleeve and quickly assemble the same with the duct of the drying unit even when the gap is comparatively narrower than that applied in common practice. Thereby, the risk of having a leak can be eliminated or reduced as much as possible. Thereby, also the assemblage can expedited and the production costs can be reduced.

[0009] In alternative embodiments, the sleeve is fitted around one of the inlet port and the outlet port. And the other one of the inlet port and the outlet port is fluidly connected directly with the tub. These embodiments are particularly advantageous as the sleeve can be easily manipulated and quickly assembled with the respective inlet/outlet port of the duct. In another alternative embodiment, the inlet port and the outlet port of the duct are arranged side-by-side. In this embodiment, the sleeve has two counterpart partitions that form a double-partitioned sleeve. The double-partitioned sleeve is jointly fitted around the inlet port and the outlet port of the duct. This embodiment is particularly advantageous as the number of parts can be decreased and thus the production costs and the assembly costs can be reduced. Thereby, also the double-partitioned sleeve can be easily manipulated and quickly assembled with the two ports of the duct.

[0010] In another embodiment, the gripping surface of the handle has a size and

shape that matches the fingers of an average adult person. This embodiment is particularly advantageous as the handle can be rendered more ergonomic for the assembly operator. In other alternative embodiments, the handle is provided as a tab or a loop respectively.

- [0011] In another embodiment, the gripping surface of each handle has an unsmooth texture. This embodiment is particularly advantageous as the unsmooth texture improves the grip and the tactile feeling. Thereby, the assembly operator can more easily manipulate the sleeve even when his/her fingers get sweaty during the assemblage.
- [0012] In other alternative embodiments, the texture of the handle is rendered unsmooth by the provision of one or more grooves, ridges, knobs, indentations, or holes into the gripping surface. These embodiments are particularly advantageous as the required grip of the handle can be easily adjusted in accordance with the actual circumstances.
- [0013] In another embodiment, the handles are level with the mouth of the sleeve and extend substantially vertically away from the longitudinal direction of the sleeve. This embodiment is particularly advantageous as the assembly operator can easily approach the handle from the lateral sides and immediately fit the mouth of the sleeve onto the duct. In other alternative embodiments, the handles are upwardly or downwardly inclined with respect to mouth of the sleeve. These embodiments are particularly advantageous as the alignment angle of the handle can be adjusted to the specific configuration of the duct.
- [0014] In another embodiment, at least two handles are respectively provided onto the opposite sides of the sleeve. This embodiment is particularly advantageous as the assembly operator can more easily manipulate the gasket.
- [0015] In another embodiment, the sleeve and the duct each has a matching oblong shape. This embodiment is particularly advantageous as a comparatively large area along the circumference of the collar can be used to circulate the hot air through the drum and thus the drying rate can improved. Of course the sleeve may have other shapes.
- [0016] In another embodiment, the flexible gasket is moulded from a synthetic

rubber or a natural rubber into a single piece. The synthetic rubber may comprise ethylene propylene diene monomer (EPDM) rubber. Other synthetic rubbers which are known to those skilled in the art may be alternatively used.

- [0017] In other alternative embodiments, the laundry washer-dryer may be provided as laundry dryer or a laundry washer-dryer respectively. In addition, the laundry washer-dryer may be provided as a front loading type appliance or a top loading type appliance. Furthermore, the laundry washer-dryer may be provided with a drying unit that utilizes the heat-pump technology or the condenser technology.
- [0018] In another embodiment, the flexible gasket is assembled with the laundry washer-dryer such that the sleeve extends slantwise upwards. This embodiment is particularly advantageous as the slanted alignment of the drying unit secures sufficient space for the balance weight which is to be mounted onto the tub.
- [0019] Additional features and additional advantageous effects of the flexible gasket and the laundry washer-dryer of the present invention will become more apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:
- [0020] Figure 1 – is a schematic partial perspective view of a laundry washer-dryer which has a flexible gasket according to an embodiment of the present invention, wherein the housing and the door have been omitted for ease of illustration;
- [0021] Figure 2 – is a schematic sectional view of the laundry washer-dryer of Fig. 1;
- [0022] Figure 3 – is a schematic partial perspective exploded view of the laundry washer-dryer of Fig. 1, prior to assembling the flexible gasket with the duct of the drying unit.
- [0023] Figure 4 – is a schematic enlarged perspective view of the detail A of Fig. 1;
- [0024] Figure 5 – is a schematic enlarged front view of the detail B of Fig. 3;
- [0025] Figure 6 – is a schematic enlarged sectional view of the detail B of Fig. 3.
- [0026] The reference signs appearing on the drawings relate to the following

technical features.

1. Gasket
2. Laundry washer-dryer
3. Tub
- [0027] 3a. Damper
- 3b. Spring
4. Drum
- [0028] 5. Aperture
- [0029] 6. Drying unit
- [0030] 6a. Heater
- 6b. Impeller
- [0031] 7. Duct
- [0032] 7a. Outlet port
- 7b. Inlet port
- [0033] 8. Collar
- [0034] 9. Sleeve
- [0035] 10. Handle (tab)
- [0036] 11. Gripping surface
- [0037] 12. Groove
- [0038] 13. Mouth
- [0039] 14. Corner
- [0040] 15. Outer rim
- [0041] 16. Inner rim
- [0042] 17. Opening
- [0043] 18. Annular bend
- [0044] 19. Drain hole
- [0045] The flexible door boot gasket (1) (hereinafter shortly referred to as “gasket”) is suitable for use in a laundry washer-dryer (2). The laundry washer-dryer (2) comprises a housing (not shown) which includes a tub (3), wherein the tub (3) is supported by dampers (3a) and springs (3b), a rotatable drum (4) inside the tub (3), wherein the drum (4) is linked to an electric motor (not shown), an aperture (5) for loading/unloading the drum (4), a pivotable door (not shown) which is disposed onto the housing so as

to open/close the aperture (5), a drying unit (6) which has a duct (7) that is adapted to circulate via its outlet port (7a) and inlet port (7b) hot air through the drum (4).

- [0046] The gasket (1) comprises a collar (8) which is adapted to leak-tightly connect the tub (3) to the housing and to seal the mutual interfaces between the tub (3), the housing and the door and a sleeve (9) which is adapted to circulate the hot air through the drum (4), wherein the sleeve (9) is formed into the collar (8) and adapted to fit around at least one of the outlet port (7a) and the inlet port (7b). The duct (7) includes: an electrical heater (6a) for heating the air and an impeller (6b) for moving the hot air.
- [0047] The flexible gasket (1) of the present invention further comprises: one or more handles (10) each disposed onto the sleeve (9) and each having a respective gripping surface (11) which is accessible to the assembly operator and suitable to be gripped by the assembly operator when fitting the sleeve (9) around the respective port (7a, 7b) of the duct (7).
- [0048] The laundry washer-dryer (2) of the present invention comprises the flexible gasket (1).
- [0049] In an embodiment, the inlet port (7a) and an outlet port (7b) of the duct (7) are arranged side-by-side. In this embodiment, the sleeve (9) is accordingly double-partitioned and further adapted to jointly fit around the inlet port (7a) and the outlet port (7b) of the duct (7).
- [0050] In another embodiment, the handles (10) are provided in form of tabs (10).
- [0051] In an alternative embodiment, the handles (10) are provided in form of loops (not shown).
- [0052] In another embodiment, the gripping surfaces (11) of the respective handles (10) each has at least partly an unsmooth texture.
- [0053] In another embodiment, each handle (10) comprises one or more grooves (12) which are formed into the respective gripping surface (11).
- [0054] In another alternative embodiment, each handle (10) comprises one or more ridges (not shown) which are formed onto the respective gripping surface (11).
- [0055] In another embodiment, the gripping surface (11) of each handle (10) is level with the mouth (13) of the sleeve (9) and also normal to the

longitudinal direction of the sleeve (9).

- [0056] In another embodiment, the sleeve (9) is oblong shaped with rounded corners (14) and two handles (10) are respectively formed onto the opposite short sides on its mouth (13).
- [0057] In another embodiment, the flexible gasket (1) further comprises: an outer rim (15) which is adapted to connect the collar (8) with the periphery of the aperture (5) in the housing; an inner rim (16) which is adapted to connect the collar (8) with the periphery of the opening (17) of the tub (3), one or more annular bends (18) which join the outer rim (15) and the inner rim (16); a radially inwardly extending tongue (not shown) which is adapted to divert the laundry inside the drum (4) away from the region immediately between the drum (4) and the collar (8) and one or more drain holes (19) which open into the tub (3).
- [0058] In another embodiment, the flexible gasket (1), including the collar (8), the sleeve (9), the handles (10), the rims (15, 16), the annular bends (18) and the tongue are moulded from a suitable synthetic rubber into a single piece.
- [0059] In another embodiment, the synthetic rubber comprises ethylene propylene diene monomer (EPDM) rubber.
- [0060] In another embodiment, the flexible gasket (1) is assembled with the tub (3), the housing and the duct (7) such that the sleeve (9) extends slantwise upwards.
- [0061] A major advantageous effect of the present invention is that by virtue of the handles (10), the sleeve (9) of the gasket (1) has been rendered ergonomic for the assembly operator. Thereby, the assembly operator can be easily manipulate the sleeve (9) and quickly assemble the same with the duct (7) of the drying unit (6) even when the gap therebetween is comparatively narrower than that applied in the common practice. Thereby, the risk of having a leak can be eliminated or reduced as much as possible. Thereby, also the assemblage can expedited and the production costs can be reduced. Other advantageous effects of the present invention can be taken from the aforementioned particular embodiments.

Claims

1. A gasket (1) for use in a laundry washer-dryer (2) which comprising a housing which includes a tub (3), a rotatable drum (4) inside the tub (3), an aperture (5) for loading/unloading the drum (4), a door which is disposed onto the housing so as to open/close the aperture (5), a drying unit (6) which has a duct (7) that is adapted to circulate via its outlet port (7a) and inlet port (7b) hot air through the drum (4), the gasket (1) comprising a collar (8) which is adapted to leak-tightly connect the tub (3) to the housing and to seal the interfaces between the tub (3), the housing and the door and a sleeve (9) which is adapted to circulate the hot air through the drum (4), wherein the sleeve (9) is formed into the collar (8) and adapted to fit around at least one of the outlet port (7a) and the inlet port (7b), the flexible gasket (1) being **characterized in that** one or more handles (10) each disposed onto the sleeve (9) and each having a respective gripping surface (11) which is accessible to the assembly operator and suitable to be gripped by the assembly operator when fitting the sleeve (9) around the respective port (7a, 7b) of the duct (7).
2. The gasket (1) according to claim 1, **characterized in that** the handles (10) are provided in form of tabs (10) or loops respectively.
3. The gasket (1) according to claim 1 or 2, **characterized in that** the gripping surfaces (11) of the respective handles (10) each has at least partly an unsmooth texture.
4. The gasket (1) according to claim 3, **characterized in that** each handle (10) comprises one or more grooves (12) which are formed into the respective gripping surface (11).
5. The gasket (1) according to claim 3, **characterized in that** each handle (10) comprises one or more ridges which are formed onto the respective gripping surface (11).
6. The gasket (1) according to any one of claims 1 to 5, **characterized in that** the gripping surface (11) of each handle (10) is level with the mouth (13) of the sleeve (9) and also normal to the longitudinal direction of the sleeve (9).
7. The gasket (1) according to any one of claims 1 to 6, **characterized in that** the sleeve (9) is oblong shaped with rounded corners (14) and two handles (10) are respectively formed onto the opposite short sides on its mouth (13).

8. The gasket (1) according to any one of claims 1 to 7, **characterized in that** an outer rim (15) which is adapted to connect the collar (8) with the periphery of the aperture (5) in the housing, an inner rim (16) which is adapted to connect the collar (8) with the periphery of the opening (17) of the tub (3), one or more annular bends (18) which join the outer rim (15) and the inner rim (16), a radially inwardly extending tongue which is adapted to divert the laundry inside the drum (4) away from the region immediately between the drum (4) and the collar (8) and one or more drain holes (19) which open into the tub (3).
9. The gasket (1) according to claim 8, **characterized in that** the collar (8), the sleeve (9), the handles (10), the rims (15, 16), the annular bends (18) and the tongue are moulded from a suitable synthetic rubber into a single piece.
10. The gasket (1) according to any one of claims 1 to 9, wherein the inlet port (7a) and the outlet port (7b) of the duct (7) are arranged side-by-side, the flexible gasket (1) being **characterized in that** the sleeve (9) is double-partitioned and further adapted to jointly fit around the inlet port (7a) and the outlet port (7b) of the duct (7).
11. A laundry washer-dryer (2) comprising a housing which includes a tub (3), a rotatable drum (4) inside the tub (3), an aperture (5) for loading/unloading the drum (4), a door which is disposed onto the housing so as to open/close the aperture (5), a drying unit (6) which has a duct (7) that is adapted to circulate via its outlet port (7a) and inlet port (7b) hot air through the drum (4), **characterized in that** the flexible gasket (1) as defined in any one of claims 1 to 10.
12. The laundry washer-dryer (2) according to claim 11, **characterized in that** the flexible gasket (1) is assembled with the tub (3), the housing and the duct (7) such that the sleeve (9) extends slantwise upwards.

Fig. 1

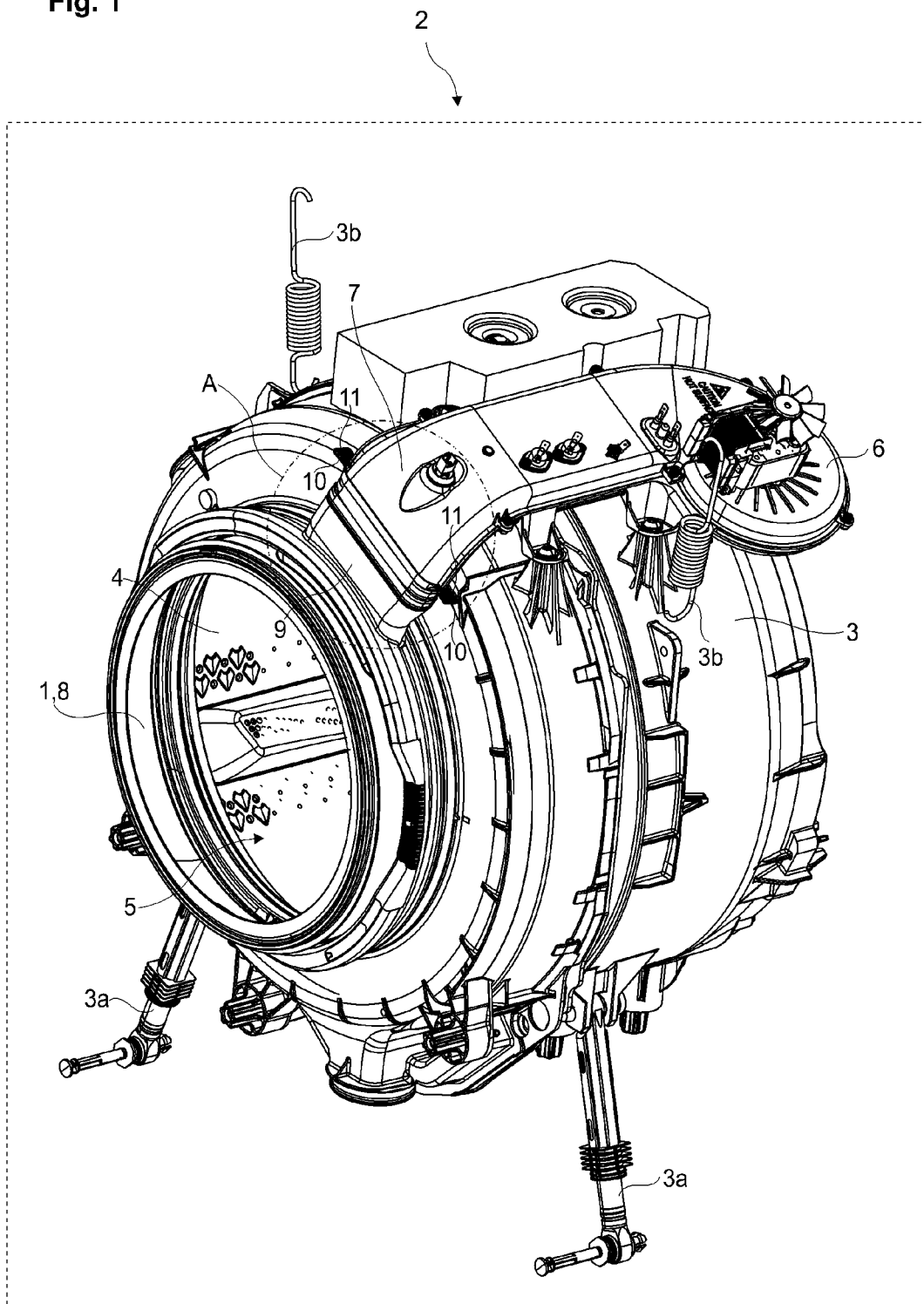


Fig. 2

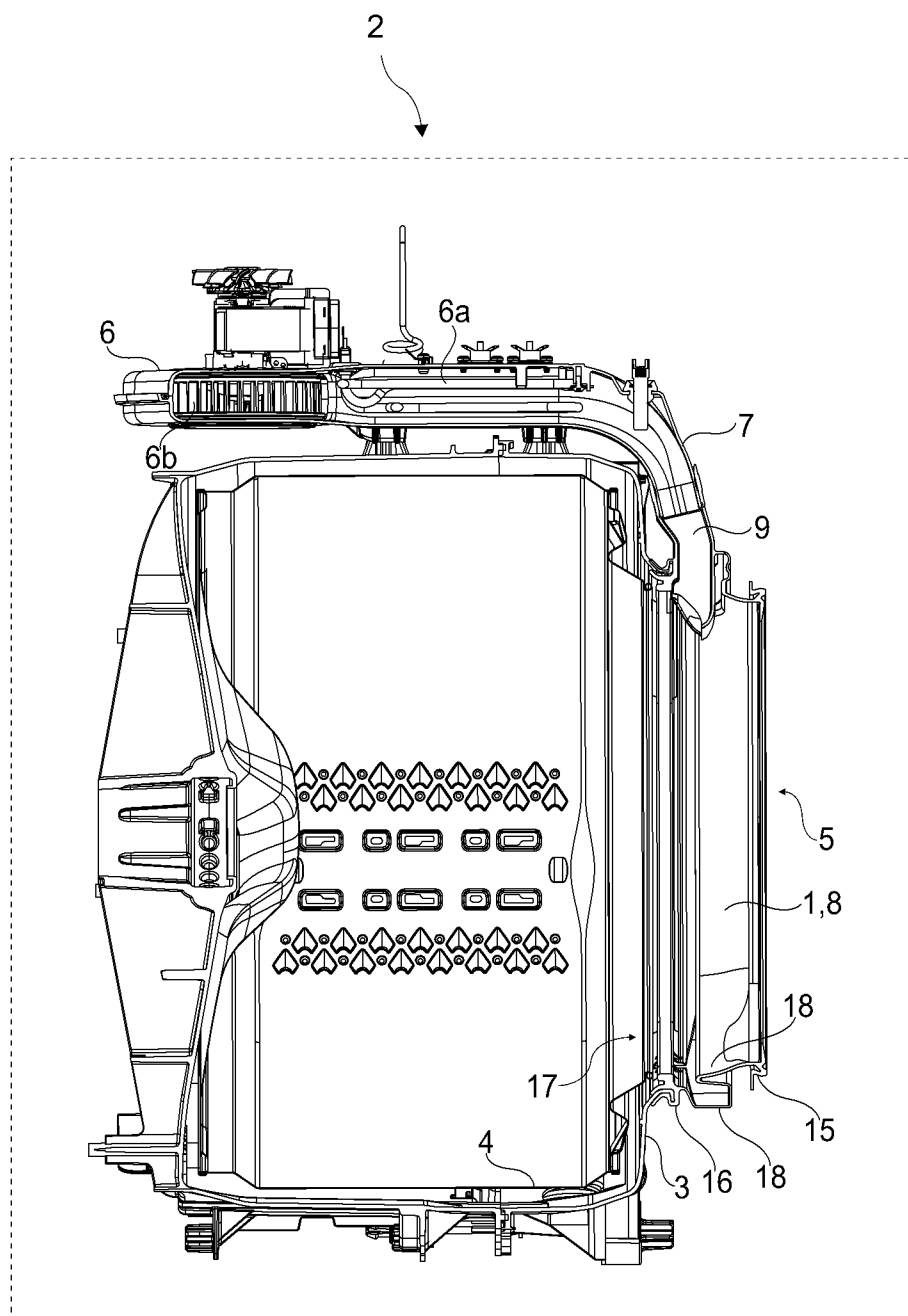


Fig. 3

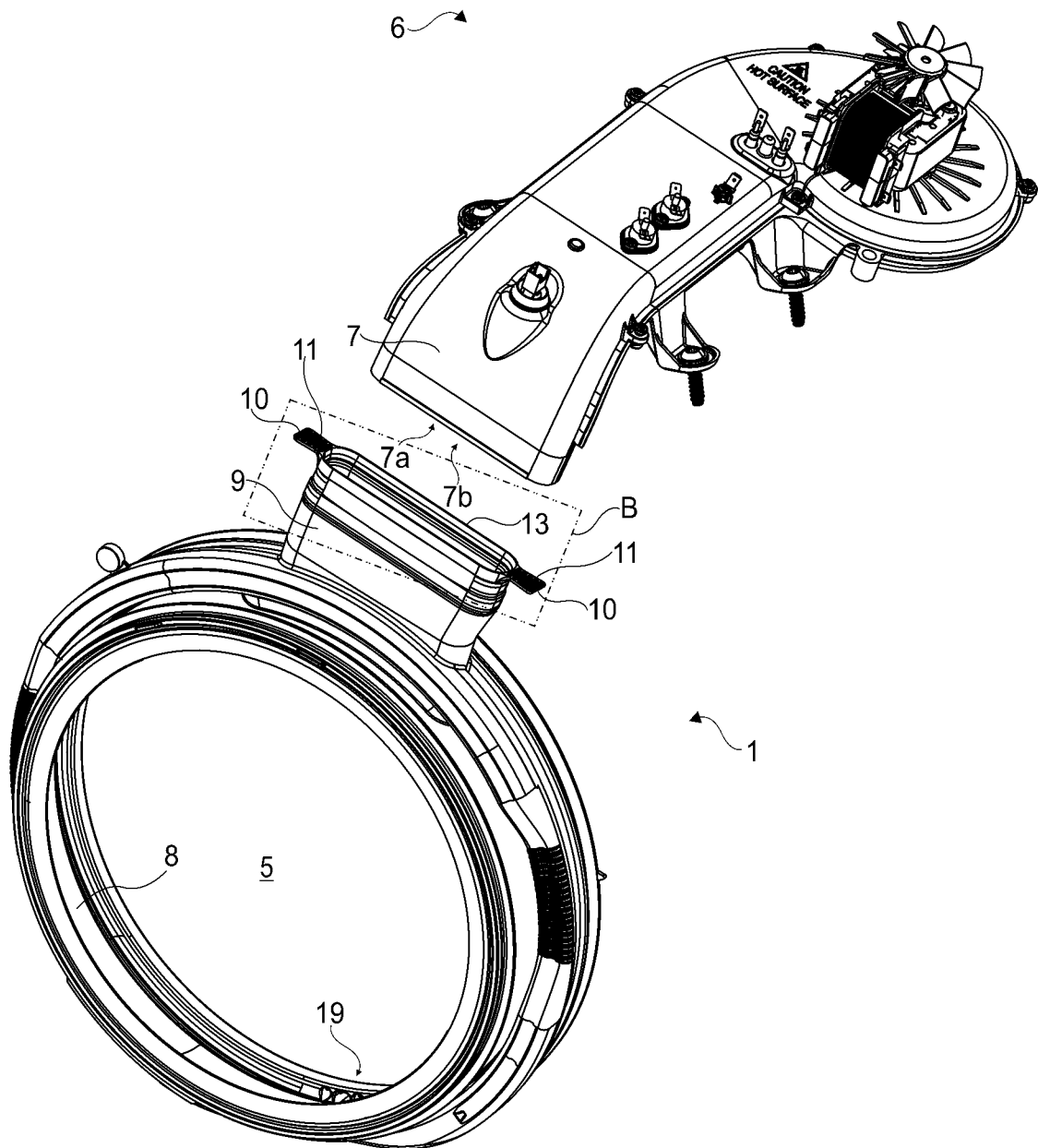


Fig. 4

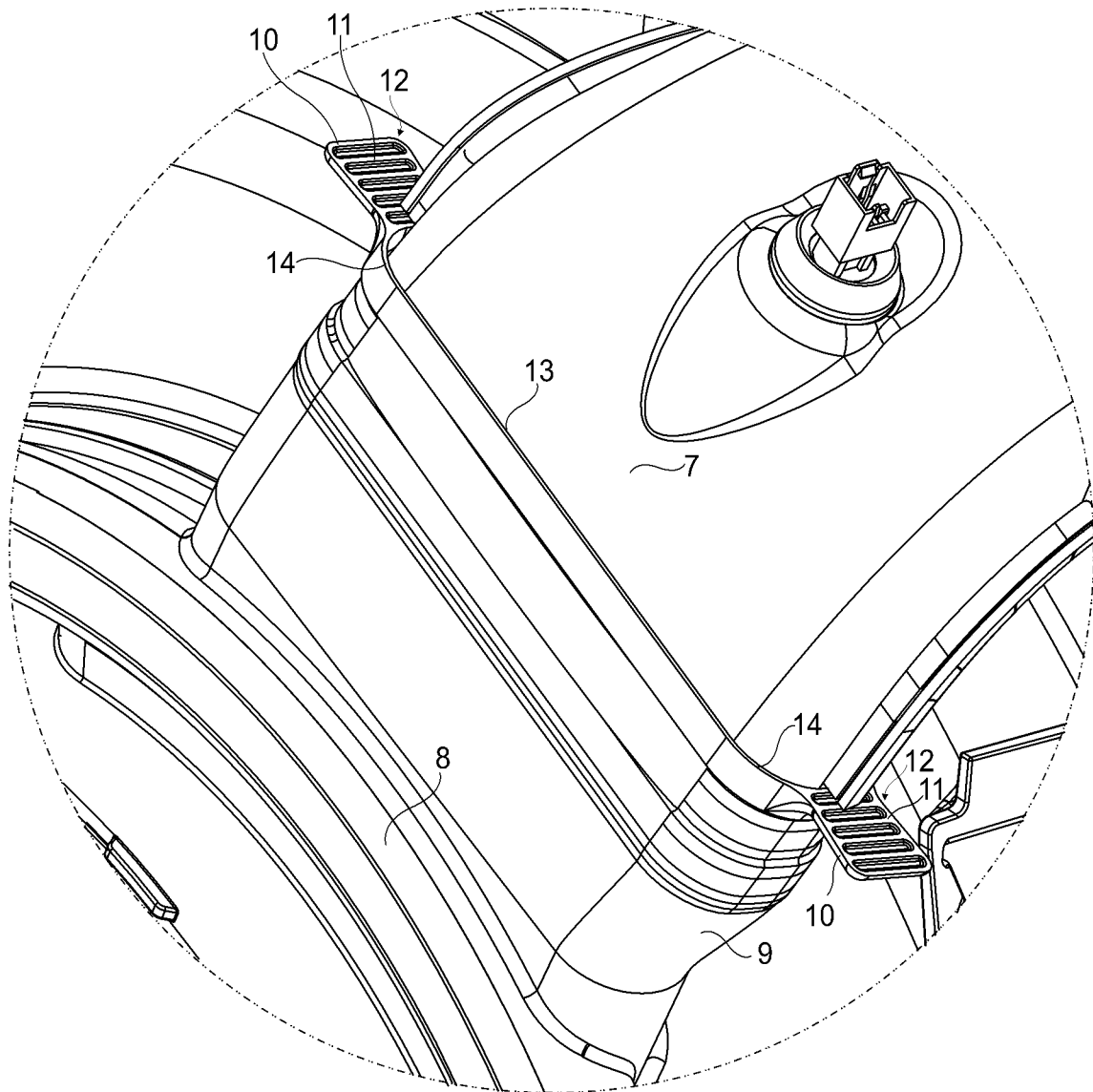


Fig. 5

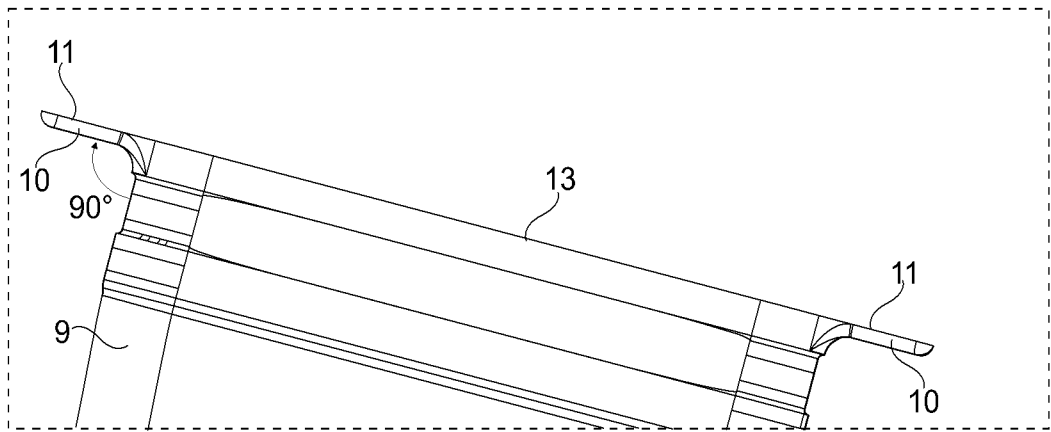
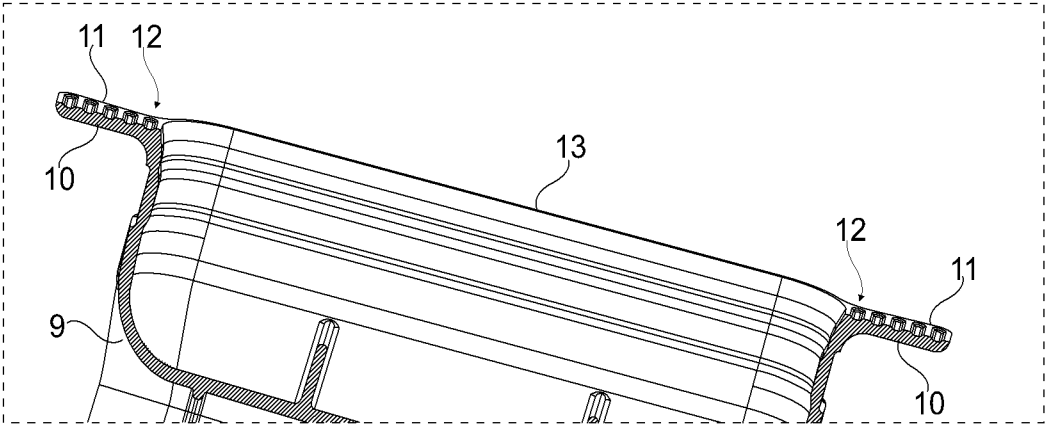


Fig. 6



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/065506

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F37/26 D06F25/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011/285260 A1 (MOON SUK YUN [KR] ET AL) 24 November 2011 (2011-11-24) paragraph [0109] - paragraph [0110]; figures 6-12 paragraph [0125] -----	1-12
A	US 2005/178170 A1 (KIM JAE K [KR] ET AL) 18 August 2005 (2005-08-18) cited in the application figures 4-6 paragraph [0039] - paragraph [0043] -----	1-12
A	EP 1 752 575 A1 (LG ELECTRONICS INC [KR]) 14 February 2007 (2007-02-14) figures -----	1-12
E	WO 2016/015762 A1 (ELECTROLUX APPLIANCES AB [SE]) 4 February 2016 (2016-02-04) the whole document -----	1



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

16 February 2016

Date of mailing of the international search report

25/02/2016

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/065506

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