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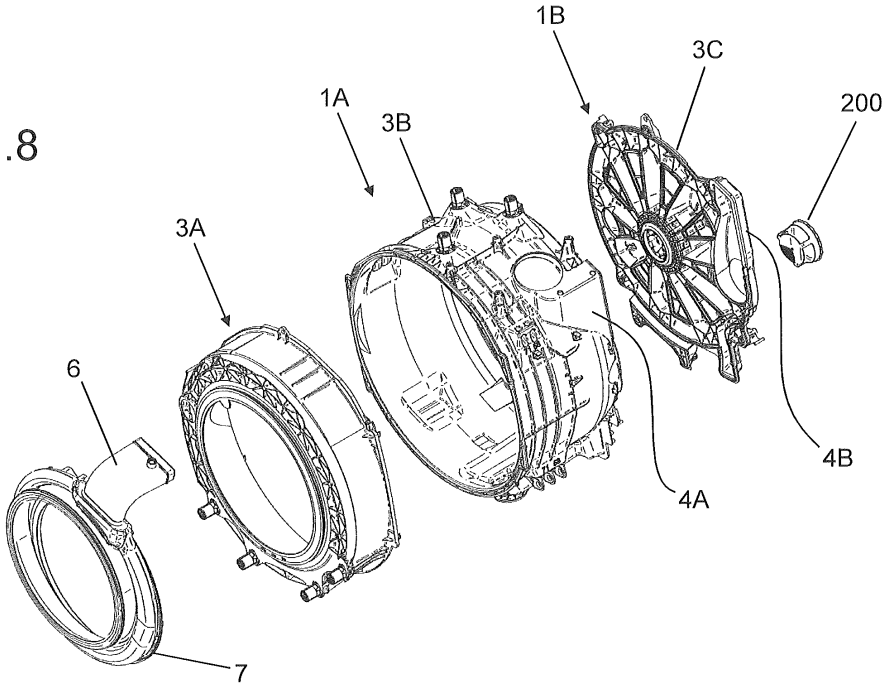
(54) **HOUSEHOLD APPLIANCE ADAPTED TO PERFORM AT LEAST A DRYING CYCLE, SUCH AS A WASHING/DRYING MACHINE OR A DRYING MACHINE**

(57) Household appliance (1) adapted to perform at least a drying cycle comprising a tub (3) in which a drum (2) is rotatably mounted, said tub (3) including a plurality of structural components (3A-3C), whereby said structural components (3A-3C) comprise a tub body (3B) extending from a front section (3B') to a rear section (3B"), and a rear component (3C) mounted to said tub body (3B) at said rear section (3B"); a drying system (10), having an inlet (10a) for receiving wet air from said tub (3) and an outlet (10b) for providing dried air to said tub (3), said drying system (10) including a condenser (4) adapted to receive a flow of wet air from said tub (3) and to make it condense, said household appliance (1) further comprises a first structural portion (1A) made in one piece and including said tub body (3B) and a second structural portion (1B) made in one piece and comprising said rear component (3C).

Fig.8



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Description

FIELD OF THE INVENTION

[0001] The present invention refers to a household appliance adapted to perform at least a drying cycle, such as a washing/drying machine or a drying machine.

PRIOR ART

[0002] Drying machines and washing/drying machines comprise a rotating drum in which the items to be dried are placed. The drum is rotatably mounted in a tub. To perform the drying through a recirculation line, the air is extracted from the compartment, treated and reintroduced therein. The recirculation line includes:

a condenser that causes the condensation of the moisture contained in the air extracted from the compartment (such moisture is transferred to the air by the linen whilst it is drying);
a blowing unit that moves the air along the recirculation line; the blowing unit typically comprises a fan (or impeller) and a casing, in which the fan is rotatably mounted; the fan is driven in rotation by a respective motor, mounted to the casing;
an element that heats the air before reintroducing it into the compartment.
In this technical context, the Applicant has felt the need to reduce the complexity and costs associated with the production of the condenser.

SUMMARY OF THE INVENTION

[0003] It is an object of the present invention to provide a household appliance adapted to perform at least a drying cycle wherein the condenser included in the drying system is realized in a simple and cost effective manner.
[0004] This and further objects are substantially achieved by a household appliance as described in the appended claims.
[0005] The basic idea of the present invention is to make the condenser integral with the tub; in other terms, the condenser is substantially realized as the assembly of two semi-parts, each made in one piece with one component of the tub body.
[0006] Accordingly, when the tub's components are assembled and welded in order to manufacture the tub, also the condenser is obtained without performing additional production steps.
[0007] In view of the above, the invention refers to a household appliance adapted to perform at least a drying cycle, said appliance comprising:

a. a tub in which a drum is rotatably mounted, said tub including a plurality of structural components, said structural components comprising:
a tub body extending from a front section to a rear section, and
a rear component mounted to said tub body at said rear section;

b. a drying system, having an inlet for receiving wet air from said tub and an outlet for providing dried air to said tub, said drying system including a condenser adapted to receive a flow of wet air from said tub and to make it condense and obtain dried air,

wherein said household appliance comprises a first structural portion made in one piece and including said tub body;
wherein said household appliance comprises a second structural portion made in one piece and comprising said rear component;
wherein said condenser is formed by coupling said first structural portion and said second structural portion.
[0008] Preferably said condenser comprises a first structural component and a second structural component, said first structural component being included in said first structural portion, said second structural component being included in said second structural portion. Preferably the second structural component of said condenser is box-like shaped with one face missing.
[0009] Preferably said tub body comprises a rear base, said rear base including a shared portion which is also part of said condenser.
[0010] Preferably the shared portion of said rear base partly closes the missing face of the second structural component.
[0011] Preferably the first structural component of said condenser is box-like shaped with one face missing.
[0012] Preferably the perimeter of the missing face of the second structural component is at least partly joined to the perimeter of the missing face of the first structural component to form said condenser.
[0013] Preferably the first structural component has a first top opening connected to a conduit for insertion of nebulized water in said condenser.
[0014] Preferably said shared portion comprises a rear opening, said rear opening providing a flow connection between said second structural component and the inside of the tub.
[0015] Preferably said rear opening is enclosed in the perimeter of the missing face of said second structural component.
[0016] Preferably said rear component comprises a plurality of radial structural supports extending from a central hub.
[0017] Preferably the structural components of said tub further comprise a front annular component mounted on said tub body at said front section.
[0018] Preferably said drying system further comprises a blowing unit to promote an air flow inside said drying system, wherein said condenser is arranged upstream of said blowing unit.

[0019] Preferably the first structural component has a second top opening which provides a fluid connection with said blowing unit.

[0020] Preferably said second structural component has an auxiliary opening facing the rear opening provided at the rear base of the tub body, the auxiliary opening being removably closed by a closing element, the latter being provided with a filter portion positioned at said rear opening when the closing element closes the auxiliary opening.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Some examples of preferred and advantageous embodiments are described for purely illustrative and non limiting purposes, with reference to the attached drawings, in which:

figure 1 shows a block diagram of a household appliance according to the invention;
figures 2-3 show perspective views of a portion of the household appliance of figure 1;
figures 4-5 show perspective views of a first component included in the portion of figures 2-3;
figures 6-7 show perspective views of a second component included in the portion of figures 2-3;
figure 8 shows an exploded perspective view of the portion of figures 2-3, wherein some parts have been removed to better show other parts;
figures 9a-9b show perspective views of a detail of figures 2-3, 8;
figures 10a-10b are enlarged views of a part of figure 4.

DETAILED DESCRIPTION OF THE INVENTION

[0022] In the accompanying drawings, 1 indicates a household appliance adapted to perform at least a drying cycle.

[0023] The appliance 1 can be a drying machine, adapted to dry linen and/or clothes previously washed by a different machine.

[0024] The appliance 1 can also be a washer-drier, namely a machine capable of both washing and drying linen and/or clothes. In this case, the appliance 1 is also adapted to perform at least a washing cycle.

[0025] The appliance 1 (figure 1) comprises a drum 2 which can rotate and which is intended to house the items to be dried.

[0026] The appliance 1 comprises a tub 3, in which the drum 2 is rotatably mounted.

[0027] Advantageously the appliance 1 comprises a drying system 10 which has an inlet 10a for receiving wet air from the tub 3 and an outlet 10b for providing dried air to be inserted back into the tub 3. This allows the air rich in moisture (following contact with the items to be dried contained in the drum 2 placed in the tub 3) to be taken and reintroduced into the same tub 3 after being dried and heated.

[0028] Preferably the appliance 1 further comprises a connection conduit 6 adapted to guide the flow of dried air from the outlet 10b of the drying system 10 to the tub 3.

[0029] Preferably, the connection conduit 6 is associated to an annular shaped gasket 7, arranged around the loading opening 7a of the tub 3 and provided with a passage to let the dried air reach the inside of the same tub 3.

[0030] In a preferred embodiment, the connection conduit 6 is made of an elastomeric material, e.g. the same material as the annular gasket 7.

[0031] In a preferred embodiment, the connection conduit 6 and the annular gasket 7 are made in one piece.

[0032] The drying system 10 comprises a condenser 4 that receives a gaseous fluid containing particles of vapor from said tub 3 and that causes at least partial condensation thereof. Preferably the inlet 10a of the drying system 10 coincides with the inlet of the condenser 4. The tub 3 includes a plurality of structural components 3A-3C. The structural components 3A-3C comprise:

a tub body 3B extending from a front section 3B' to a rear section 3B", and
a rear component 3C mounted to the tub body 3B at the rear section 3B".

[0033] Preferably, the structural components 3A-3C further comprise a front annular component 3A mounted on the tub body 3B at the front section 3B'.

[0034] Preferably the tub body 3B has a substantially cylindrical shape.

[0035] The aforementioned loading opening 7a is provided at the front section 3B' of the tub body 3B.

[0036] The rear section 3B" is substantially closed by a rear base RB; one or more openings can be provided in the rear base RB, as will be disclosed in further detail in the following. Preferably the rear component 3C comprises a plurality of radial structural supports 3C' extending from a central hub 3C" (figure 6).

[0037] Preferably the condenser 4 comprises a first structural component 4A and a second structural component 4B.

[0038] As shown in figure 6, the second structural component 4B of the condenser 4 is box-like shaped with one face missing. In other terms, the second structural component 4B comprises side walls SW, which define a substantially close perimetral structure, and a base wall BW, from which the side walls extend in a direction substantially perpendicular to the planar extension of the same base wall BW. Preferably, the second structural component 4B substantially consists of said side walls SW and base wall BW. Accordingly, the second structural component 4B is substantially open at its section opposite to the base wall BW relative to the side walls SW, i.e. a face is missing that closes the box-like shape defined by the side walls SW and base wall BW.

[0039] Preferably the rear base RB of the tub body 3B

includes a shared portion SP, which is also part of the condenser 4. In particular the shared portion 4a partly closes the missing face of the second structural component 4B.

[0040] Preferably the shared portion SP comprises a rear opening 301, which can have, for example, a substantially circular profile.

[0041] The rear opening 301 provides a flow connection between the second structural component 4B and the inside of the tub 3, so that the wet air coming from the items loaded into the drum 2, can reach the condenser 4 in order to be dried.

[0042] Figure 10a schematically shows a broken line BL that defines the border of said shared portion SP.

[0043] Preferably the first structural component 4A of the condenser 4 is box-like shaped with one face missing.

[0044] The missing face of the first structural component 4A faces part of the missing face of the second structural component 4B.

[0045] Preferably the perimeter P2 of the missing face of the second structural component 4B is at least partly joined to the perimeter P1 of the missing face of the first structural component 4A. Accordingly, the upper part of the condenser 4 is formed.

[0046] For example, the coupling between the perimeters P1, P2 can be obtained by welding. Preferably, the first structural component 4A has a first top opening T1 connected to a conduit C for insertion of nebulized water in the condenser 4.

[0047] The nebulized water has a temperature significantly lower than the temperature of the wet air coming from the tub 3. For example, the temperature of the nebulized water is the temperature of the network water in particular it can be comprised between 13°C and 17 °C.

[0048] The interaction between the nebulized water at low temperature and the inner wall of the component 4B at high temperature causes the moisture present in the wet air to condense on the wall, thereby drying the flow of air.

[0049] Preferably the perimeter P2 of the missing face of the second structural component 4B encloses the aforementioned rear opening 301.

[0050] Figure 10b shows the perimeter P2 of the missing face of the second structural component 4B and the rear opening 301 enclosed thereby.

[0051] According to the invention, the household appliance 1 comprises a first structural portion 1A made in one piece and a second structural portion 1B made in one piece.

[0052] The first structural portion 1A comprises the tub body 3B of the tub 3.

[0053] The second structural portion 1B comprises the rear component 3C of the tub 3. Advantageously, the condenser 4 is formed by coupling the first structural portion 1A with the second structural portion 1B.

[0054] In more detail, the first structural portion 1A preferably comprises the first structural component 4A of the condenser 4.

[0055] Preferably, the second structural portion 1B comprises the second structural portion 4B of the condenser 4.

[0056] Thus the condenser 4, that is substantially formed by the first structural component 4A, the second structural component 4B and the share portion SP of the rear component 3C, is obtained by joining the first structural portion 1A and the second structural portion 1B of the household appliance 1.

[0057] Preferably, the tub body 3B of the tub 3 and the first structural component 4A of the condenser 4 are made in one piece.

[0058] In particular, the tub body 3B and the first structural component 4A of the condenser 4 are molded in a single molding operation.

[0059] Preferably, the rear component 3C of the tub 3 and the second structural component 4B of the condenser 4 are made in one piece.

[0060] In particular, the rear component 3C of the tub 3 and the second structural component 4B of the condenser 4 are molded in a single molding operation.

[0061] In a preferred embodiment, a couple of configurable molds are provided: one configurable mold for the first structural portion 1A, and one configurable mold for the second structural portion 1B.

[0062] In case a washing machine has to be manufactured, the mold for the first structural portion is configured according to the shape of a conventional tub body, i.e. it does not include the first structural component of the condenser.

[0063] Analogously, the mold for the second structural portion is configured according to the shape of a conventional rear component, i.e. it does not include the second structural component of the condenser.

[0064] By contrast, when a washer-drier according to the invention has to be manufactured, the mold for the first structural component is configured to as to further include the first structural component of the condenser, and the mold for the second structural portion is configured to further include the second structural component of the condenser. Preferably, the drying system 10 further comprises a blowing unit 5 to promote an air flow inside the same drying system 10.

[0065] Preferably, the condenser 4 is arranged upstream of the blowing unit 5 according to the direction of the air flow.

[0066] Preferably, the blowing unit 5 comprises a casing 51, in which an impeller or fan 59 is rotatably mounted; an electric motor 52' operates on the impeller 59 to drive the same in rotation.

[0067] Preferably the casing 51 comprises a scroll 511, which substantially surrounds the impeller 59, and a conduit 512, radially extending from the scroll 511.

[0068] Preferably the conduit 512 houses a heating element, e.g. a suitably powered electric element, which is employed to heat the air to be fed back into the tub 3.

[0069] In summary, the main components of the drying system 10 are arranged in the following order:

the condenser 4, which receives wet air from the tub 3 through the rear opening 301;
the blowing unit 5, which promotes the air flow in the drying system and in the tub 3; in particular, the blowing unit 5 withdraws dried air from the condenser 4 and makes it advance through the conduit 512 (where it is also heated).

[0070] Then the connection conduit 6 received heated dried air from the blowing unit 5 and feeds it to the tub 3 through the opening provided in the annular gasket 7.

[0071] Preferably the first structural component 4A of the condenser 4 has a second top opening T2 which provides a fluid connection with the blowing unit 5.

[0072] The second top opening T2 has preferably a rounded shape, so as to facilitate the coupling with the blowing unit 5, and in particular with the scroll 511.

[0073] Preferably the second structural component 4B has an auxiliary opening W facing the rear opening 301 provided at the rear base RB of the tub body 3B.

[0074] Preferably the auxiliary opening W is removably closed by a closing element 200, shown in figures 9a-9b.

[0075] The closing element 200 is provided with a filter portion 210; when the closing element 200 closes the auxiliary opening W, the filter portion 210 is positioned at the rear opening 301, so as to prevent fluff to reach the condenser 4 and the other components of the drying system 10.

[0076] It has to be noted that the filter portion 210 is preferably entirely made of filtering elements; in practice, the filter portion 210 can consist of a substantially circular mesh. In figures 9a-9b only a part of such mesh is represented for sake of simplicity; as said, such mesh structure preferably extends over the whole filter portion 210.

[0077] Preferably, the closing element 200 further comprises a closing portion 220, adapted to removably close the auxiliary opening W.

[0078] For example, the closing portion 220 can be realized as a threaded disc, adapted to engage a corresponding threaded profile provided around the auxiliary opening W. Accordingly the closing portion can be screwed on / unscrewed from the auxiliary opening W. Preferably, the closing portion 220 and the filter portion 210 are connected by a connection structure 230.

[0079] The connection structure 230 preferably connects perimetric portions 210a-210c of the filter portion 210 with respective perimetric portions 220a-220c of the closing element 220.

[0080] Preferably the connection structure 230 has one or more openings so as to let the air flow passing through the filter portion 210 advance to the upper part of the condenser 4. Preferably the connection structure 230 comprises a plurality of ribs 231-233, forming a plurality of radial openings 230a-230c.

[0081] As said, when the closing element 200 is coupled to the condenser 4 so that the closing portion 220 closes the auxiliary opening W, the filter portion 210 is associated to the rear opening 301 and filters the flow of air coming from the tub 3.

[0082] In particular, the flow of air passes through the filter portion 210, then through the openings 230a-230c and then moves forward to the upper part of the condenser 4, preferably due to the suction action exerted by the blowing unit 5.

[0083] When the filter portion 210 need to be cleaned, the closing element 200 is removed from the auxiliary opening W, for example unscrewing the closing portion 220.

Claims

1. Household appliance adapted to perform at least a drying cycle, said appliance (1) comprising:

a. a tub (3) in which a drum (2) is rotatably mounted, said tub (3) including a plurality of structural components (3A-3C), said structural components (3A-3C) comprising:

i.a tub body (3B) extending from a front section (3B') to a rear section (3B"), and
ii. a rear component (3C) mounted to said tub body (3B) at said rear section (3B");

b. a drying system (10), having an inlet (10a) for receiving wet air from said tub (3) and an outlet (10b) for providing dried air to said tub (3), said drying system (10) including a condenser (4) adapted to receive a flow of wet air from said tub (3) and to make it condense and obtain dried air,

wherein said household appliance (1) comprises a first structural portion (1A) made in one piece and including said tub body (3B);
wherein said household appliance (1) comprises a second structural portion (1B) made in one piece and comprising said rear component (3C);
wherein said condenser (4) is formed by coupling said first structural portion (1A) and said second structural portion (1B).

2. Household appliance according to claim 1 wherein said condenser (4) comprises a first structural component (4A) and a second structural component (4B),
wherein said first structural component (4A) is included in said first structural portion (1A),
wherein said second structural component (4B) is included in said second structural portion (1B).

3. Household appliance according to claim 2 wherein the second structural component (4B) of said condenser (4) is box-like shaped with one face missing.

4. Household appliance according to any one of the preceding claims wherein said tub body (3B) comprises a rear base (RB), said rear base (RB) including a shared portion (SP) which is also part of said condenser (4).

5. Household appliance according to claims 3 and 4 wherein the shared portion (SP) of said rear base (RB) partly closes the missing face of the second structural component (4B).

6. Household appliance according to any one of claims 2 to 5 wherein the first structural component (4A) of said condenser (4) is box-like shaped with one face missing.

7. Household appliance according to claim 6 wherein the perimeter of the missing face of the second structural component (4B) is at least partly joined to the perimeter of the missing face of the first structural component (4A) to form said condenser (4).

8. Household appliance according to claims 6 or 7 wherein the first structural component (4A) has a first top opening (T1) connected to a conduit (C) for insertion of nebulized water in said condenser (4).

9. Household appliance according to claim 4, or any one of claims 5 to 9 when depending on claim 4, wherein said shared portion (SP) comprises a rear opening (301), said rear opening (301) providing a flow connection between said second structural component (4B) and the inside of the tub (3).

10. Household appliance according to claim 9 wherein said rear opening (301) is enclosed in the perimeter of the missing face of said second structural component (4B).

11. Household appliance according to any one of the preceding claims wherein said rear component (3C) comprises a plurality of radial structural supports (3C') extending from a central hub (3C").

12. Household appliance according to any one of the preceding claims wherein the structural components (3A-3C) of said tub (3) further comprise a front annular component (3A) mounted on said tub body (3B) at said front section (3B').

13. Household appliance according to any one of the preceding claims wherein said drying system (10) further comprises a blowing unit (5) to promote an air flow inside said drying system (10), wherein said condenser (4) is arranged upstream of said blowing unit (5).

14. Household appliance according to claim 13 and any one of claims 8 to claims 12 when depending on claim 7, wherein the first structural component (4A) has a second top opening (T2) which provides a fluid connection with said blowing unit (5).

15. Household appliance according to any one of the preceding claims wherein said second structural component (4B) has an auxiliary opening (W) facing the rear opening (301) provided at the rear base (RB) of the tub body (3B), wherein the auxiliary opening (W) is removably closed by a closing element (200), the latter being provided with a filter portion (210) positioned at said rear opening (301) when the closing element (200) closes the auxiliary opening (W).

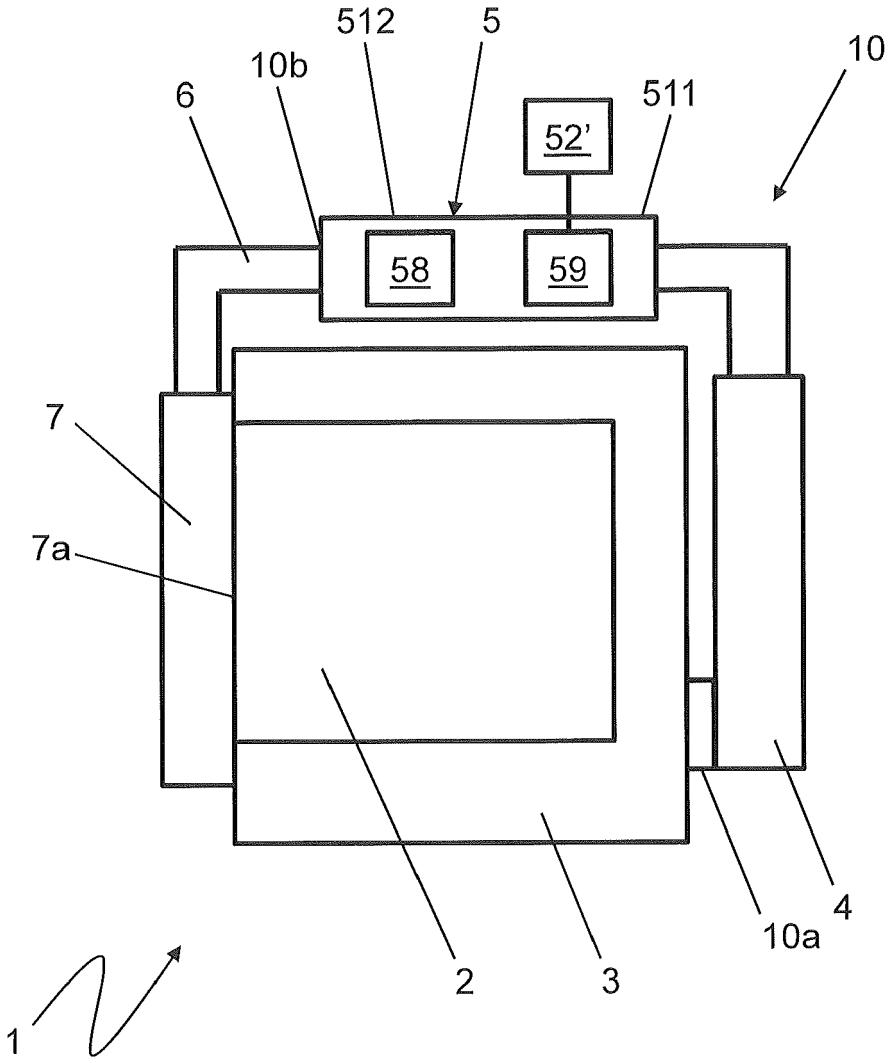


Fig. 1

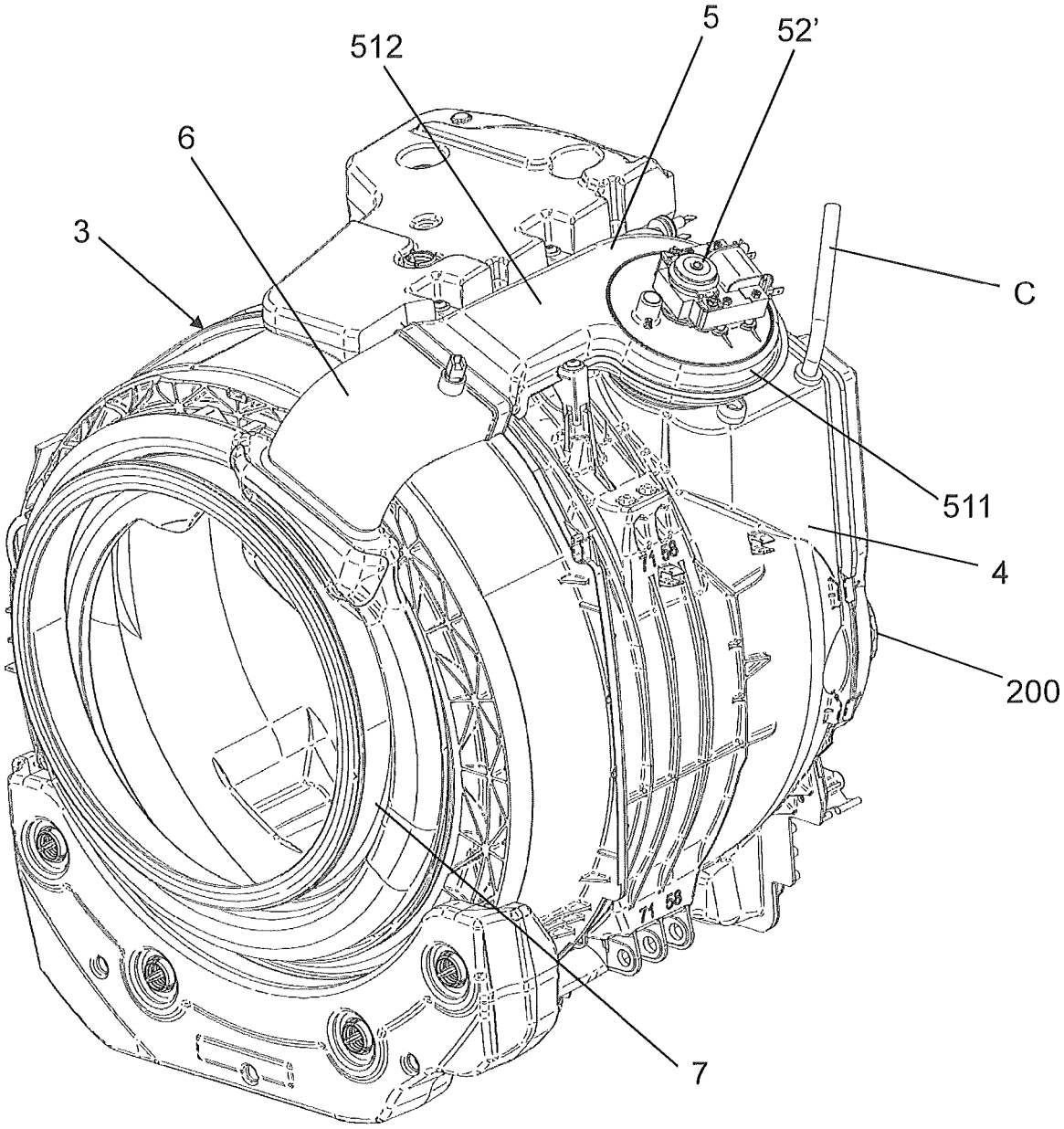


Fig. 2

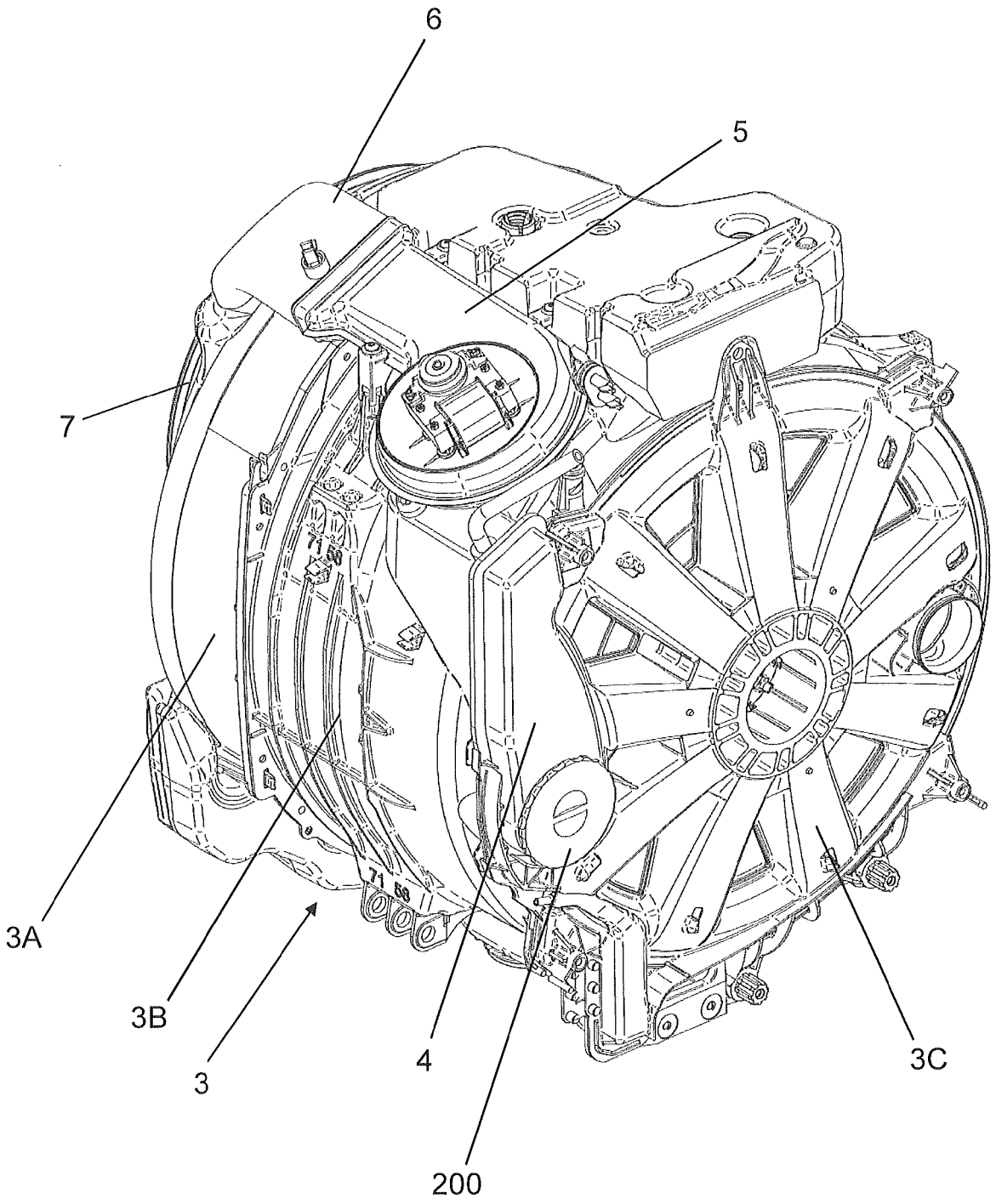


Fig. 3

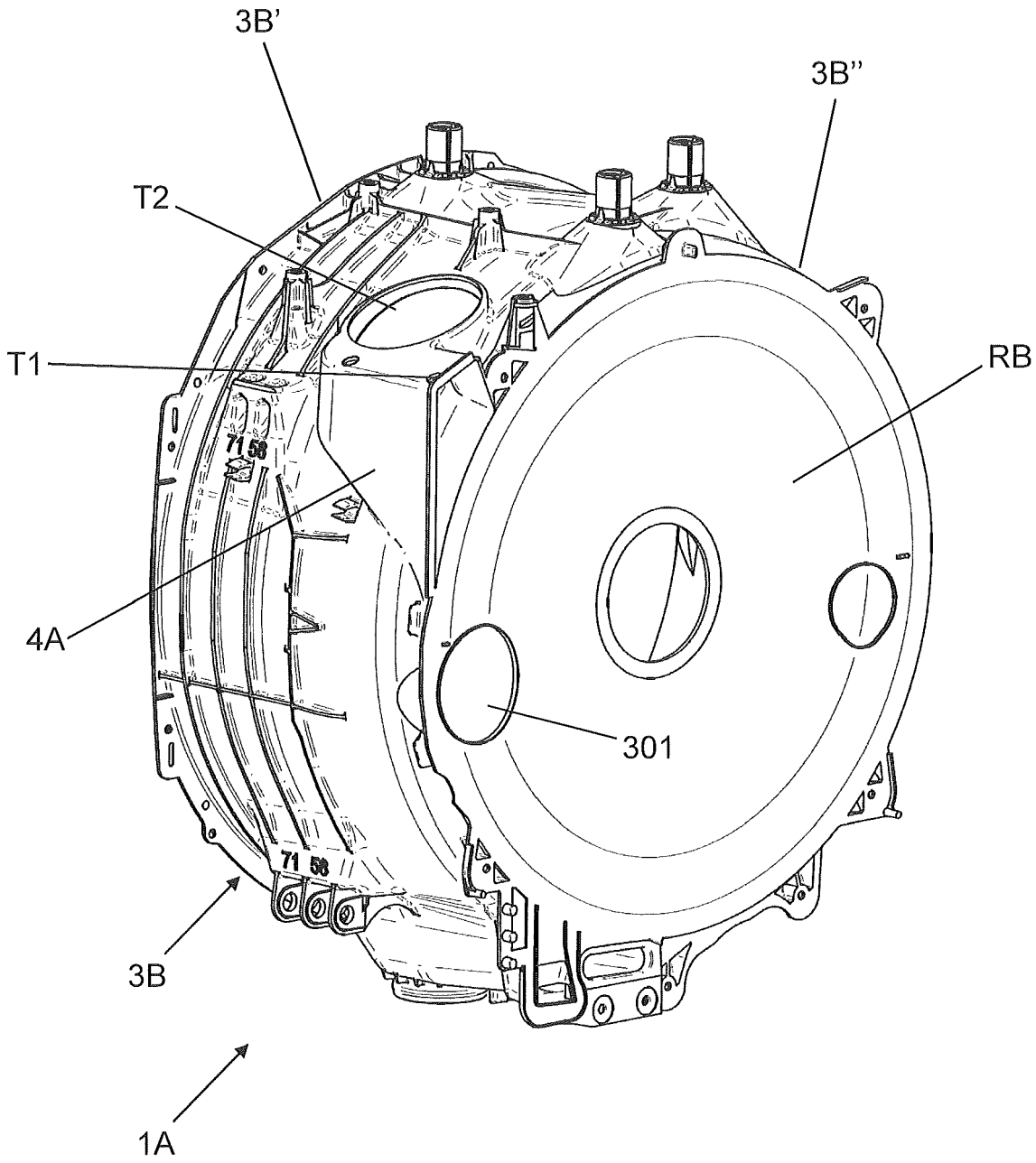


Fig. 4

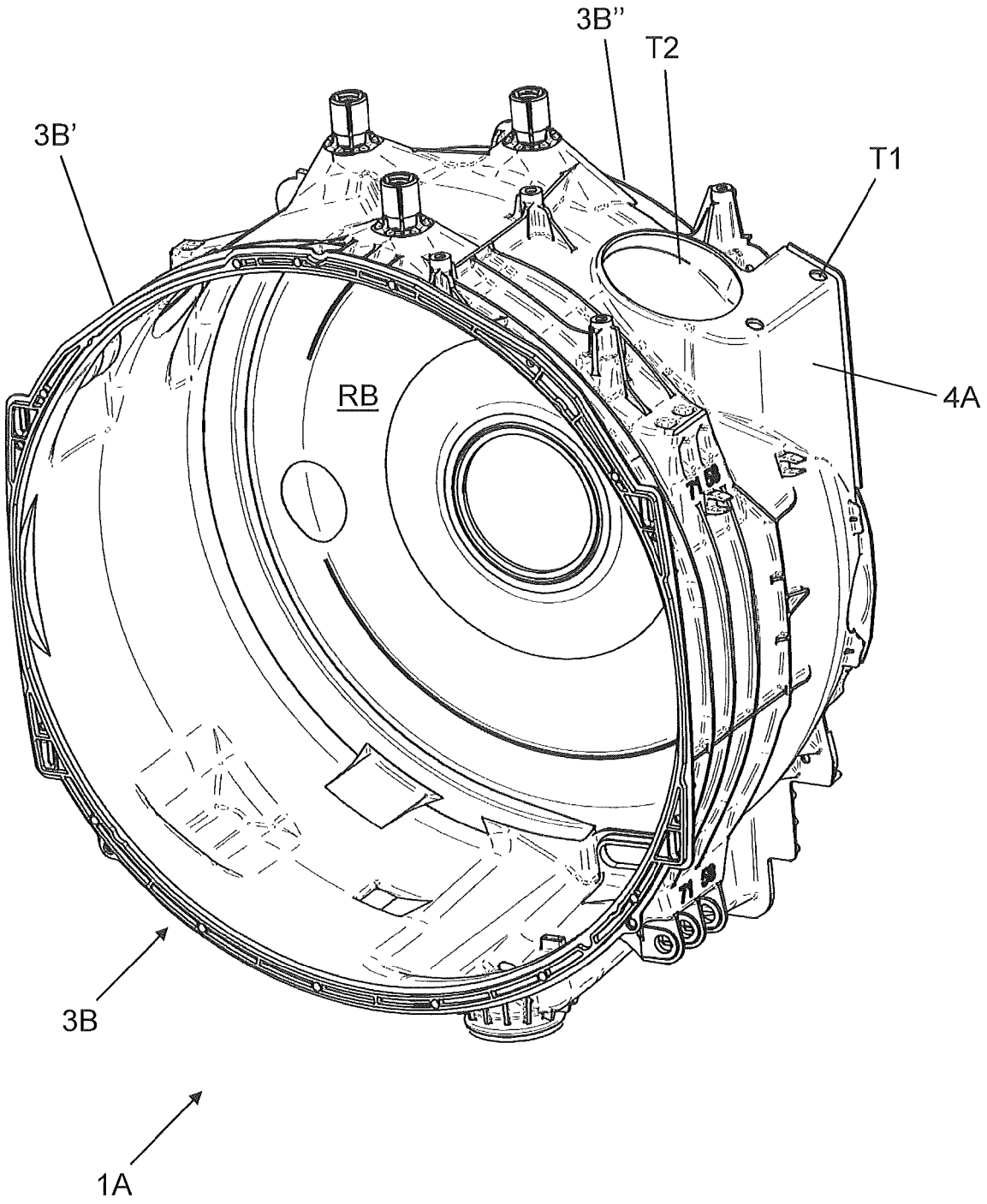


Fig. 5

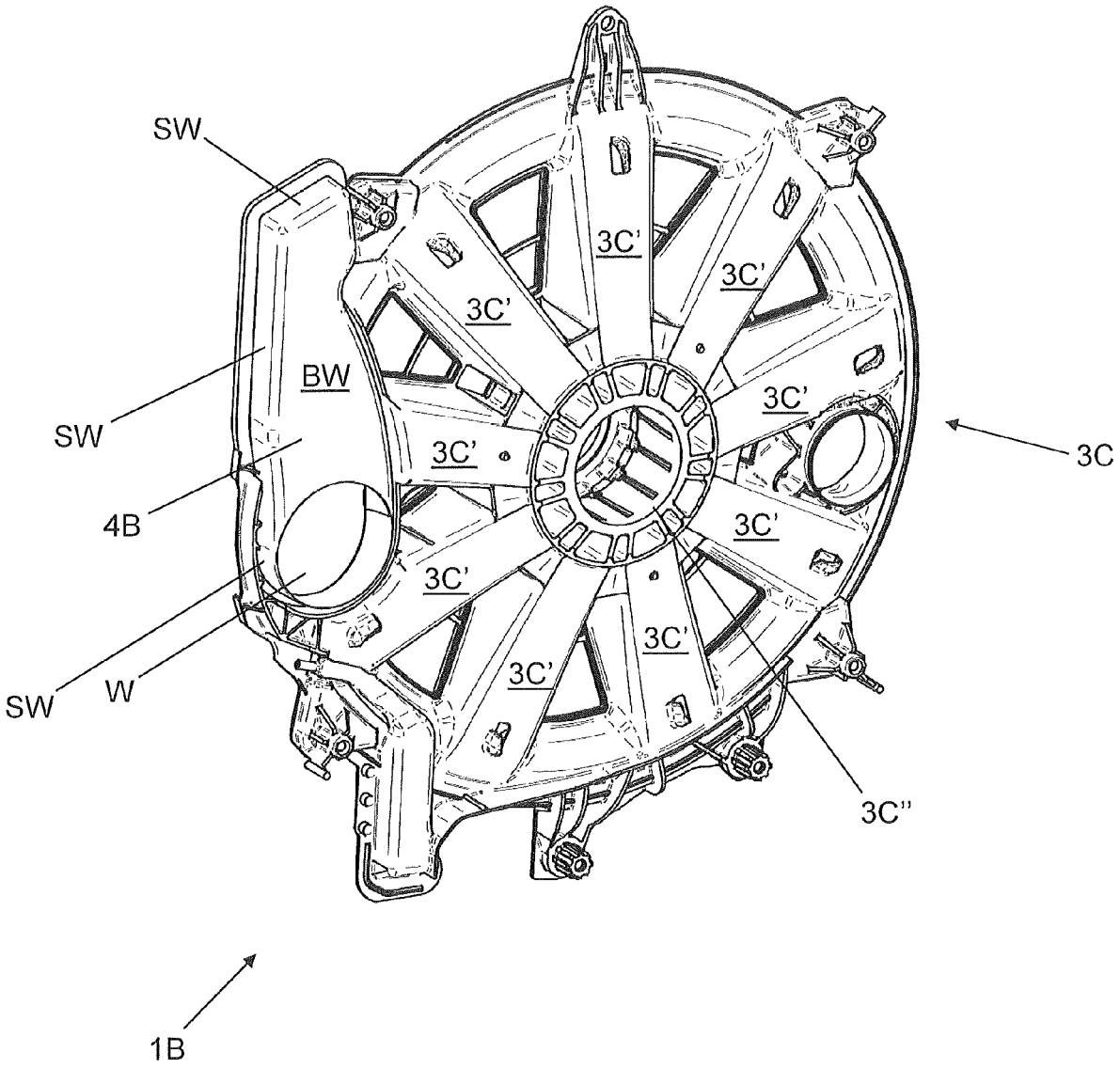


Fig. 6

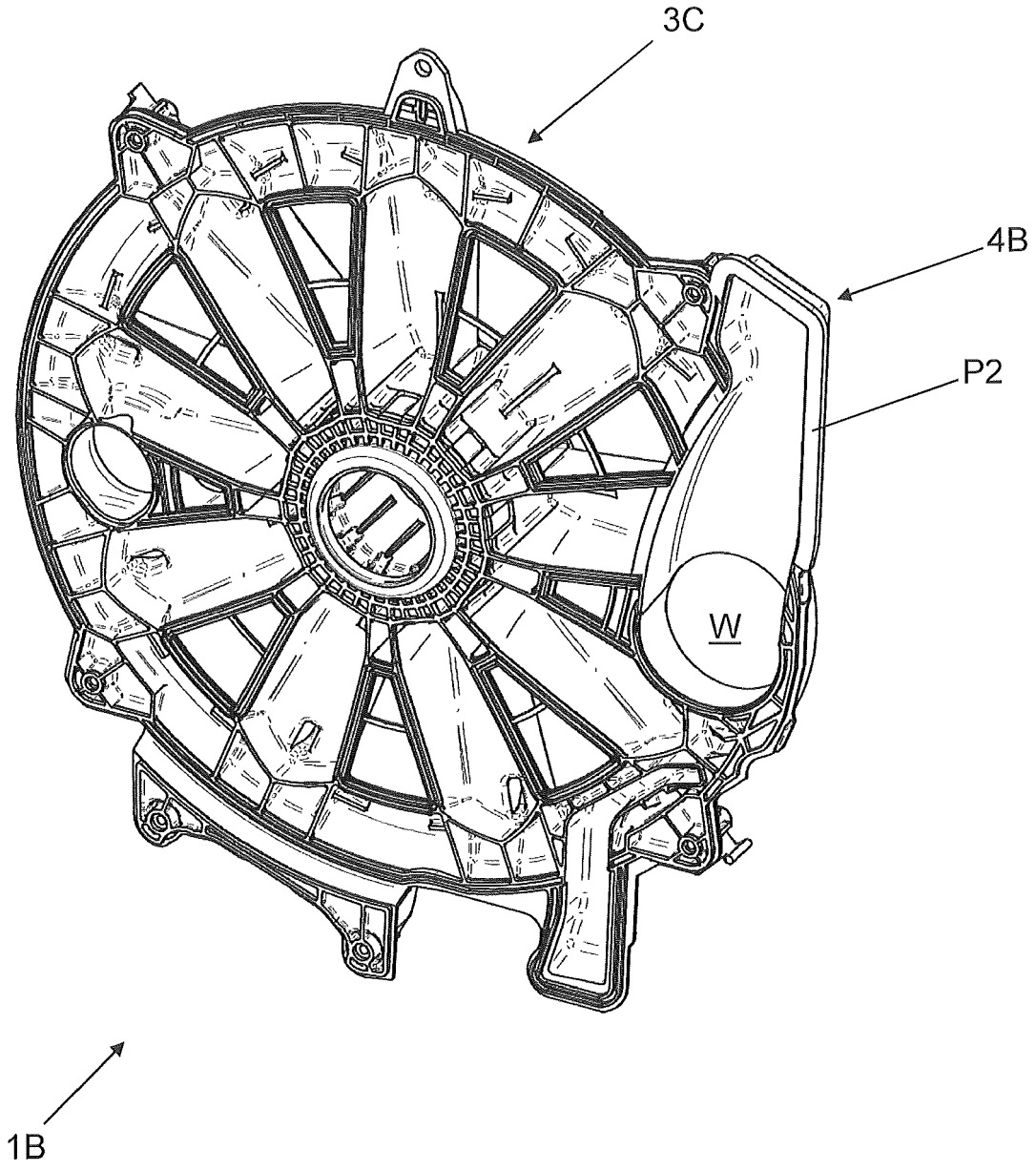


Fig.7

Fig.8

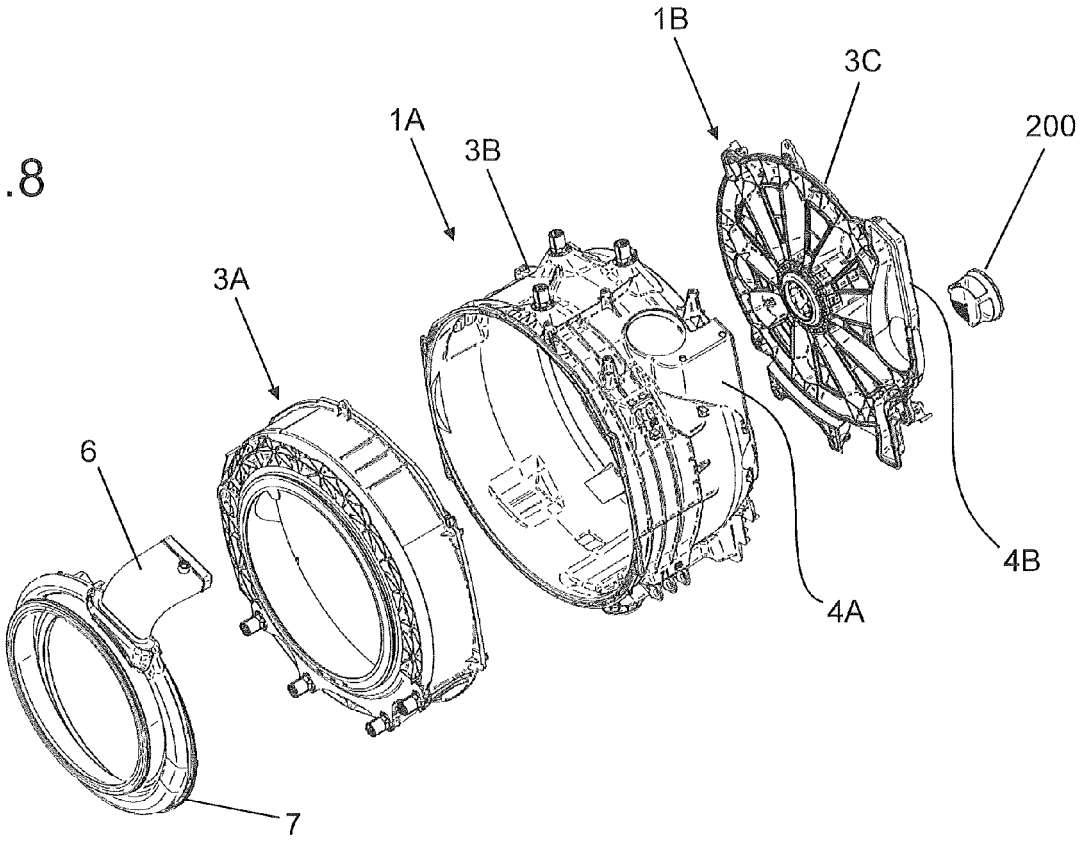


Fig.9a

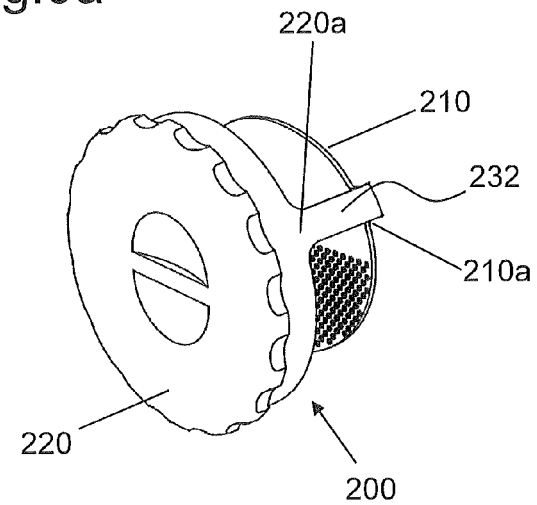
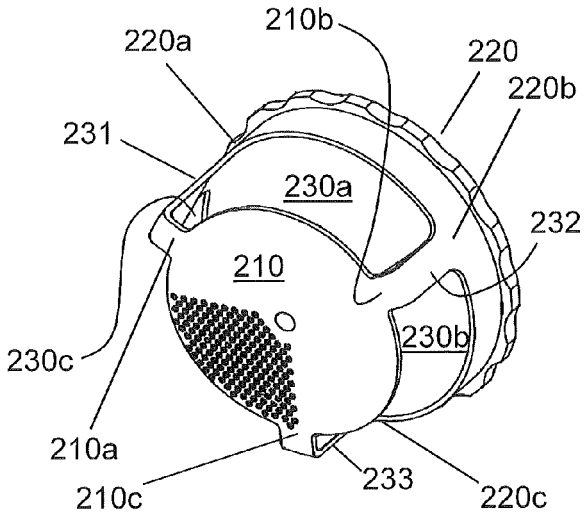


Fig.9b



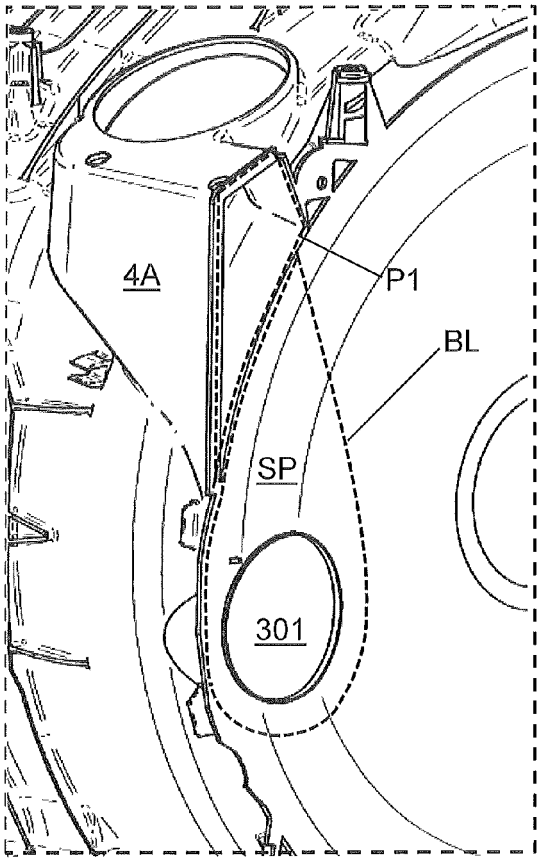


Fig.10a

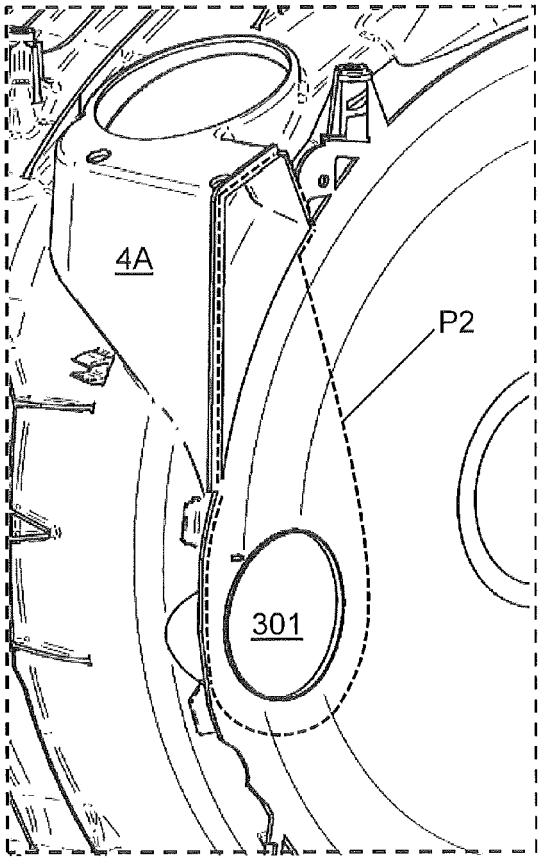


Fig.10b

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 15 19 2290

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 A	US 2 892 335 A (GRAY JR WALTER E) 30 June 1959 (1959-06-30) * column 1, lines 15-20; column 2, lines 37-57; column 3, line 24 - column 4, line 13; claims; figures * -----	1-14 15	INV. D06F25/00 ADD. D06F37/26
A	EP 2 886 708 A1 (BSH ELECTRODOMÉSTICOS ESPAÑA S A [ES]) 24 June 2015 (2015-06-24) * paragraphs [0002], [0003], [0007], [0026], [0043] - [0049], [0056] - [0060]; claims; figures * -----	1-15	
A	EP 1 710 339 A1 (LG ELECTRONICS INC [KR]) 11 October 2006 (2006-10-11) * paragraphs [0001], [0002], [0022] - [0026], [0050] - [0066]; claims; figures * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 April 2016	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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