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(54) Improvement in the front flange of a household-type clothes washing machine

(57) Front-loading clothes washing machine comprising: a perforated rotating drum (5) holding the clothes to be washed, an access opening (6) into said drum, a stationary tub (3) containing said drum (5), an access opening (4) into said tub (3) provided so as to lie in alignment with said access opening (6) of said drum, an outer casing (1) containing said tub therewithin, a front aperture (2) in said outer casing adapted to ensure access to the access opening (4) of the tub, a loading door (8) provided to close said front aperture (2) in the outer casing, an annular bellows-like gasket (7) adapted to provide an elastic, water-tight junction between the access opening (4) of the tub and the front aperture (2) in the outer casing, in which the portion of said drum that defines the respective access opening (6) has an elongated cylindrical configuration (12) on its front side, which extends coaxially with the access opening (4) of the tub, the latter being preferably provided with a corresponding elongated cylindrical configuration (14) adapted to enclose said elongated cylindrical configuration (12) of the drum opening from the outside.

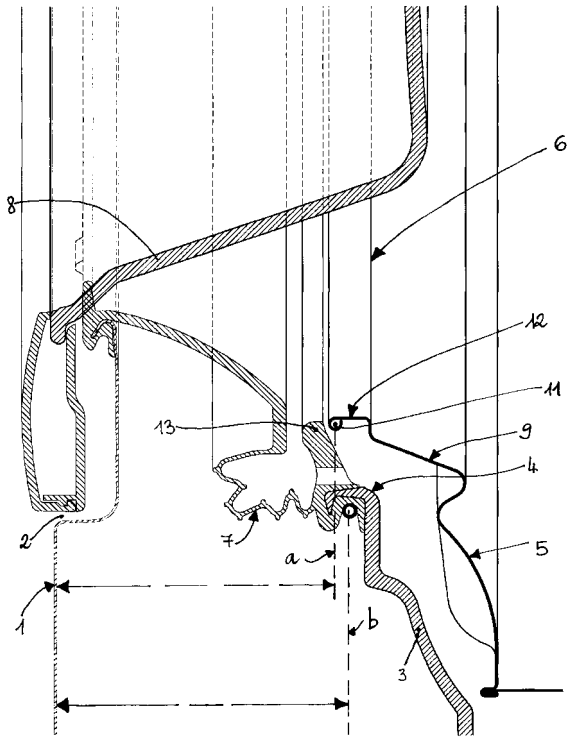

Fig. 3

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Description

[0001] The present invention refers to an improved kind of front-loading clothes washing machine, which is adapted to eliminate, or at least decisively reduce, one of the factors causing the clothes to suffer damages during washing.

[0002] It is widely known that the way in which the clothes are handled in a front-loading clothes washing machine ultimately depends to a substantial extent on the actual architecture of the same machine. In these machines, in fact, the tub containing the rotating drum is provided with a front opening of its own, which faces the front wall of the machine; the rotating drum contained therein is in turn provided with an access opening of its own, which of course is in a corresponding, i.e. mating relationship with the opening in the tub.

[0003] Finally, also the outer casing, or cabinet, of the machine is provided with a corresponding aperture, which is usually closed by an appropriate door, which is generally referred to as loading door.

[0004] Since the tub is suspended, but is filled with washing liquor, the need arises for a water-tight seal to be provided between the tub opening and the aperture in the outer casing (due to reasons that are well known in the art, the rotating drum itself is not closed). Such water-tight seal is usually provided in the form of an annular gasket, generally referred to as bellows in the art, which is arranged between the circular rim of the opening of the tub and the corresponding aperture in the outer casing.

[0005] Owing to the fact that the tub must be capable of oscillating freely, albeit within definite limits, within the outer casing of the machine, said annular gasket must also be flexible, so as to allow for the relative movements and displacements that can take place between outer casing and tub.

[0006] For the clothes being washed to be prevented from being able to come out of the drum and get pinched - during the rotation thereof - between said flexible gasket and the tub, thereby incurring damages that can be also of quite a serious nature, the gasket itself is shaped so as to feature a circular lip, or appendix, that is adapted to arrange itself in a stable manner in front of the front edge of the access opening of the drum, quite close thereto, so that the resulting narrow gap therebetween is such as to practically prevent the washload items that may possibly stick out of the access opening of the drum from slipping in between the same drum and the tub.

[0007] Briefly stated, the above-mentioned gasket works in the same way as a sealed chamber that prevents washload items from slipping in from the drum into the tub, or between the respective openings, but not washing liquor from passing therethrough.

[0008] However, prior-art solutions are generally characterized in that, even if provided with such gasket made and arranged in an optimum manner in front of the access opening of the drum, the fact that this access opening is substantially aligned almost on the same plane as the front vertical wall of the drum, as best shown in the cross-sectional view of Figure 1 and the illustration in Figure 2, gives rise to the circumstance that the washload items that are lifted within the drum during the rotation thereof tend to substantially arrange themselves, i.e. distribute over the entire the cylindrical side wall thereof, as well as onto the front portion thereof, so that, when falling down again, they can easily fall also onto the rim of the access door of the drum, especially when the latter is fully loaded.

[0009] In this case, owing to said gap between the access opening of the drum and said lip of the annular gasket being immediately contiguous thereto, it may well occur that said washload items so falling back onto the rim of the drum opening, slip in or get pinched in said gap.

[0010] While the quite limited width of said gap is actually such as to prevent washload items from entering the space between the drum and the tub, it in fact does not in all cases prevent small portions of said items from slipping in and being caught in said gap, thereby suffering damages due to fretting between the drum rotating within the tub and said gasket, which on the contrary stands still.

[0011] It would therefore be desirable, and it is actually a main object of the present invention, to provide a front-loading clothes washing machine, in which the possibility for washload items, or portions thereof, to slip in and get pinched between the front edge of the access opening of the drum and said bellows-like gasket is substantially eliminated or minimized to a fully negligible extent.

[0012] According to the present invention, this aim is reached in a particular type of clothes washing machine provided with a drum, a tub and a respective bellows-like gasket as described in greater detail below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 3 is a median elevational cross-sectional view, through the same part as shown in Figure 1, of a clothes washing machine according to a first embodiment of the present invention;
- Figure 4 is similar median elevational cross-sectional view of a clothes washing machine according to a second embodiment of the present invention;
- Figure 5 is a same cross-sectional view as the one appearing in Figure 3, but represented as a perspective view from the front side of the machine.

[0013] A clothes washing machine according to the prior art comprises an outer casing 1 provided with a front aperture 2 enabling the washload to be introduced in the machine, a washing tub 3 provided with an access opening 4, a perforated drum 5 rotatably mounted within said drum and provided in turn with an access opening of its own, and a bellows-like gasket 7 arranged in a water-tight manner between the access opening 4 of the tub

and the loading aperture 2 in the outer casing, wherein said aperture is adapted to be closed by an appropriate loading door 8.

[0014] By convention, said aperture 2, said access opening 4 of the tub and said access opening 6 of the drum are arranged almost coaxially with each other and have the same size, so as to facilitate introducing and removing the washload.

[0015] With reference to Figure 3, according to the present invention said access opening 6 of the drum 5 terminates frontally with a rim 11 that is separated, relative to the front flange 9 of the same drum, by an elongated cylindrical configuration 12, and not - as usual in the prior art (see Figure 2 - with a circular edge 10 of a minimum thickness that joins directly with the front flange 9 of the drum.

[0016] Said elongated configuration 12 then projects from said front flange 9 towards the aperture 2 of the outer casing as a cylinder having an axis that substantially coincides with the axis (not shown) of the same drum.

[0017] In practice, said cylindrical flange projects out of said front flange 9 of the drum and, as a result, the cylindrical mantle thereof keeps the circular edge 10 of the access opening of the drum spaced apart from the flange 9.

[0018] In this connection, it should be noticed that - for reasons of greater simplicity - the same reference numeral 9 is used in this specification to indicate the front flange of the drum when describing both the prior art and the present invention.

[0019] Since said circular edge 10 is therefore so spaced axially apart from the respective flange, it will be readily realized that the washload items tumbling and falling back from the interior of the drum, and moving along the front flange thereof, will only hardly be able to reach the rim 11 when falling down, and, for the same reason, they will still more hardly be able to slip into said gap between the lip 13 of the bellows 7 and said rim 11.

[0020] Referring again to Figure 3, it can be noticed that a preferred embodiment is easily obtained if the plane "a" extending parallel to the front wall of the outer casing and orthogonal to the axis of the drum, and passing through the access opening 6 of the drum, is closer to the front wall of the outer casing than the plane "b" generally centered on said access opening 4 of the tub 3 actually is.

[0021] Such solution enables substantially the same advantages to be obtained as the ones offered by the afore-described embodiment, while however avoiding the need for rather costly modifications to be introduced in the construction of the tub.

[0022] A further embodiment of the present invention, which is illustrated in Figure 4, is based on a solution in which also the access opening 4 of the tub 3 is provided with a cylindrically shaped portion 14 so as to enclose said elongated cylindrical configuration 12 from the outside, in such a manner that said portion 14 and said elongated configuration 12 come to arrange themselves as two coaxial cylinders, one inside the other.

[0023] In all these embodiments, said annular lip 13 of the bellows 7 is of course so shaped and arranged as to ensure that it comes in all cases to lie in front of the edge 11 of the access opening of the drum, as this is the case in the prior art.

[0024] It has been further found experimentally that, for a clothes washing machine of the household type, the ideal size of said elongated cylindrical configuration 12 representing the best possible compromise between functional considerations, calling for it to be as large as possible, and moulding considerations, calling for it to be as narrow as possible, is at least 12 mm, as measured on the generatrix of the cylinder.

Claims

1. Front-loading clothes washing machine, preferably of the household type, comprising:

   - a perforated rotating drum (5) holding the clothes to be washed,
   - an access opening (6) into said drum,
   - a stationary tub (3) containing said drum (5) rotatably mounted therewithin,
   - an access opening (4) into said tub (3), provided so as to lie in alignment with said access opening (6) of said drum,
   - an outer casing (1) adapted to contain said tub therewithin,
   - a front aperture (2) in said outer casing, adapted to ensure access to said access opening (4) of said tub,
   - an annular bellows-like gasket (7) adapted to provide an elastic, water-tight junction of said access opening (4) of said tub to said front aperture (2) of said outer casing,

   characterized in that the portion of said drum that defines the respective access opening (6) has an elongated cylindrical configuration (12) on its front side, which extends coaxially with said access opening (4) of said tub.

2. Clothes washing machine according to claim 1, **characterized in that** the plane (a) containing the front edge (11) of said access opening (6) of the drum lies closer to the plane of said front aperture (2) of the outer casing than the plane (b) centered on said access opening (4) of said tub (3) actually is.

3. Clothes washing machine according to claim 1 or 2, **characterized in that** the portion of said tub that defines the respective access opening

   (4) has on its front side a corresponding cylin-

drically shaped portion (14) that substantially encloses said elongated cylindrical configuration (12) of said access opening of the drum from the outside.

4. Clothes washing machine according to claim 2 or 3, **characterized in that** said annular bellows-like gasket (7) has an annular lip (13) provided to lie in a substantially regular manner in front of said circular front edge (11) of said access opening (6) of said drum.

5. Clothes washing machine according to any of the preceding claims 2 to 4, **characterized in that** said elongated cylindrical configuration (12) projecting from the flange (9) of the drum is at least 12 mm in size lengthwise (as measured on the respective generatrix).

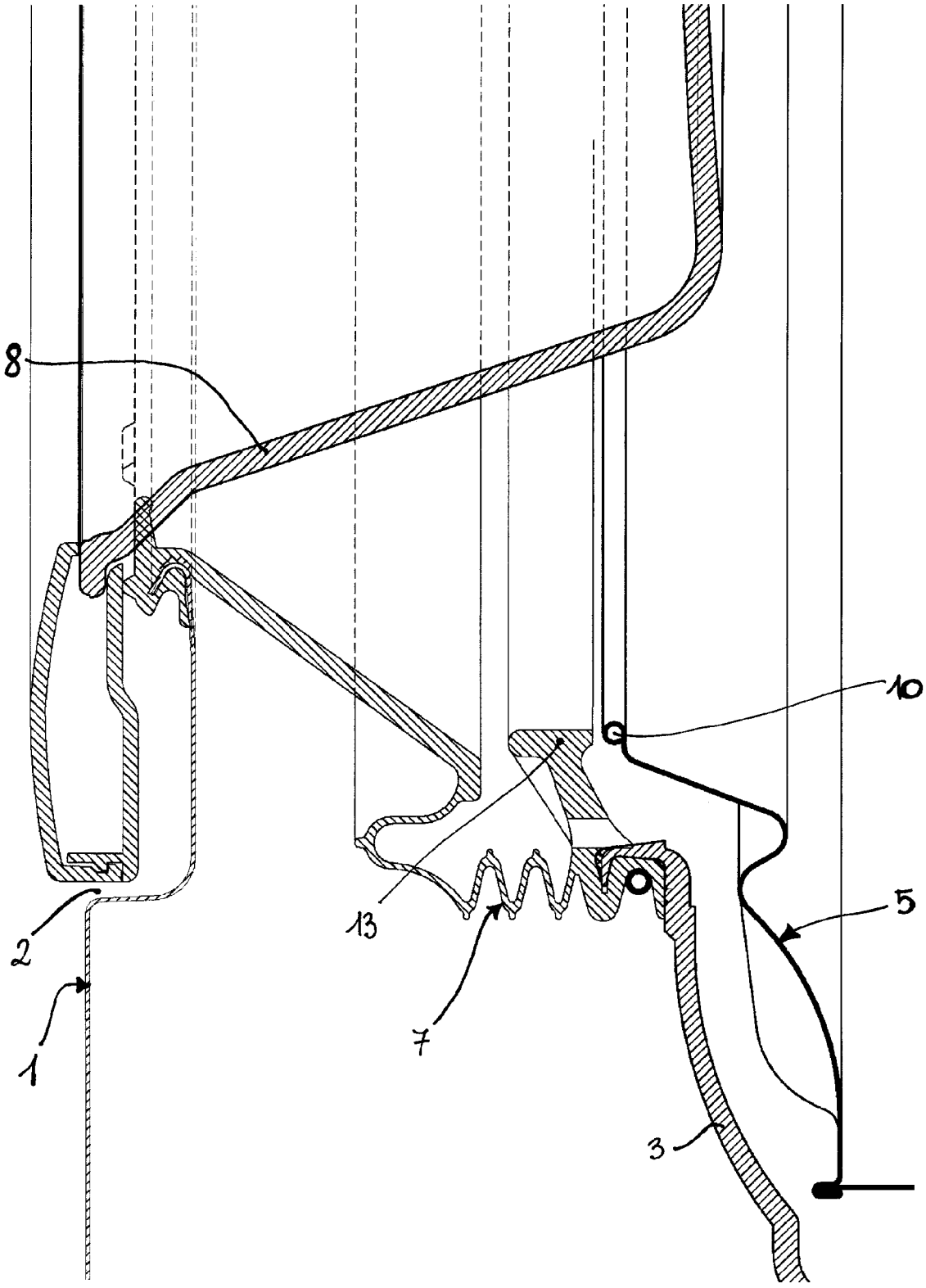

Fig. 1

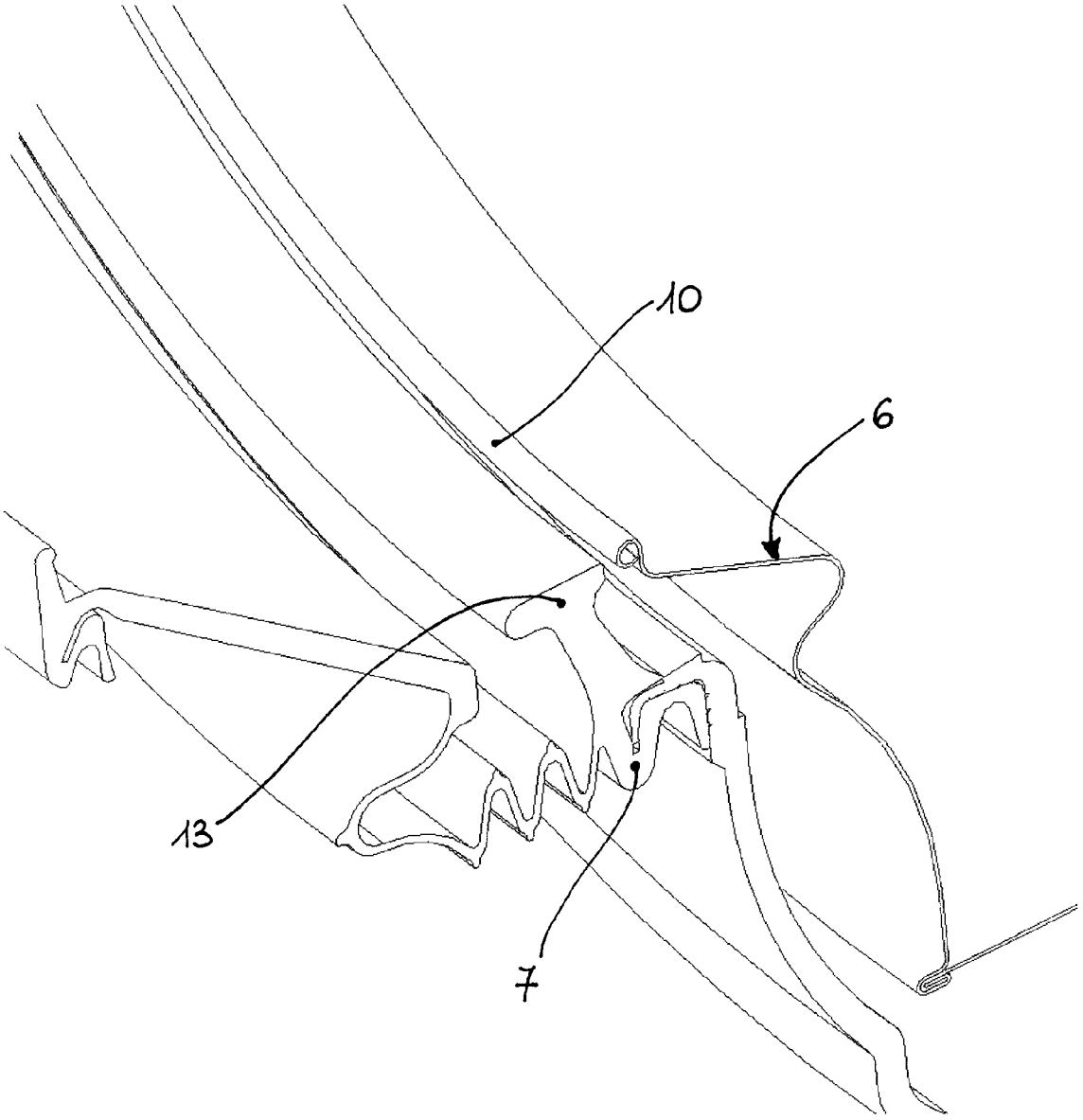

Fig. 2

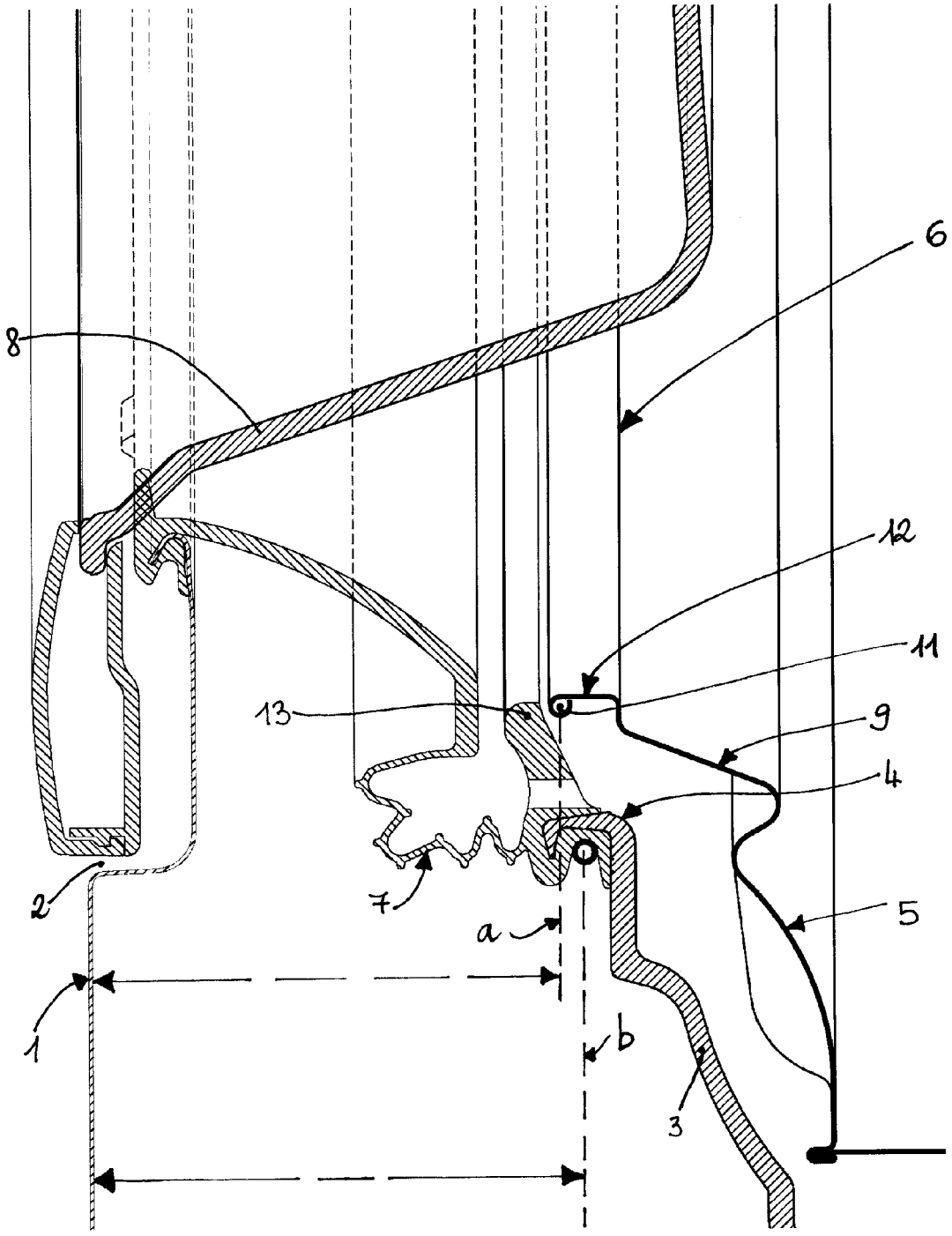

Fig. 3

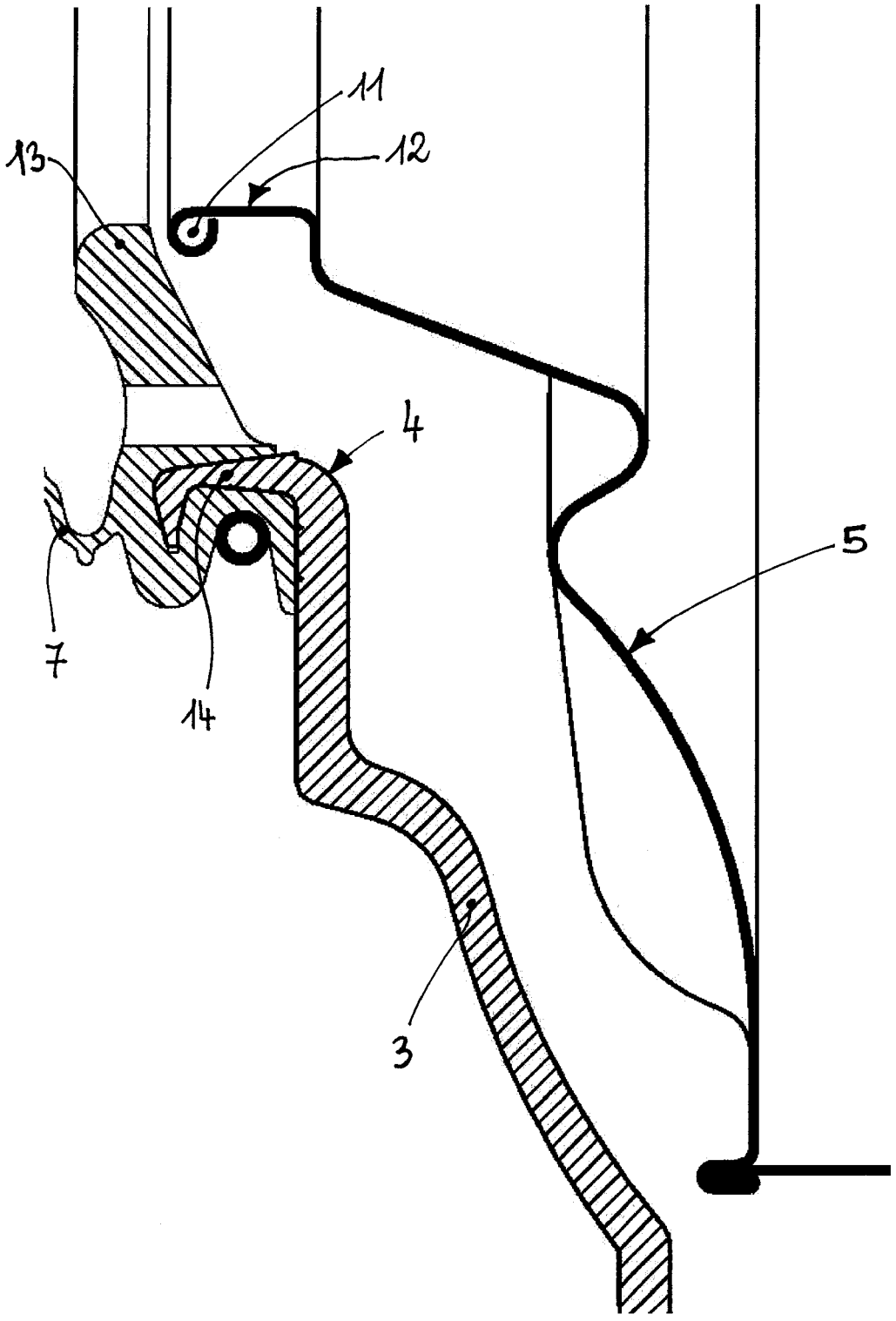

Fig. 4

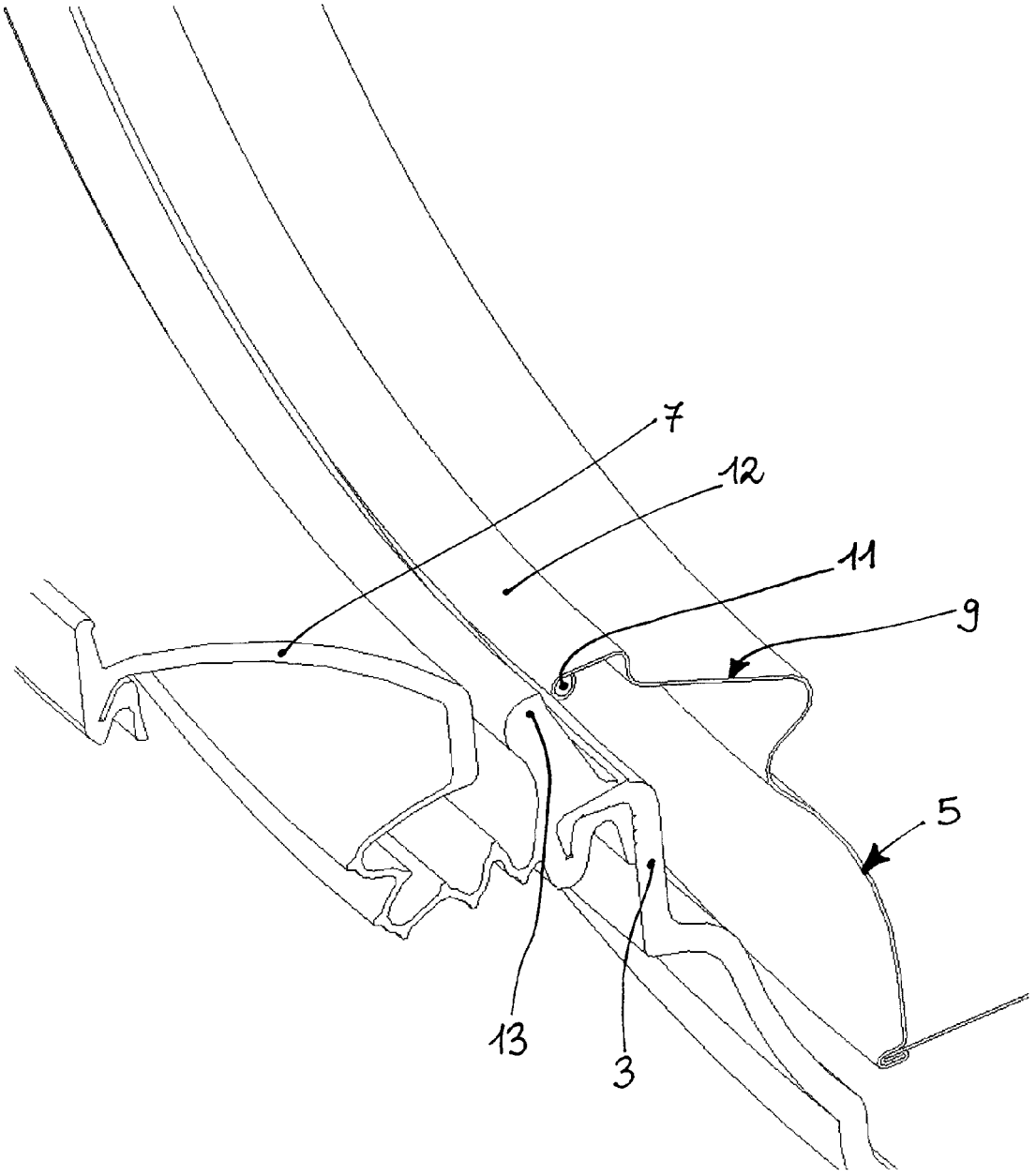

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 0969

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	GB 2 296 018 A (* ELECTROLUX ZANUSSI ELETTRODOMESTICI SPA) 19 June 1996 (1996-06-19) * page 2, lines 3-37 * * page 3, lines 29-36 * * figures 1-3 *	1-5	D06F37/26
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X	EP 1 389 642 A (WHIRLPOOL CORPORATION) 18 February 2004 (2004-02-18) * paragraphs [0002], [0013], [0014] * * figure 1 *	1-5	
X	DE 198 56 973 A1 (LG ELECTRONICS INC., SEOUL/SOUL, KR; LG ELECTRONICS INC., SEOUL/SOUL) 24 June 1999 (1999-06-24) * column 2, lines 37-45 * * column 3, lines 19-28 * * figures 1,4-6 *	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) D06F
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 July 2005	Weinberg, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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