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(71) Applicant: **Electrolux Home Products Corporation N.V.**
1130 Brussel (BE)

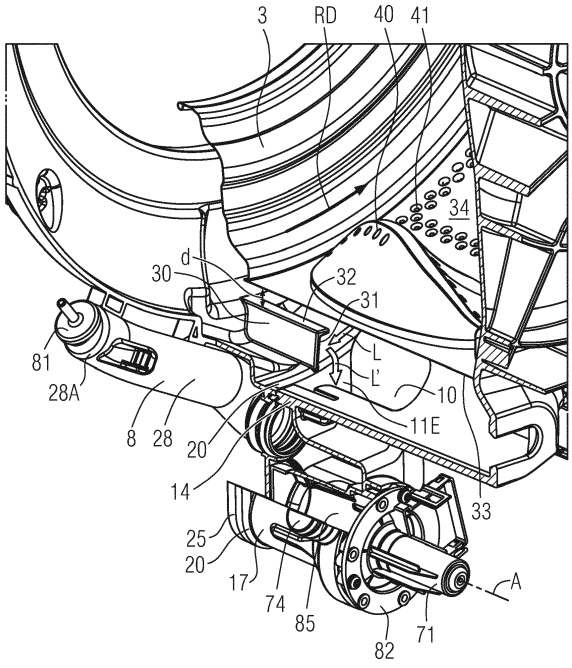
(72) Inventor: **Bondi, Martino**
33080 Porcia (PN) (IT)

(74) Representative: **Nardoni, Andrea et al**
Electrolux Italia S.p.A.
Corso Lino Zanussi, 30
33080 Porcia (PN) (IT)

(54) Washing tub unit and washing machine

(57) A washing tub unit for a washing machine comprising
a washing tub (2) housing a rotatable drum (3) for receiving goods to be washed,
wherein the washing tub (2) has an inner tub wall (121) facing the outside wall (33) of the drum (3) and having a tub bottom (12) in the lowest region of the inner tub wall (121), the washing tub (2) being composed of pre-formed tub parts (21, 22) which are connected with each other,
wherein a draining tub outlet (18) is formed in one of the pre-formed tub parts (22) and arranged within the tub bottom (12),
wherein at least one directing element (30) is formed in the other preformed tub part (21) and arranged on the tub bottom (12) adjacent to the tub outlet (18),
the directing element (30) having an impact wall (31) protruding upwardly from the tub bottom (12) towards the outside wall of the drum (3) but keeping a distance from the outside wall of the drum (3) and extending continuously to the edge of the tub outlet (18), thereby directing washing liquid running down the inner tub wall (121) and impacting onto the impact wall (31) directly towards and into the tub outlet (18).

FIG 6



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Description

[0001] The invention relates to a washing tub unit for a washing machine and a washing machine.

[0002] Washing machines in households, also called domestic washing machines, are well-known and usually are used for washing laundry.

[0003] Washing machines usually comprise washing tubs in which a rotatable drum is housed for receiving goods to be washed, usually laundry. Washing liquid is introduced into the washing tub, which washing liquid consists only of water or mainly of water and detergents or washing or cleaning agents added to or dissolved in the water for improving the washing quality.

[0004] Usually at the tub bottom of the washing tub a sump is arranged for draining the washing liquid from the tub into a draining circuit or draining device in order to either feed back the washing liquid from the sump into the washing tub again, often being heated by a heating element arranged in or near the sump, in a closed circuit or circulation mode or to drain the washing liquid out of the washing machine into a sewage conduit, in an open circuit, when it is not needed any more.

[0005] During some operational phases, especially during fast rotation of the drum, washing liquid is taken up by the drum and flows down along the inner wall of the washing tub towards the tub bottom.

[0006] US 7,607,327 B2 discloses a drum type washing machine comprising a water tub and a rotary drum installed in the water tub. A recessed drain groove (or: a sump) is formed in the inner bottom portion of the water tub elongated in a direction of the central axis of the drum. A water outlet is provided on the bottom portion of the drain groove. A guiding member with a guiding surface and a sloped surface is installed on the bottom of the drain groove. The guiding surface has a wall portion installed on the downstream side with respect to the water outlet along the rotational direction of the drum during the water-draining process and a flange portion extending from a top end portion of the wall portion covering at least part of the water outlet. The wall portion extends parallel to a plane perpendicularly intersecting the central axis of the drum. The sloped surface extends from an upper portion of the drain groove to an area near the water outlet, the water outlet being interposed between the wall portion and the sloped portion.

[0007] A certain disadvantage of this solution known from US 7,607,327 B2 is that, unless the draining groove extends over the complete depth of the washing tub, some of the washing liquid running down the inner tub wall will flow not directly into the sump (draining groove) which will delay or deteriorate the draining effect. Furthermore, the provision of a guiding wall covering part of the water outlet may cause flow turbulence that keeps water circulating in the sump (draining groove) without being drained efficiently towards the water outlet.

[0008] US 6,574,996 B1 discloses a washing machine including a tub having a helical flow path defined by a channel and a sump located at the lower end of the channel and a water outlet in the sump. A dam is positioned in the sump upstream of the water outlet which is perpendicular to the flow path and extends from the tub side wall to at least beyond the outer perimeter of the water outlet. The dam has sufficient height to prevent debris heavier than water from flowing from the channel to the water outlet.

[0009] DE 36 09 464 A1 discloses a washing machine with a washing tub having an outlet opening and an inlet opening for water and detergent positioned above the outlet opening, wherein a flow of the water and detergent is directed downwards along the tub wall towards the outlet opening. In the flow path close to the outlet opening at least one, in particular semi-circular, deflector rib is arranged which overlaps at least the upper edge of the outlet opening. The deflector rib prevents the first amount of water and detergent from immediately being drained through the outlet but rather generates a turbulence for better dissolution of the detergent in the water.

[0010] In both of these known solutions according to US 6,574,996 B1 and DE 36 09 464 A1 a flow of components in the water, may it be debris or detergent, is blocked from the outlet, and, therefore, the water flowing towards the outlet is, in same manner, obstructed.

[0011] It is a purpose of the invention to propose a washing tub unit which has good draining properties.

[0012] This purpose is achieved by a washing tub unit having the features of claim 1. Preferred embodiments and improvements according to the invention are claimed in the dependent claims.

[0013] According to claim 1 a washing tub unit for a washing machine is provided comprising a washing tub housing (or: containing) a rotatable drum for receiving goods to be washed, wherein the washing tub has an inner tub wall facing the outside wall of the drum and having a tub bottom in the lowest region of the inner tub wall, the washing tub being composed of pre-formed tub parts which are connected with each other, wherein a draining tub outlet is formed in or with one of the pre-formed tub parts and arranged within the tub bottom and wherein at least one directing element (or: deflector element) is formed in or with another of the pre-formed tub parts and arranged on the tub bottom adjacent to the tub outlet, the directing element having an impact wall (or: directing or guiding wall) protruding upwardly from the tub bottom towards the outside wall of the drum but keeping a distance from the outside wall of the drum and extending continuously to the edge of the tub outlet, thereby directing washing liquid running down the inner tub wall and impacting onto the impact wall directly towards and into the tub outlet.

[0014] By means of the at least one directing element according to the invention washing liquid that runs down the inner tub wall during at least one phase of operation, in particular during fast rotation of the drum during spinning, is practically completely drained into the tub draining outlet, as also the part of the washing liquid flowing

down the inner tub wall but not in a direction towards the tub outlet will be directed (or: deflected or guided) by the impact wall into the tub outlet.

[0015] In a preferred embodiment the impact wall of the directing element extends basically perpendicular to the rotational direction of the drum or to the flow direction of the washing liquid along the inner tub wall and/or parallel to the rotational axis of the drum.

[0016] Furthermore, the impact wall can be inclined under an inclination angle to the tub bottom, wherein the inclination angle α can be in particular between 70° and 88°.

[0017] Preferably the directing element comprises an overhang (or: flange) arranged above the impact wall to catch washing liquid splashing upwardly when impacting on the impact wall.

[0018] In an advantageous embodiment the washing tub is composed of a pre-formed front tub part having a front tub bottom part and a pre-formed rear tub part having a rear tub bottom part, wherein the rear tub part is connected with the front tub part in a connecting area. Preferably the pre-formed tub parts are each injection-moulded or formed by injection-moulding from a thermoplastic material and further preferably the connection between the two tub parts is made by hot welding.

[0019] In a preferred and advantageous embodiment the directing element is an integral part with the front tub bottom part and/or formed from the same thermoplastic material as the front tub part and/or formed in the same injection-moulding process as the front tub part. Preferably the impact wall of the directing element extends over the complete depth of the front tub bottom part, in order to catch and re-direct all washing liquid flowing into the front tub bottom part. Instead of the front tub bottom part also the rear tub bottom part could be the part the directing element is integral with.

[0020] In a further embodiment a draining sump is arranged in a lower region of the washing tub and has a sump inlet, a sump bottom and a side wall structure surrounding the sump inlet and being connected to the sump bottom, wherein the side wall structure and the sump bottom of the sump are arranged below the tub bottom and wherein the sump inlet is formed by the tub outlet in the tub bottom.

[0021] Preferably a front side wall part of the side wall structure of the sump is an integral part with the front tub part, in particular formed from the same thermoplastic material as the front tub part and/or formed in the same injection-moulding process as the front tub part. The other parts of the side wall structure of the sump are preferably integral parts with the rear tub part, in particular formed from the same thermoplastic material as the rear tub part and/or formed in the same injection-moulding process as the rear tub part.

[0022] It is advantageous that the impact wall of the directing element extends to the edge formed between the tub bottom and the front side wall part of the sump and/or that the front side wall part has a flat or planar surface and/or lies itself or has its flat or planar surface lying in a connecting plane or in a same plane as the connecting area of the two tub parts.

[0023] Instead of the word "draining" also the word "drainage" can be used in this application and *vice versa.*

[0024] "Circumferential wall" means a wall that is arranged, in particular in a closed manner, around something like an axis for instance and is not limited to a cylindrical or circular shape .

[0025] In claim 10 a washing machine is claimed having a washing tub unit according to the invention.

[0026] Further exemplary embodiments are described and explained in the following with reference to the drawings, which show in

FIG 1 a washing tub unit in a three-dimensional perspective view from the front under a viewing angle from the side,

FIG 2 the washing tub unit of FIG 1 in a perspective view from the rear under a viewing angle from the side,

FIG 3 the washing tub unit of FIG 2 in a partially cut perspective view from the rear under a viewing angle from the side so that the tub interior with a directing element according to the invention can be partly seen,

FIG 4 the lower section of the washing tub unit according to FIG 3 with the front tub part and the rear tub part and the directing element at the sump in a partially sectioned three-dimensional view from the side,

FIG 5 the lower section of the washing tub unit according to FIG 3 and 4 with the front tub part and the rear tub part and the directing element at the sump in a partially sectioned three-dimensional view from the rear under a viewing angle from the side and the top, and

FIG 6 the lower section of the washing tub unit according to FIG 5 with the lower section of the drum in a partially sectioned three-dimensional view from the rear under a viewing angle from the side and the top.

[0027] Identical or at least corresponding parts and quantities in FIG 1 to 6 are designated with the same reference numerals. Reference is made also to the list of reference numerals if a reference numeral is not mentioned in the text.

[0028] FIG 1 to 3 show a washing tub unit for a washing machine comprising a washing tub 2 and a draining device 7. The washing tub 2 is basically assembled from two parts, in this case a front tub part 21 and a rear tub part 22, which are connected (or: joined) in a connecting

(or: joining) area 20 in order to form the washing tub 2 that it is closed in a liquid-tight manner, at its rear and at its circumference.

[0029] In the connecting area 20 at least one front connecting (or: joining) part 23 of the front tub part 21 and at least one rear connecting part 24 of the rear tub part 22 are connected with each other, in particular by hot welding in order to form a sort of liquid-tight welding seam in the connecting area 20. The front connecting part 23 and the rear connecting part 24 are in particular formed at least partially like connecting flanges which are pressed against each other and then connected, in particular welded by hot welding, to form a permanent connection between the two connecting parts 23 and 24 and thus between the two tub parts 21 and 22.

[0030] The connecting area 20 is preferably arranged in or forms a connecting or joining plane. In particular the connecting parts 23 and 24 have planar surfaces that are joined, in particular welded, in the connecting plane.

[0031] The front tub part 21 and the rear tub part 22 are, therefore, at least in their connecting parts 23 and 24, formed or made of a material that can be hot welded, preferably a suitable thermoplast or thermoplastic material, as are well known in the art

[0032] Preferably the complete rear front tub part 21 and the complete rear tub part 22 are formed from such a thermoplast or thermoplastic material and are produced by moulding between or in at least two complementary moulding forms, in particular injection-moulding in the moulding forms.

[0033] The hot welded connection also ensures a water tight connection so that no water or washing liquid can escape from the washing tub 2 through or in the connecting area 20 and no further seals or sealing rings are required.

[0034] At the front of the washing tub unit there is an opening 4 for loading of goods to be washed, such as laundry, into the tub interior 9 inside the washing tub 2 which opening 4 is formed in a front tub part 21. The opening 4 is at least partially surrounded by a counterweight structure 5 associated to the front tub part 21 for balancing the washing tub unit during operative conditions. The opening 4 allows access from the exterior or outside of the washing tub 2 to a rotatable or rotating drum 3, arranged in the tub interior 9 of the washing tub 2 and provided for receiving goods such as laundry to be washed.

[0035] Adapted to the rotating drum 3 the inner wall 121 of the washing tub 2 is preferably mainly formed in a cylindrical shape or as a cylindrical surface or wall. The drum 3 is rotatable or can be rotated about a rotational axis RA in at least one, preferably two, rotational direction (s) RD by a rotation drive or drum drive 6 a part of which is shown in FIG 1 below the washing tub 2 but is not explained any further as the rotation and the drive of the rotating drum are well-known in the art.

[0036] The drum drive 6 is fastened at fastening section 61 arranged at the lower section of the rear tub part 21. The rear tub part 21 has a central through-hole 60 for a drive axle (not shown) connecting the drum drive 6 with the drum 3 for rotation of the drum 3 about the rotational axis RA in the at least one, usually two rotational directions RD and bearing the forces and momenta exerted by the rotating drum 3 and the load of the laundry or the washing goods within the drum 3. For this purpose, as can be seen in FIG 2 and 3, the rear side of the rear tub part 22 is reinforced with reinforcing ribs 62 around the through-hole 60.

[0037] As can be seen best in FIG 3 to 6 in the tub bottom 12 a sump 10 is formed. The sump 10 has a mainly horizontal sump bottom 13 and a side wall structure 11 rising upwards from the sump bottom 13 up to the tub bottom 12, so that the sump bottom 13 is the lowest wall of the sump 10 and arranged below the tub bottom 12. An opening in the tub bottom 12 surrounded by the side wall structure 11 forms a sump inlet 18 for the washing liquid in the uppermost part of the sump 10. The sump bottom 13 and the side wall structure 11 are arranged lower than the tub bottom 12 so that washing liquid in the washing tub 2 can be collected and drained in the sump 10 under the influence of gravity and/or, in addition, low pressure exerted by a draining pump 70 of the draining device 7.

[0038] A carrier bridge 14 extends adjacent to the sump inlet 18 over the sump 10 as a protrusion or extension of the tub bottom 12 inwards from a side wall part 11B and serves as a resting surface or element for coupling a holding element for a heating element (not shown) for heating the washing liquid within the tub 2 which heating element is connected electrically outside the tub 2 through a through-hole 63 in the back of the rear tub part 22.

[0039] A rear tub bottom part 12A and adjacent side wall parts 11A, 11B, 11C and 11D of the side wall structure 11 of the sump 10 and the sump bottom 13, that is to say all limiting walls of the sump 10 except for a front sump wall 11E, are integral with or part of the rear tub part 22, preferably formed from the same thermoplastic material and in the same injection-moulding process in the same moulding form.

[0040] The side wall parts 11A, 11B and 11C follow each other around the sump 10, preferably arranged rectangularly to each other, and are at least approximately vertical walls with sloped upper entry sections at the sump inlet 18 and preferably horizontally curved intermediate transition sections in between the side wall parts 11A, 11B and 11C. The side wall part 11D is arranged above the vertical side wall part 11C and slopes upwardly from the vertical side wall part 11C forming a bottom wall of an air channel 16 of the sump 10 for releasing air bubbles caught in the liquid in the sump 10.

[0041] A sump front wall 11E which closes the side wall structure 11 of the sump 10 at the front is formed integral with the front tub part 21 and connected with the adjacent side wall parts 11A and 11C and 11D and with the sump bottom 13 at the connecting parts 23 and 24

in the connecting area 20 to close and also seal the sump 10.

[0042] Preferably the front wall 11E lies in the connecting plane of the two tub parts 21 and 22 and is surrounded by the connecting parts 23 and 24 which are connected, in particular welded, together in the connecting area 20.

[0043] A front tub bottom part 12B of the tub bottom 12 is integral with the front tub part 21 and partly connected by the hot welding in a sealed manner with the rear tub bottom part 12A in or at the connecting area 20 and partly separated from the rear tub bottom part 12A by the sump 10 and by the air channel 16 of the sump 10.

[0044] As can be seen in FIG 3 to 6, washing liquid L runs down the inner wall 121 of the washing tub 2 at least in certain phases of operation, for instance during fast rotation of the drum 3 such as in a spinning phase when the washing liquid L is to be drained out from the tub 2 through the sump 10. The flow direction of the washing liquid L is visualised by an arrow which runs in particular opposite to the rotational direction RD of the drum 3 as shown in FIG 6.

[0045] Now, only washing liquid flowing along the inner wall 121A into the rear tub bottom 12A of the rear tub part 22 will have a flow direction towards the sump 10 which is arranged in the rear tub part 22 and thus, at least mainly, flow directly into the sump 10.

[0046] However, a significant portion of the washing liquid L running down the inner wall 121 of the tub 2, in particular the washing liquid L flowing along the inner wall 121B of the front tub part 21 into the front tub bottom 12B, will not flow directly into the sump 10 due to the sump 10 not covering the whole width of the tub bottom 12, in particular not the front tub bottom 12B. This would normally cause an incomplete or at least delayed drainage of the washing liquid L. During a spinning phase of the drum, water released from laundry under the effect of centrifugal forces may be dragged by the rotating drum and prevented from entering the sump 10.

[0047] In order to solve this problem and to improve the draining of the washing liquid L, in particular in the front tub bottom 12B, according to the invention a directing element 30 is arranged on the tub bottom 12, in particular the front tub bottom 12B, for directing washing liquid L running down the inner wall 121B of the front tub part 22 of the tub 2 into the sump 10.

[0048] This directing element 30 has an impact wall 31 which protrudes upwardly from the front tub bottom 12B and extends over the width or depth of the front tub bottom 12B continuously to the edge of the sump 10, preferably basically perpendicular to the flow direction of the washing liquid L and/or parallel to the rotational axis RA of the drum 3 and/or to the axis A. The impact wall 31 can be orthogonal to the front tub bottom 12B but also be inclined under an inclination angle α towards the direction where the washing liquid L comes from as shown, wherein the inclination angle α can be in particular between 70° and 88°.

[0049] The washing liquid L impacts or impinges on the impact wall 31 and is re-directed in a flow direction along the impact wall 31 towards the sump 10. The re-directed washing liquid flowing along the impact wall 31 into the sump 10 is designated by L'.

[0050] The directing element 30 has, in particular, an overhang 32 arranged above the impact wall 31 to catch washing liquid L splashing upwardly when impacting on the impact wall 31 and keep it from spilling over the directing element 30 but rather direct it downward and towards the sump 10.

[0051] The directing element 30 is preferably formed integral with the tub wall, in particular with the front tub bottom 12B or front tub part 22, and is brought into its position relative to the sump 10 when the front tub part 22 and the rear tub part 21 are connected in the connecting area 20.

[0052] The distance d of the top part, in particular the overhang 32, of the directing element 30 to the outside wall 33 of the drum 3 is shown in FIG 6 and is usually smaller than the height of the directing element 30. This distance d is in particular chosen as a compromise between the need of allowing the directing element to intercept the water amount dragged by the rotating drum, expecially during spinning, and the need of avoiding interference between the directing element and the drum circumferential tolerances of production.

[0053] The draining device 7 is shown in greater detail in FIG 4 to 6. Adjacent to the sump 10 and arranged at least partly lower than the sump 10 and its sump bottom 13 there is a draining conduit 75 of the draining device 7.

[0054] The draining conduit 75 has, next to the sump 10, a mainly cylindrical circumferential wall 17 in which a rectangular opening is formed as a sump outlet 15 through which the sump 10 is in fluid connection with the draining conduit 75. The sump outlet 15 is arranged above the sump bottom 13, the sump bottom 13 slightly sloping downward towards the section of the circumferential wall 17 which is below the sump outlet 15, and/or arranged in an upper region of the circumferential wall 17 to allow for smooth draining flow from the sump 10 into the draining conduit 75.

[0055] The draining conduit 75 also comprises, at a first end, here a rear end 75A, a pump receiving part 37 which has a mainly cylindrical circumferential wall 87 in which a draining outlet 74 is formed. A central (geometrical) axis A of the draining conduit 75 runs through the central region of the circumferential wall 17 and the pump receiving part 37 being their respective central or cylinder axis. The central axis A is preferably parallel to the rotational axis RA of the drum 3.

[0056] The pump receiving part 37 or its circumferential wall 87 is arranged coaxially and subsequent to the circumferential wall 17 with respect to the central axis A at an opposite end of the circumferential wall 17 than the front tub part 21. The circumferential wall 87 of the pump receiving part 37 has a greater diameter or radius from the axis A than the circumferential wall 17. The circumferential walls 17 and 87 of the draining conduit 75 to-

gether enclose an inner space or inner chamber 85 of the draining conduit 75.

[0057] Now, the circumferential wall structure of the conduit 75, in particular the circumferential wall 17 in the front of the conduit 75 and also a part of the circumferential wall of the pump receiving part 37 in the rear of the conduit 75, protrudes or extends into the sump 10 and connects the sump bottom 13 with the side wall parts 11B and 11C of the side wall structure 11 of the sump 10, thus forming a rigid structure, as can be seen best in FIG 3 and 4. Therefore, the circumferential wall structure of the draining conduit 75 forms itself curved side wall parts of the side wall structure 11 of the sump 10 and, at the same time, separation wall(s) between the sump 10 and the conduit inner chamber 85.

[0058] This design and arrangement of the sump outlet 15 as an, preferably rectangular, opening in a curved, preferably cylindrical, and concave as seen from the sump 10 (or convex as seen from the conduit inner chamber 85) separation wall between the sump 10 and the inner chamber 85 of the conduit 75 leads to very good flow results within the sump 10 and at the same time to a very solid and rigid construction. In particular, due to the sump outlet 15 being oriented towards the sump inlet 18 there is a direct and short flow path for the drained liquid thorugh the sump 10 resulting in less turbulences.

[0059] The conduit 75 is, thus, rigidly connected with the sump side wall structure 11 and the tub bottom 12 over a pre-determined length and with at least two sump side wall parts 11B and 11C and the sump bottom 13 so that forces exerted on the conduit 75 are distributed and born in a larger section into three dimensions.

[0060] In addition to the draining conduit 75 having the sump outlet 15 as the draining conduit inlet the draining device 7 comprises a draining pump 70 with a pump wheel (not shown) as well as a pump drive 71, usually an electric motor with or without a gear and preferably with, usually electronic, control of the rotational speed, for rotating the pump wheel about a rotational axis which is the central axis A of the draining conduit 75 in the mounted state.

[0061] A rear side of the pump receiving part 37 at the rear end 75A of the conduit 75 pointing away from the circumferential wall 17 is formed like a ring-shaped flange or flange ring surrounding a rear opening of the pump receiving part 37. The pump drive 71 is fixed at this rear side of the pump receiving part 37 of the draining conduit 75 at the rear end 75A, preferably by means of a circular planar drive flange 82 and screws 83 to be guided through guidings 84 in the drive flange 82 and to be screwed into corresponding screw holes at the rear side 87.

[0062] The pump wheel is introduced through the rear opening into the inner conduit chamber 85 and arranged within the pump receiving part 37 or, more specifically, inside the part of the inner conduit chamber 85 of the draining conduit 75 that is surrounded by the circumferential wall of the pump receiving part 37.

[0063] The whole circumferential wall structure and the pump receiving part 37 of the conduit 75 are formed integral with the rear tub part 12, i.e. formed in the same material and/or injection-moulding process.

[0064] The front tub part 21 has a cover wall 25. The cover wall 25 covers or closes the draining conduit 75 and its inner chamber 85 at a second end, here a front end, 75B which is, as seen axially along the central axis A, opposite to the rear end 75A and, further upwardly, forms the sump front wall 11E of the sump 10 and continues into a front tub bottom part 12B of the tub bottom 12 which is more or less directed at a right angle to the cover wall 25. So the front cover of the conduit 75 and the sump 10 are formed integrally by the same cover wall 25 which in turn is formed integrally with the front tub part 21.

[0065] The cover wall 25 is at least at the side towards the conduit 75 or sump 10 mainly flat or planar and is at least at the front end 75B of the conduit 75 oriented orthogonal to the central axis A of the conduit 75. Furthermore, the cover wall 25 is connected with the circumferential wall 17 of the conduit 75, usually in the connecting area 20 and/or in the connecting plane, which connection is made at the same time the two tub parts 21 and 22 are connected in the connecting area 20 by hot welding.

[0066] Due to the front wall of the conduit 75 formed by the cover wall 25 and the front wall 11E of the sump 10 also formed by the cover wall 25 being planar, preferably lying in the same connecting plane, the cavity or volume or the conduit 75 as well as of the sump 10 is in each case formed entirely in the rear tub part 22 and only closed by the front tub part 21. This allows for simple moulding forms and manufacture.

[0067] In the sump front wall 11E, which is preferably constituted or formed by the cover wall 25, there is a hole or an opening 80 for mounting a pipe or level detection tube 28 of a level detection device 8. The level detection tube 28 is arranged at least slightly upwardly and is closed at a distal end or upper end 28A opposite to the connecting end 28B which is connected in the opening 80. A different level of washing liquid in the sump 10 and the tub bottom 12 will result in a different filling level in the level detection tube 28 and cause a variation of the air pressure above the liquid level which can be detected or sensed by an air pressure sensor 81 at the upper end 28A.

[0068] This opening 80 is arranged above the draining conduit 75 and on the other side of the sump 10 than the sump outlet 15, basically opposite to the sump outlet 15, which results in the level detection tube 28 being emptied efficiently by the pump pressure being exerted in the sump 10 through the sump outlet 15. A central axis of the, preferably circular, opening 80 and/or an inserting direction for inserting the connecting end 28B of the level detection tube 28 is oriented parallel to the central axis A of the conduit 75.

[0069] The central axis A of the conduit 75 extends, in the mounted state, preferably in a horizontal direction or in a horizontal plane orthogonal to the direction of gravity

which results in a horizontal axial flow of draining liquid through the draining conduit 75.

[0070] In a preferred embodiment not shown, a filter element is mounted into the inner chamber 85 of the draining conduit 75 by inserting the filter element through a rear opening of the conduit in an axial direction along the central axis A.

[0071] In order to facilitate and improve the connection between the front tub part 21 and the rear tub part 22 at the connecting area 20 connecting elements 26 and 27 can be provided wherein, as shown, the connecting element 26 arranged at the front tub part 21 is a protruding part and is received by a receiving recess as a second connecting element 27 which design improves the connecting properties of hot welding and constitutes a welded water tight sealing. Also the connecting parts 26 and 27 allow for a pre-positioning of the two tub parts 21 and 22 before welding.

[0072] The front tub part 21 and the rear tub part 22 are, in the preferred embodiment shown, both formed in such a way that they can be injection-moulded from a thermoplastic material between two moulding forms in a moulding process reducing the use of runners or moveable form parts in further moulding steps. At least one, preferably both, of the two moulding forms, usually an inner moulding form, forms cavities and concave spaces in the tub parts 21 and 22 such as the sump 10 or the tub interior 9 or the draining conduit 75 which cavities or concave spaces start at the connecting line between the two moulding parts and are open towards the connecting part line of the moulding parts, wherein the sump 10 and the conduit 75 are preferably basically formed in the rear tub part 22. In particular, the front tub part 21 and preferably also the most part of the rear tub part 22, have a shape that allows for direct linear retraction of the moulding forms along a common retraction direction which is parallel to an axis running through the tub part 21 or 22 in case of tub part 22 the central axis A of the draining conduit 75. In order to be able to withdraw or retract each of the moulding forms after the moulding process it is necessary that no moulded part of the freshly moulded tub part is in the way of a moulding form section along the retraction direction. The moulding process will be anyway greatly simplified if the number of moulded parts in the way of a moulding form section along the retraction direction is very little, for example just one.

[0073] This is achieved in the construction of the tub parts 21 and 22 by not allowing or by limiting in number, in a direction opposite to the retraction direction, any broadening or increase in the diameter or inner dimension of each of the cavities or concave spaces in the tub parts 21 and 22 in any lateral direction which is orthogonal to the retraction direction of each of the two moulding forms. In other words, the inner dimensions or diameters of each cavity and concave space, as seen in a linear projection along the retraction axis, in particular along or parallel to the central axis A, in the front tub part 21 and in the most part of the rear tub part 22, in particular the sump 10, the tub interior 9, the shape of the directing element 30 and the draining conduit 75, stay the same or decrease, i.e. do not increase, in a direction which is opposite to each moulding form retraction direction. This allows linear retraction of an inner moulding form which has the complementary shape to these cavities or concave spaces out of these cavities and spaces of a freshly moulded front tub part 21 and the most part of rear tub part 22 in a retraction direction parallel to the retraction axis, in particular central axis A.

List of reference numerals

[0074]

2	washing tub
3	drum
4	opening
5	counterweight structure
6	drum drive
7	draining device
8	level detection device
9	tub interior
10	draining sump
11	side wall structure
11A	side wall part
11B	side wall part
11C	side wall part
11D	side wall part
11E	front side wall part
12	tub bottom
12A	rear tub bottom part
12B	front tub bottom part
13	sump bottom
14	carrier bridge
15	sump outlet
16	air channel
17	circumferential wall
18	sump inlet
19	reinforcing rib
20	connecting area/seam
21	front tub part
22	rear tub part
23	front connecting part
24	rear connecting part
25	front cover
26,27	connecting element
28	level detection tube
28A	distal end
28B	connecting end
30	directing element
31	impact wall
32	overhang
33	drum wall
34	drum interior
37	pump receiving part
38	flange
39	sealing ring

40	lifter
41	perforations
60	through-hole
61	fastening element
62	reinforcing ribs
63	through-hole
70	draining pump
71	pump drive
74	draining outlet
75	draining conduit
75A	first end
75B	second end
80	connecting hole
81	air pressure sensor
82	drive flange
83	screws
84	screw guidings
85	inner conduit chamber
121	inner tub wall
121A	inner wall of rear tub part 22
121B	inner wall of front tub part 21
A	central axis
L	washing liquid
L'	re-directed washing liquid (flowing into sump 10)
RA	rotational axis
RD	rotational direction
α	inclination angle
d	distance

Claims

1. Washing tub unit for a washing machine comprising

a) a washing tub (2) housing a rotatable drum (3) for receiving goods to be washed,
b) wherein the washing tub (2) has an inner tub wall (121) facing the outside wall (33) of the drum (3) and having a tub bottom (12) in the lowest region of the inner tub wall (121), the washing tub (2) being composed of pre-formed tub parts (21, 22) being connected with each other,
c) wherein a draining tub outlet (18) is formed in one of the pre-formed tub parts (22) and arranged within the tub bottom (12),
d) wherein at least one directing element (30) is formed in another of the pre-formed tub parts (21) and arranged on the tub bottom (12) adjacent to the tub outlet (18),
e) the directing element (3) having an impact wall (31) protruding upwardly from the tub bottom (12) towards the outside wall of the drum (3) but keeping a distance from the outside wall of the drum (3) and extending continuously to the edge of the tub outlet (18), thereby directing washing liquid running down the inner tub wall (121) and impacting onto the impact wall (31) directly towards and into the tub outlet (18).

2. Washing tub according to claim 1, wherein the impact wall (31) extends basically perpendicular to the rotational direction (RD) of the drum (3) or to the flow direction of the washing liquid (L) along the inner tub wall (121) and/or parallel to the rotational axis (RA) of the drum (3).

3. Washing tub according to claim 1 or claim 2, wherein the impact wall (31) is inclined under an inclination angle (α) to the tub bottom (12), wherein the inclination angle α can be in particular between 70° and 88°.

4. Washing tub according to any of the preceding claims, wherein the directing element (30) has an overhang (32) arranged above the impact wall (31) to catch washing liquid (L) splashing upwardly when impacting on the impact wall (31).

5. Washing tub unit according to any of the preceding claims, wherein one of the pre-formed tub parts is a front tub part (21) having a front tub bottom part (12B) and another of said pre-formed tub parts is a rear tub part (22) having a rear tub bottom part (12A).

6. Washing tub unit according to claim 5, wherein the directing element (30) is an integral part with the front tub bottom part (12B) and/or formed from the same thermoplastic material as the front tub part (21) and/or formed in the same injection-moulding process as the front tub part (21) and/or wherein the impact wall (31) of the directing element (30) extends over the depth of the front tub bottom part (12B).

7. Washing tub unit according to any of the preceding claims, wherein a draining sump (10) is arranged in a lower region of the washing tub (2) and has a sump inlet (18), a sump bottom (13) and a side wall structure (11) surrounding the sump inlet (18) and being connected to the sump bottom (13), wherein the side wall structure (11) and the sump bottom (13) of the sump (10) are arranged below the tub bottom (12) and wherein the sump inlet (18) is formed by the tub outlet in the tub bottom (12).

8. Washing tub unit according to claim 7 referring back to claim 5 or claim 6, wherein a front side wall part (11E) of the side wall structure (11) of the sump (10) is an integral part with the front tub part (21), in particular formed from the same thermoplastic material as the front tub part (21) and/or formed in the same injection-moulding process as the front tub part (21) and wherein the other parts (11A to 11D) of the side wall structure (11) of the sump (10) are integral parts with the rear tub part (22), in particular formed from the same thermoplastic material as the rear tub part (22) and/or formed in the same injection-moulding

process as the rear tub part (22).

9. Washing tub unit according to claim 8, wherein the impact wall (31) of the directing element (30) extends to the edge formed between the tub bottom (12) and the front side wall part (11E) of the sump (10), which preferably has a flat or planar surface and/or lies itself or has its flat or planar surface lying in a connecting plane or in a same plane as the connecting area (20) of the two tub parts (21 and 22).

10. Washing machine having a washing tub unit according to one of the preceding claims.

FIG 1

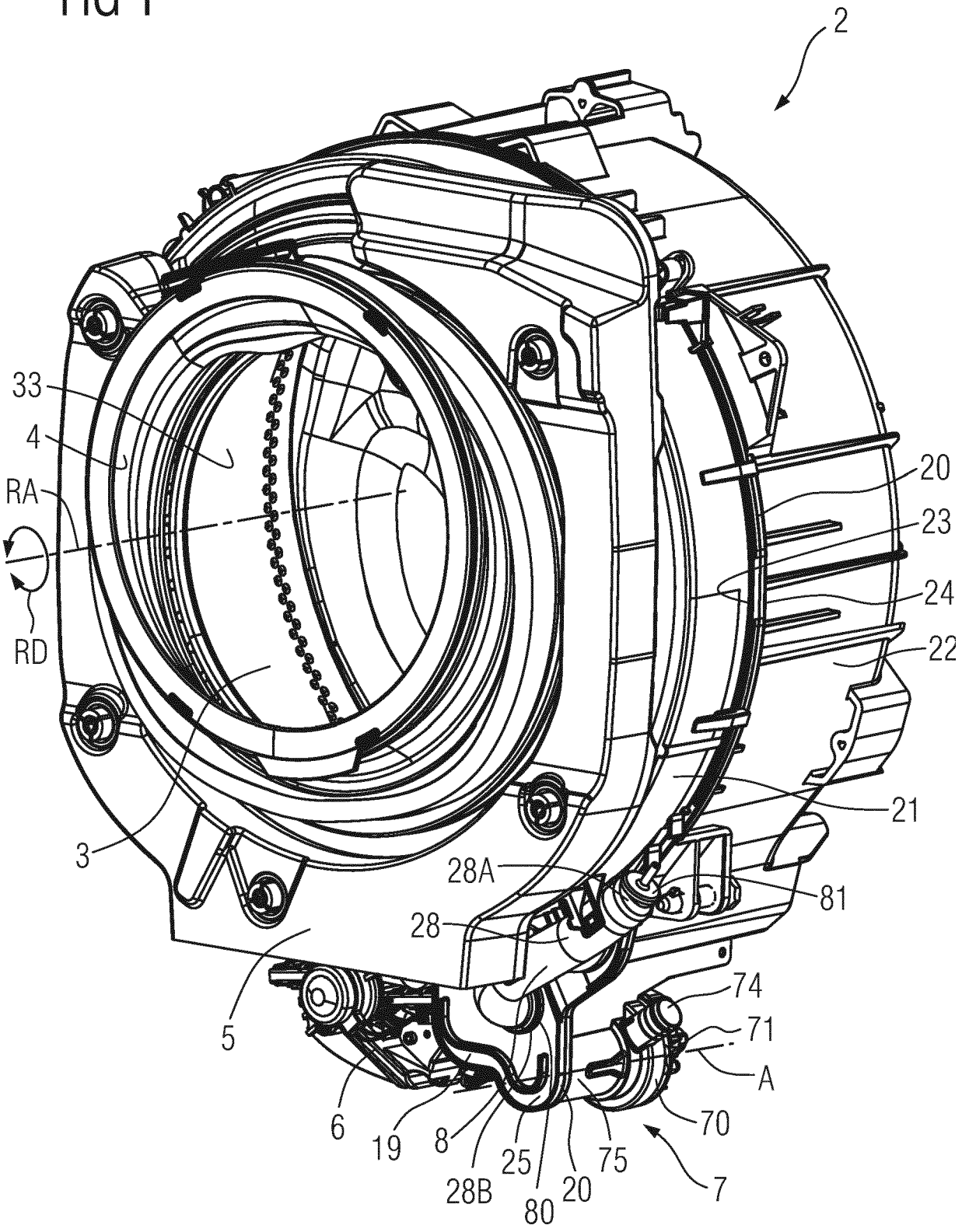

2
33
4
RA
RD
3
20
23
24
22
21
28A
81
28
74
71
A
5
6
19
8
25
75
70
7
28B
80
20

FIG 2

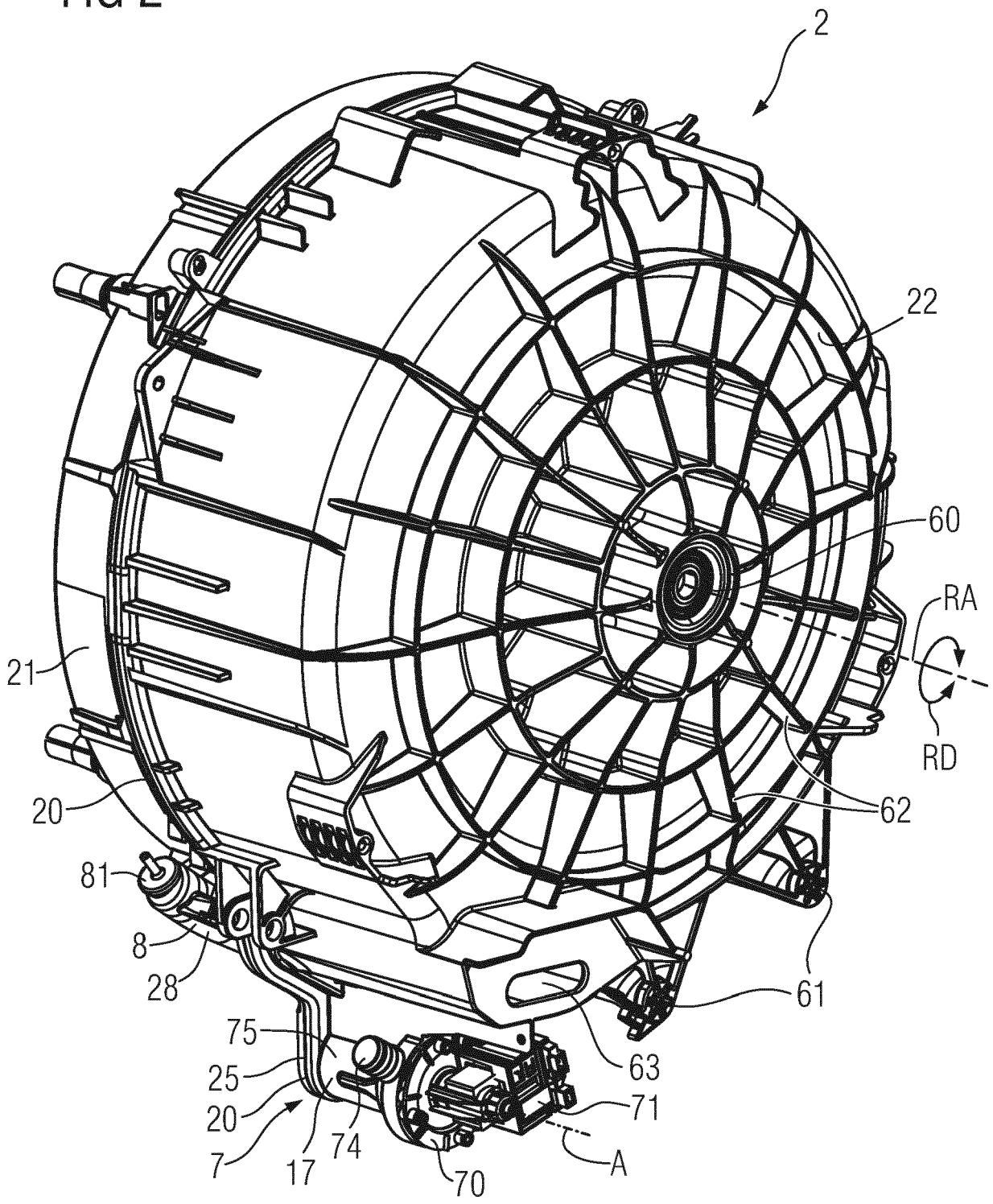
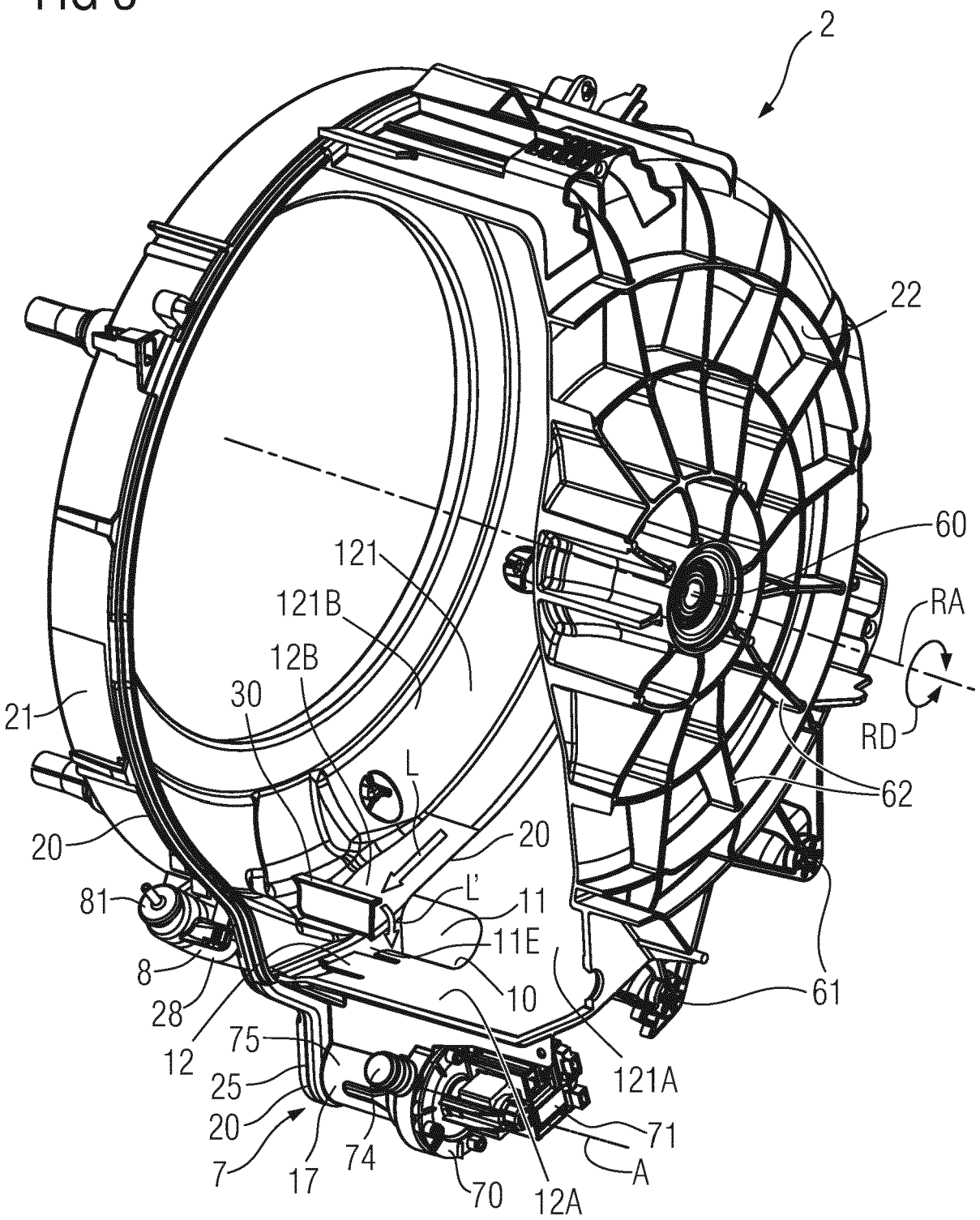


FIG 3


2
22
60
RA
RD
62
121
121B
12B
30
21
L
20
20
81
L'
11
11E
8
10
61
28
12
75
25
20
7
17
74
70
12A
121A
71
A

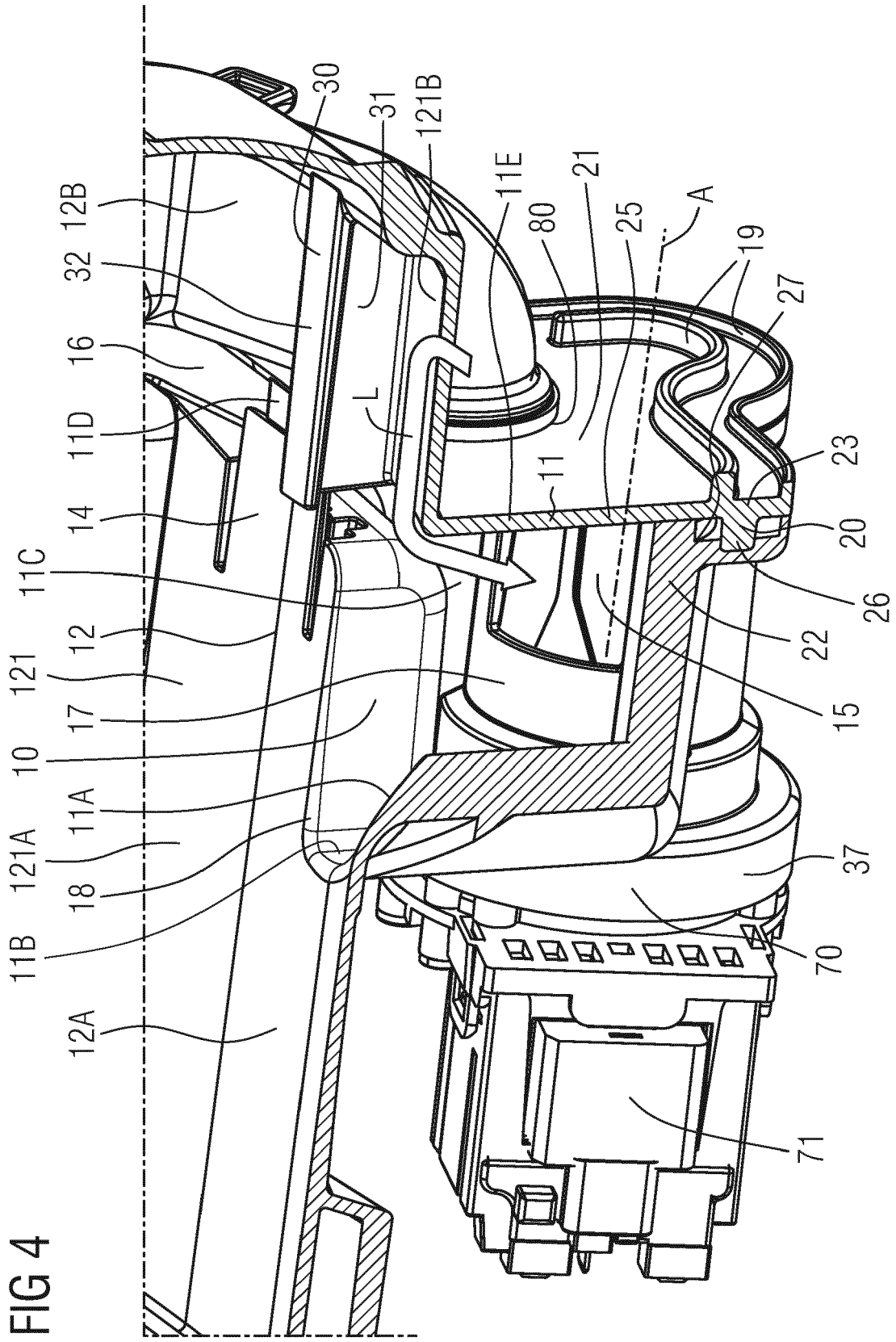

30
31
121B
11E
21
80
25
A
19
27
23
20
26
22
15
37
70
71
12B
32
16
11D
14
11C
12
121
17
10
11A
121A
18
11B
12A
L
11

FIG 4

FIG 5

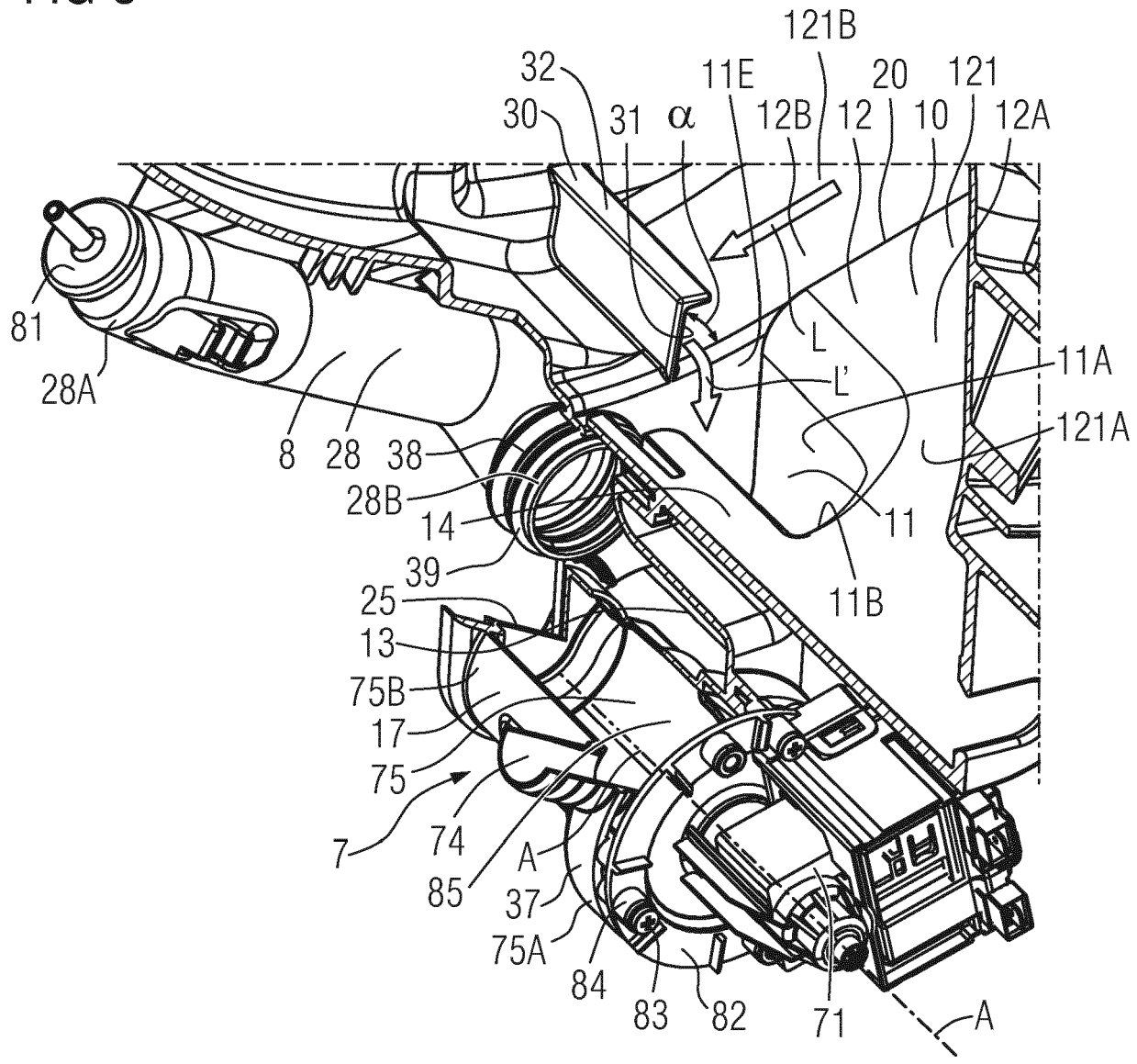
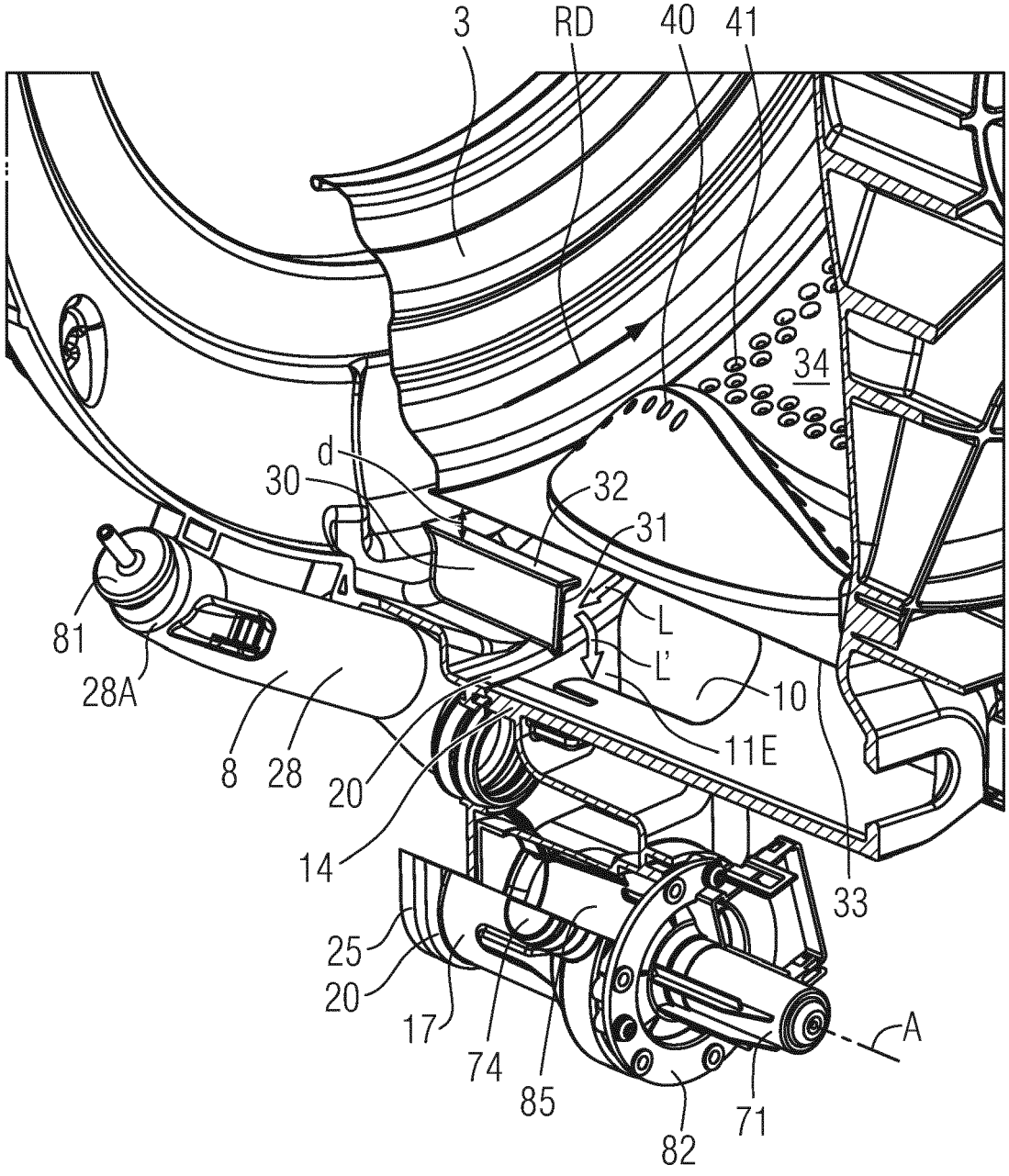

121B
32
11E
20
121
30
31
α
12B
12
10
12A
81
L
11A
28A
L'
121A
8
28
38
28B
14
11
39
11B
25
13
75B
17
75
7
74
A
85
37
75A
84
83
82
71
A

FIG 6


3
RD
40
41
34
d
30
32
31
L
L'
10
11E
33
81
28A
8
28
20
14
25
20
17
74
85
82
71
A

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EUROPEAN SEARCH REPORT

Application Number
EP 12 15 7040

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	US 2011/132041 A1 (METTE UWE [US] ET AL) 9 June 2011 (2011-06-09)	1-3,5-10	INV. D06F39/08
A	* paragraphs [0003] - [0006], [0012], [0015], [0016], [0019] - [0024], [0042] - [0051], [0061], [0067], [0073]; figures 2,7-9K *	4	D06F37/26
Y	EP 2 405 050 A1 (ELECTROLUX HOME PROD CORP [BE]) 11 January 2012 (2012-01-11)	1-3,5,7	
A	* paragraphs [0006], [0009] - [0011], [0027] - [0031], [0036]; figures *	4,6,8-10	
Y	EP 0 844 324 A2 (AEG HAUSGERAETE GMBH [DE]) 27 May 1998 (1998-05-27)	1-3,5,7	
A	* column 1, line 54 - column 2, line 31 *	4,6,8-10	
A	WO 2009/030688 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]; GRACIA BOBED ISMAEL [ES]; BORQUE M) 12 March 2009 (2009-03-12) * page 1, line 24 - page 2, line 25; page 6, line 23 - page 7, last line; figures *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
A	US 2003/041389 A1 (CHEO FRANCIS C [US] ET AL) 6 March 2003 (2003-03-06) * paragraphs [0009], [0017], [0027] - [0034]; figures *	1-10	D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 August 2012	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS

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03-08-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011132041 A1	09-06-2011	NONE	
EP 2405050 A1	11-01-2012	CN 102312368 A	11-01-2012
		EP 2405050 A1	11-01-2012
EP 0844324 A2	27-05-1998	DE 19648201 A1	28-05-1998
		EP 0844324 A2	27-05-1998
WO 2009030688 A1	12-03-2009	AT 499474 T	15-03-2011
		CN 101796240 A	04-08-2010
		EA 201070341 A1	29-10-2010
		EP 2198081 A1	23-06-2010
		ES 2336520 A1	13-04-2010
		US 2011023557 A1	03-02-2011
		WO 2009030688 A1	12-03-2009
US 2003041389 A1	06-03-2003	CA 2398597 A1	05-03-2003
		US 2003041389 A1	06-03-2003

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Patent documents cited in the description

- US 7607327 B2 **[0006] [0007]**
- US 6574996 B1 **[0008] [0010]**
- DE 3609464 A1 **[0009] [0010]**