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(54) Washing tub unit and washing machine

(57) 1. Washing tub unit for a washing machine comprising

a) a washing tub (2) having a tub interior (9) housing a rotatable drum (3),

b) a draining sump (10) arranged in a lower region of the washing tub (2), and

c) a draining device (7) being in fluid connection with the draining sump (10) for draining washing liquid from the tub interior (9),

d) wherein the draining device comprises a draining conduit (75) and a draining pump (70),

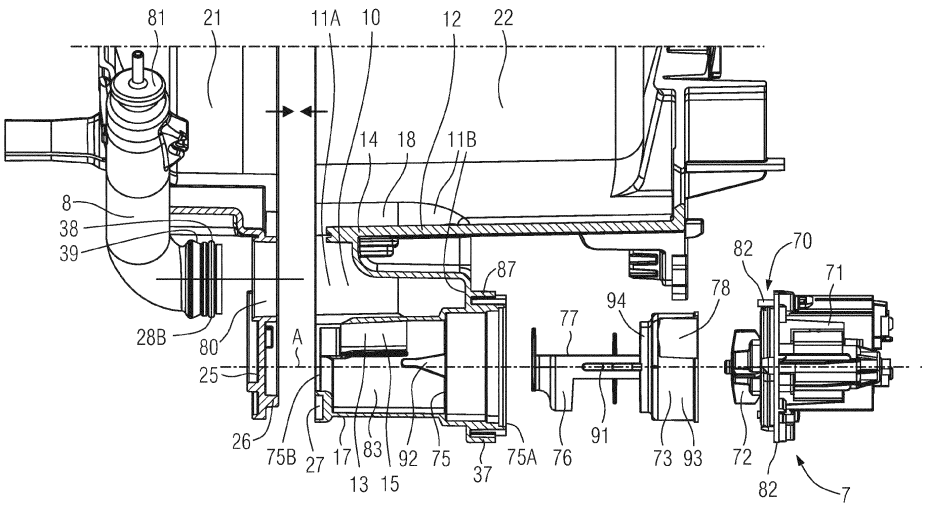
e) wherein the washing tub (2) is composed of a pre-formed front tub part (21) and a pre-formed rear tub part (22) being connected with the front tub part (21) in a connecting area (20),

f) wherein the conduit (75) is formed integral with a first tub part being a first one of the front tub part (21) and the rear tub part (22) and

g) wherein the conduit (75) has a pump receiving part (37) at a first end (75A) for receiving the draining pump (70) and is closed by a cover wall (25) at a second end (75B) of the conduit (75) opposite to the first end (75A),

h) wherein the cover wall (25) is formed integral with a second tub part being the second one of the front tub part (21) and the rear tub part (22) and is connected with the conduit (75) in the connecting area (20).

FIG 8



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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 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] EP 2 198 081 B1 discloses a plastic washing-machine tub with a front wall, a rear wall and a cylindrical wall enclosing an inner tub compartment. The tub comprises two tub shells made from injection-moulded plastic that can be connected together by means of an assembly plane in a tub closure direction, the first tub shell comprising the front wall and the second tub shell comprising the rear wall, and further an integral bulge emerging from the cylindrical wall and defining a cavity serving as draining sump connected to the inner tub compartment via an inlet opening for emptying washing water form the inner tub compartment and a subsequent draining pipe or conduit with an outlet opening. The assembly plane divides the bulge into two parts, a first bulge part being arranged in the first tub shell and a second bulge part in the second tub shell, one of the bulge parts having at least one part of the inlet and outlet opening. Furthermore, the conduit of the bulge is in the tub closure direction divided by the assembly plane. The two tub shells are connected using a welding technique, in particular hot plate welding. The bulge is centered in the cylindrical wall projecting therefrom at a bulge distance from the front wall and/or from the rear wall. By this construction the use of runners or moveable parts in the form during injection-moulding of the plastic tub parts is dispensed with. The closure/joining direction of the shells of the tub is the same as the demoulding direction of each of the shells in the injection-moulding from and is perpendicular to the assembly plane. When the two shells are hermetically joined, the bulge is also sealed by means of the parting line of those shells. Furthermore, the bulge extends from lower tub part to the upper tub part while the assembly plane defining a part of the cavity as a pressure chamber which is connected to the inner tub compartment by a lower chamber part and isolated from the inner tub compartment by an upper chamber part and which has a ventilation hole arranged in its upper part.

[0006] EP 0 110 482 A1 discloses a washing machine having a washing tub with a draining sump integral with a first shell-like tub part of the washing tub and a basically flat or planar second tub part for closing the sump from one side thereof. The second tub part and the first tub part are connected with each other at a seam. The sump is fluidly connected to a parallel compartment through a rectangular slit in one of its side walls. Below this compartment a draining conduit is arranged for draining liquid from the compartment, which conduit is made integral with the first tub part at three sides and closed at the front by the second tub part. The draining pump will be connected to this conduit but is not described. Because of the shape of the rectangular opening bigger obstacles cannot pass through and the water escaping from the sump through the opening into the parallel compartment will be filtered from such larger obstacles and be drained downwards into the draining conduit.

[0007] In EP 0 267 837 A1 a washing tub for a washing machine is disclosed which is also made of two tub parts connected with each other. A draining sump is completely formed within one of the tub part and connected to a pump wheel chamber within a pump wheel housing through an opening in the lower region of the sump. The pump wheel housing enclosing the pump wheel chamber is made integral with the tub part at three sides and closed by a planar wall of the other tub part sealed by a sealing ring. The drive of the pump is arranged in front of the planar wall and the axle for driving the pump wheel reaches through the tub part into the pump wheel chamber.

[0008] EP 0 026 018 A1 discloses a further washing machine with a washing tub and a sump wherein a drive system for rotating the rotating drum within the washing tub comprises a belt and a toothed driving wheel driving the belt and being arranged on an axle driven by an electric motor. The belts and the driving wheel and the axle are all arranged within the sump resulting in disturbances in the flow of the washing liquid through the sump.

[0009] It is a purpose of the invention to propose a washing tub unit with a draining device which has good draining properties and can be easily manufactured.

[0010] 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.

[0011] According to claim 1 a washing tub unit for a washing machine is provided comprising

a) a washing tub housing a rotatable drum for receiving goods to be washed,
b) a draining sump arranged in a lower region of the washing tub, and
c) a draining device being in fluid connection with the draining sump for draining washing liquid from the tub interior,
d) wherein the draining device comprises a draining

conduit and a draining pump,

e) wherein the washing tub is composed of a pre-tub part being connected, preferably by hot welding, with the front tub part in a connecting area,

f) wherein the conduit is formed integral with a first tub part being a first one of the front tub part and the rear tub part and

g) wherein the conduit has a pump receiving part at a first end for receiving the draining pump and is closed by a cover wall at a second end of the conduit opposite to the first end,

h) wherein the cover wall is formed integral with a second tub part being the second one of the front tub part and the rear tub part and is connected with the conduit in the connecting area.

[0012] By this construction, a cost-efficient manufacture is possible. Also the pump can be mounted in a simple way onto the pump receiving part at the first end of the conduit which is separated from the second end where the connection between cover wall and the conduit is made. Therefore, the pump receiving part of the conduit bears the forces from the pump (by gravity and rotation) at the first end of the conduit which forces are transferred into and born by the tub part the conduit is made integral with. So, the connection, in particular a connecting seam, between the cover wall and the conduit at the second end of the conduit which is at the other side of the conduit is not loaded or strained by the pump forces so that the sealing between the cover wall and the conduit at the connecting area at the second end is not endangered.

[0013] Instead of the word "draining" also the word "drainage" can be used in this application and *vice versa.*

[0014] "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.

[0015] The pre-formed tub parts are preferably each injection-moulded or formed by injection-moulding from a thermoplastic material. The cover wall, in order to be integral with the corresponding tub part is then preferably formed from the same thermoplastic material as the corresponding tub part and/or formed in the same injection-moulding process as the corresponding tub part. Preferably the connection between the two tub parts is made by hot welding.

[0016] In a preferred embodiment the draining pump has at least one pump wheel arranged within a pump wheel housing and a pump drive for driving the pump wheel in a rotational movement about a central axis as rotational axis, wherein the pump wheel housing with the pump wheel of the draining pump is arranged within the interior of the pump receiving part of the conduit surrounded by a circumferential wall and the pump drive is mounted onto an end side of the pump receiving part and/or wherein the conduit or its inner chamber extends along the central axis which is the rotational axis of the pump wheel and is preferably horizontal.

[0017] The draining conduit has preferably a circumferential wall structure, surrounding an inner chamber of the conduit and the cover wall is connected to the circumferential wall structure of the conduit at the second end in the connecting area and/or in the connecting plane, which connection is preferably made at the same time the two tub parts are connected.

[0018] In an embodiment a separating part of the circumferential wall structure of the conduit forms a part of the side wall structure of the sump and separates the sump from the inner chamber of the conduit, wherein the inner chamber of the conduit is in fluid connection with the sump through at least one sump outlet, which sump outlet is formed as an opening in the separating part of the circumferential wall structure.

[0019] In an advantageous embodiment a filter element having a filtering section for filtering objects of specific size and/or dimensions out of the drained liquid, the filter element being arranged within or in the inner chamber of the conduit. Preferably the filter element is insertable into or removable from the conduit through an opening at the first end of the conduit, wherein the draining pump is releasably mounted to the pump receiving part at the first end of the conduit, and the filter element is insertable or removable after demounting of the draining pump. In particular a flange of the pump closes this opening and the conduit at the first end, the flange in particular separating the pump wheel and the pump drive which is arranged outside the conduit. Also preferably a sealing gasket is arranged between the flange and the conduit.

[0020] In a preferred embodiment the sump is formed integral with the same tub part the conduit is formed integral with and is closed by a cover wall, which cover wall is formed integral with the same tub part which the cover wall for the conduit is formed integral with. Thus, the cavities or volumes of the conduit as well as of the sump are formed entirely in this, in particular rear, tub part and only closed by the front tub part. This allows for simple moulding forms and manufacture.

[0021] In an advantageous embodiment the sump has a side wall structure and a sump bottom and the cover wall for the sump forms a side wall part, in particular a front side wall part, which is connected with the side wall structure and the sump bottom of the sump in the connecting area.

[0022] Wherein the cover wall for the sump, in particular the side wall part, preferably front side wall part, has, at least at a surface facing the sump, 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] In a preferred embodiment in the cover wall for the sump, in particular the side wall part, preferably front side wall part, an opening is formed for connecting a level detection tube of a level detection device. A central axis of the, preferably circular, opening and/or an inserting direction for inserting a connecting end of the level detection tube is oriented parallel to the central axis of the

conduit.

[0024] In an embodiment which allows for easy manufacturing greatly reducing the number of moveable parts in the moulding forms the inner dimensions or diameters of each cavity and concave space, as seen in a linear projection along a retraction axis, in particular along or parallel to the central axis, in the rear tub part, the sump, the rear tub interior and the draining conduit, do not increase, in a direction opposite to a retraction direction of each moulding form used for forming said rear tub part.

[0025] In claim 15 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 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 a rear tub part of the washing tub unit according to FIG 1 and FIG 2 in a perspective view from the front under a viewing angle from above,

FIG 4 the sump of the rear tub part of FIG 3 in greater detail in a perspective view from the front under a viewing angle from above,

FIG 5 a draining device of the washing tub unit according to FIG 1 to 4 in a perspective view from the front under a side viewing angle,

FIG 6 the draining device of FIG 5 in a perspective and, for illustrative purposes, partially sectioned view mainly from the side,

FIG 7 the draining device of FIG 5 and FIG 6 in a perspective and, for illustrative purposes, partially sectioned view from the rear under a viewing angle from above,

FIG 8 the lower parts of the front tub part and the rear tub part and the draining device according to FIG 1 to 7 in an explosive, partially sectioned view from the side before mounting or assembly,

FIG 9 the lower parts of the front tub part and the rear tub part and the draining device according to FIG 8 in a three-dimensional explosive view from the rear under a side viewing angle,

FIG 10 the lower section of the washing tub unit with the front tub part and the rear tub part and the draining device as shown in FIG 8 or FIG 9 in an explosive, partially sectioned view from the side in the assembled or mounted state.

[0027] Identical or at least corresponding parts and quantities in FIG 1 to 10 are designated with the same reference numerals.

[0028] FIG 1 and FIG 2 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 in a connecting 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 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 carrier, in this case a rotatable or rotating drum 3, arranged in the tub interior

9 of the washing tub 2. Adapted to the rotating drum 3 the washing tub 2 is preferably mainly formed in a cylindrical shape. The drum 3 is rotatable or can be rotated 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.

[0035] 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 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, the rear side of the rear tub part 22 is reinforced with reinforcing ribs 62 around the through-hole 60.

[0036] As can be seen best in FIG 3 and FIG 4 in the tub bottom 12 a sump 10 is formed, which has an advantageous construction according to the invention.

[0037] 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 within 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] The draining device 7 is shown in greater detail in FIG 5 to 10. 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.

[0045] 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.

[0046] 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.

[0047] 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 together enclose an inner space or inner chamber 85 of the draining conduit 75.

[0048] 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 87 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 walls 17 and 87 of the draining conduit 75 form themselves 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.

[0049] The curved circumferential wall 17 and 87 of the conduit 75 within the sump 10, i.e the parts defining side wall parts of the side wall structure 11 or separation walls between the sump 10 and the conduit 75, describe or cover an angle range β of usually at least 90°, preferably between 100° and 120°, measured around the central axis A. The corresponding opening angle α of the sump outlet 15, i.e. the opening in the circumferential wall 17 through which the sump 10 is in fluid communication with the inner chamber 85 of the conduit 75, is smaller than the angle range β and typically 80° or less.

[0050] 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.

[0051] 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

[0052] 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 72 (only shown in FIG 8 and FIG 10) 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 72 about a rotational axis which is the central axis A of the draining conduit 75 in the mounted state.

[0053] A rear side 87 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 88 of the pump receiving part 37. The pump drive 71 is fixed at this rear side 87 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 88 at the rear side 87. Therefore, the pump receiving part 37 and thus the whole conduit 75 has to bear the weight of the pump 70 which is accomplished by the rigid tube-like construction and the rigid connection with the sump 10 as already described. Preferably, a gasket or sealing ring (not shown) is arranged between the pump receiving part 37 of the draining conduit 75 and the drive flange 82 for sealing.

[0054] The pump wheel 72 together with a mainly cylindrical pump wheel housing 73 is introduced through the rear opening 88 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 87 of the pump receiving part 37.

[0055] The whole circumferential wall structure 17 and 87 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.

[0056] 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.

[0057] 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 by hot welding.

[0058] 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.

[0059] 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.

[0060] 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.

[0061] Within or in the interior or inner chamber 85 of the draining conduit 75 a filter element 76 is arranged, having a filtering section 77 for filtering out objects of specific size and/or dimensions, in particular larger and/or longer objects, from the draining liquid to prevent them from reaching the pump wheel 72. The filtering section 77 is arranged essentially within the circumferential wall 17 of the conduit 75 when the filter element 76 is mounted. The filter element 76 has further a, preferably mainly cylindrical, pump wheel housing 73 formed integral with the filter element 76 or the filtering section 77 and being arranged within the pump receiving part 37 of the conduit 75 in the mounted state.

[0062] 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 and improves the filtering effect of the filter 76

[0063] The main draining flow direction of the liquid in the direction from the sump outlet 15 to the rear end 75A to the pump wheel 72 is, thus, horizontal and orientated from the front to the rear or away from the front tub part 21 and its front cover 25. Also there is an axial inflow along the horizontal axis A towards the pump wheel 72 which in turn has a radial outflow like a centrifugal pump.

[0064] The draining outlet 74 of the pump receiving part 37 of the draining conduit 75 consists of a short pipe or tube extending fro the circumferential wall 87 outwardly, essentially in radial direction from the axis A, and is inclined upwardly with respect to the axis A or a horizontal plane.

[0065] In the preferred embodiment shown, a filter element 76 is mounted into the inner chamber 85 of the draining conduit 75 by inserting the filter element 76 through the rear opening 88 in an axial direction along the central axis A. A correct angular position of the filter element 76 within the conduit 75 is ensured by a positioning element 91 at the filter element 76 which is to be inserted into a positioning slot 92 at the circumferential wall 17 of the conduit 75 which positioning means 91 and 92 also support an angular fixation between filter element 76 and conduit 75.

[0066] The pump wheel housing 73 has a sort of bowl or pot shape and is provided with a mainly cylindrical housing circumferential wall 93 surrounding the central axis A when mounted and with a circular ring-shaped housing front wall 94 being perpendicular to the central axis A and separating as a separation wall the interior of the housing circumferential wall 93 from the filtering section 77. The housing circumferential wall 93 is provided with an opening over a certain angle about the axis A as a housing outlet 78. The separation wall or housing front wall 94 has a central opening through which the central axis A runs in the mounted state and which serves as a filter outlet 79 or a housing inlet and brings the filtering section 77 and the pump wheel housing 73 in fluid connection. When the filter element 76 is mounted the pump wheel housing 73 is received in the pump receiving part 37 of the conduit 75 and its housing outlet 78 overlaps in the angular range and is, thus, in fluid connection with the draining outlet 74 at the circumferential wall 87, which angular positioning is assisted and ensured by the positioning element 91 being inserted into the positioning slot 92. The pump wheel housing 73 has a slightly smaller diameter than the circumferential wall 87 of the conduit 75.

[0067] Once the filter element 76 is correctly inserted into the conduit 75 the pump wheel 72 of the pump 70 can be introduced into the pump wheel housing 73 of the filter element 76. In the mounted state the central axis A is the central axis of the pump wheel housing 73 and the pump wheel 72 as its rotational axis and preferably axis of inertia for balanced rotation. When the pump wheel 72 is introduced into the pump wheel housing 73, the blades or wings of the pump wheel 72 have a radial distance to the inner wall of the pump wheel housing 73 and can be rotated about the axis A within the pump wheel housing 73 in order to suck or draw in washing liquid from the sump 10 through the sump outlet 15 into the inner conduit chamber 85 and through the filtering section 77 and thereafter through the filer outlet 79 into the pump wheel housing 73 and to dispense or pump the liquid out of the pump wheel housing 73 through the housing outlet 78 and the draining outlet 74 in a mainly radial direction. So, the draining pump 70 and its pump wheel 72 have an axial inflow and a radial outflow for the washing liquid with respect to the central axis A.

[0068] In other words, the pump wheel 72 is separated from the sump 10 by means of the draining conduit 75 and the filter element 76 and the flow path and thus flow resistance are reduced, thereby reducing energy losses. The pump wheel 72 generates a low pressure in the conduit 75 and thus in the sump 10 and a steady flow of the drained liquid through the horizontal conduit 75.

[0069] 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.

[0070] 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.

[0071] 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 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

[0072]

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	front tub bottom part
12B	rear 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	deflector element
37	pump receiving part
38	flange
39	sealing ring
60	through-hole
61	fastening element
62	reinforcing ribs
63	through-hole
70	draining pump
71	pump drive
72	pump wheel
73	pump wheel housing
74	draining outlet
75	draining conduit
75A	first end
75B	second end
76	filter element
77	filter section
78	housing outlet
79	filter outlet
80	connecting hole
81	air pressure sensor
82	drive flange
83	screws
84	screw guidings
85	inner conduit chamber
87	circumferential wall

88 rear opening
89 screw holes
91 positioning element
92 positioning slot
93 housing circumferential wall
94 housing front wall
97 rear side

A central axis
β angle range

Claims

1. Washing tub unit for a washing machine comprising

a) a washing tub (2) having a tub interior (9) housing a rotatable drum (3),
b) a draining sump (10) arranged in a lower region of the washing tub (2), and
c) a draining device (7) being in fluid connection with the draining sump (10) for draining washing liquid from the tub interior (9),
d) wherein the draining device comprises a draining conduit (75) and a draining pump (70),
e) wherein the washing tub (2) is composed of a pre-formed front tub part (21) and a pre-formed rear tub part (22) being connected with the front tub part (21) in a connecting area (20),
f) wherein the conduit (75) is formed integral with a first tub part being a first one of the front tub part (21) and the rear tub part (22) and
g) wherein the conduit (75) has a pump receiving part (37) at a first end (75A) for receiving the draining pump (70) and is closed by a cover wall (25) at a second end (75B) of the conduit (75) opposite to the first end (75A),
h) wherein the cover wall (25) is formed integral with a second tub part being the second one of the front tub part (21) and the rear tub part (22) and is connected with the conduit (75) in the connecting area (20).

2. Washing tub unit according to claim 1, wherein the pre-formed tub parts are each injection-moulded or formed by injection-moulding from a thermoplastic material and the draining conduit and the cover wall are in each case formed from the same thermoplastic material as the corresponding tub part and/or formed in the same injection-moulding process as the corresponding tub part and wherein preferably the connection between the two tub parts (21, 22) is made by hot welding.

3. Washing tub unit according to claim 1 or claim 2, the draining pump (70) having at least one pump wheel (72) arranged within a pump wheel housing (73) and a pump drive (71) for driving the pump wheel (72) in a rotational movement about a central axis (A) as rotational axis, wherein the pump wheel housing (73) with the pump wheel (72) of the draining pump is arranged within the interior of the pump receiving part (37) of the conduit (75) surrounded by a circumferential wall (87) and the pump drive (71) is mounted onto an end side (97) of the pump receiving part (37) and/or wherein the conduit (75) or its inner chamber (85) extends along the central axis (A) which is the rotational axis of the pump wheel and is preferably horizontal.

4. Washing tub unit according to any of the preceding claims, wherein the draining conduit has a circumferential wall structure (17, surrounding an inner chamber (85) of the conduit and the cover wall (25) is connected to the circumferential wall structure of the conduit (75) at the second end (75B) in the connecting area (20) and/or in the connecting plane, which connection is preferably made at the same time the two tub parts (21 and 22) are connected.

5. Washing tub unit according to claim 4,

a) wherein a separating part of the circumferential wall structure of the conduit (75) forms a part of the side wall structure of the sump (10) and separates the sump from the inner chamber of the conduit,
b) wherein the inner chamber of the conduit is in fluid connection with the sump through at least one sump outlet (15), which sump outlet is formed as an opening in the separating part of the circumferential wall structure.

6. Washing tub unit according to any of the preceding claims, wherein a filter element (76) having a filtering section (77) for filtering objects of specific size and/or dimensions out of the drained liquid, the filter element (76) being arranged within or in the inner chamber (85) of the conduit (75).

7. Washing tub unit according to claim 6, wherein the filter element (76) is insertable into or removeable from the conduit (75) through an opening at the first end (75A) of the conduit (75), wherein the draining pump (70) is releasably mounted to the pump receiving part (37) at the first end (75A) of the conduit (75), and the filter element (76) is insertable or removeable after demounting of the draining pump (70).

8. Washing tub unit according to claim 7, wherein a flange (82) of the pump (70) closes the opening and the conduit at the first end (75A), the flange (82) in particular separating the pump wheel and the pump drive which is arranged outside the conduit (75) and/or wherein preferably a sealing gasket is arranged between the flange (82) and the conduit (75).

9. Washing tub unit according to any of the preceding claims, wherein the sump (10) is formed integral with the same tub part (21) the conduit (75) is formed integral with and is closed by a cover wall (11E, 25), which cover wall (11E, 25) is formed integral with the same tub part which the cover wall (25) for the conduit (75) is formed integral with.

10. Washing tub unit according to claim 9, wherein the sump (10) has a side wall structure (11) and a sump bottom (13) and the cover wall for the sump (10) forms a side wall part, in particular a front side wall part (11E), which is connected with the side wall structure (11) and the sump bottom (13) of the sump (10) in the connecting area (20).

11. Washing tub unit according to claim 9 or 10, wherein the cover wall for the sump (10), in particular the side wall part, preferably front side wall part (11E), has, at least at a surface facing the sump (10), 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).

12. Washing tub unit according to any of claim 9 to 11, wherein in the cover wall for the sump (10), in particular the side wall part, preferably front side wall part (11E), an opening (80) is formed for connecting a level detection tube (28) of a level detection device (8).

13. Washing tub unit according to claim 12 and claim 3, wherein a central axis of the, preferably circular, opening (80) and/or an inserting direction for inserting a connecting end (28B) of the level detection tube (28) is oriented parallel to the central axis (A) of the conduit (75).

14. Washing tub unit according to any of the preceding claims, wherein the inner dimensions or diameters of each cavity and concave space, as seen in a linear projection along a retraction axis, in particular along or parallel to the central axis (A), in the rear tub part (22), the sump (10), the rear tub interior (9) and the draining conduit (75). do not increase, in a direction opposite to a retraction direction of each moulding form used for forming said rear tub part (22).

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

FIG 1

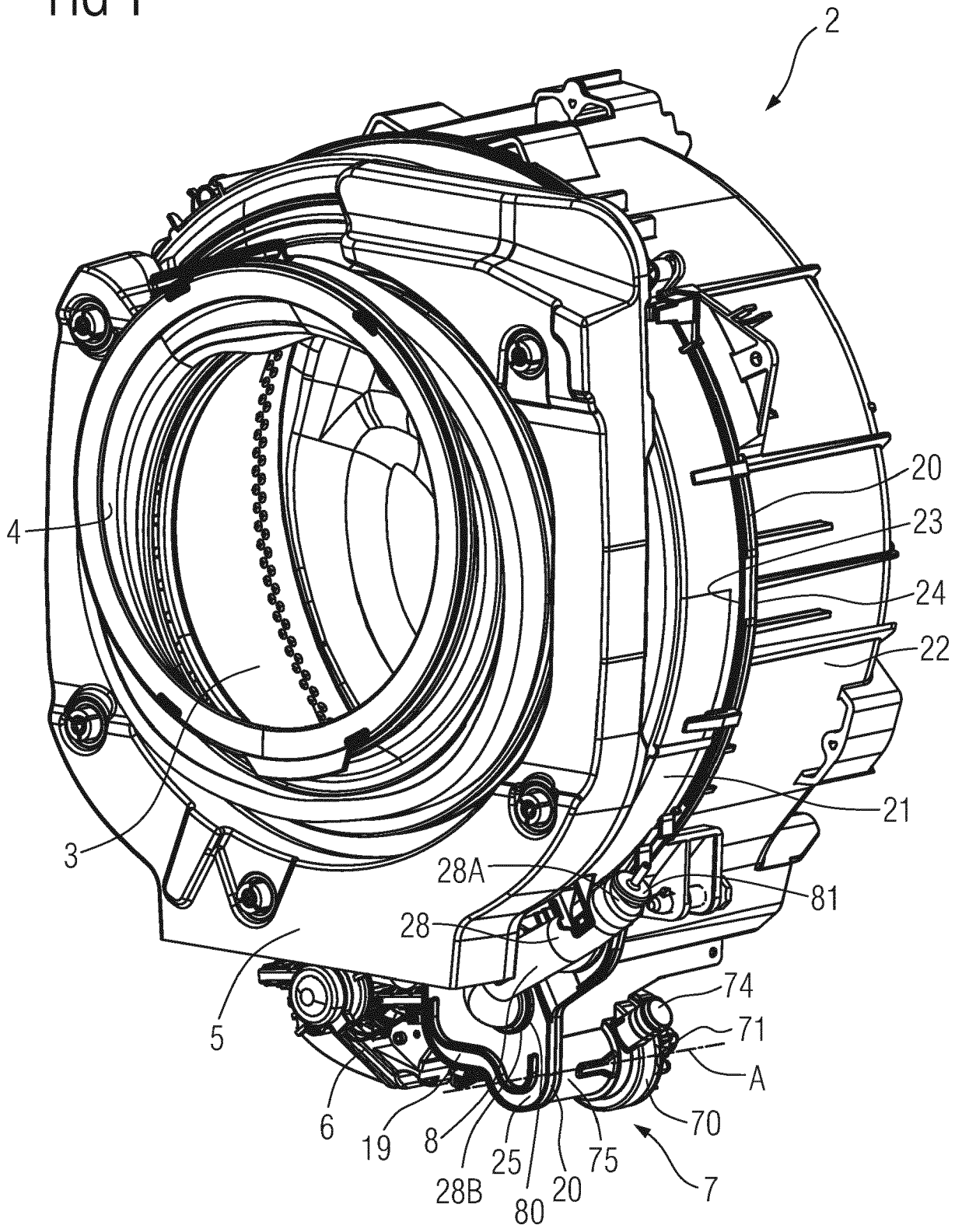
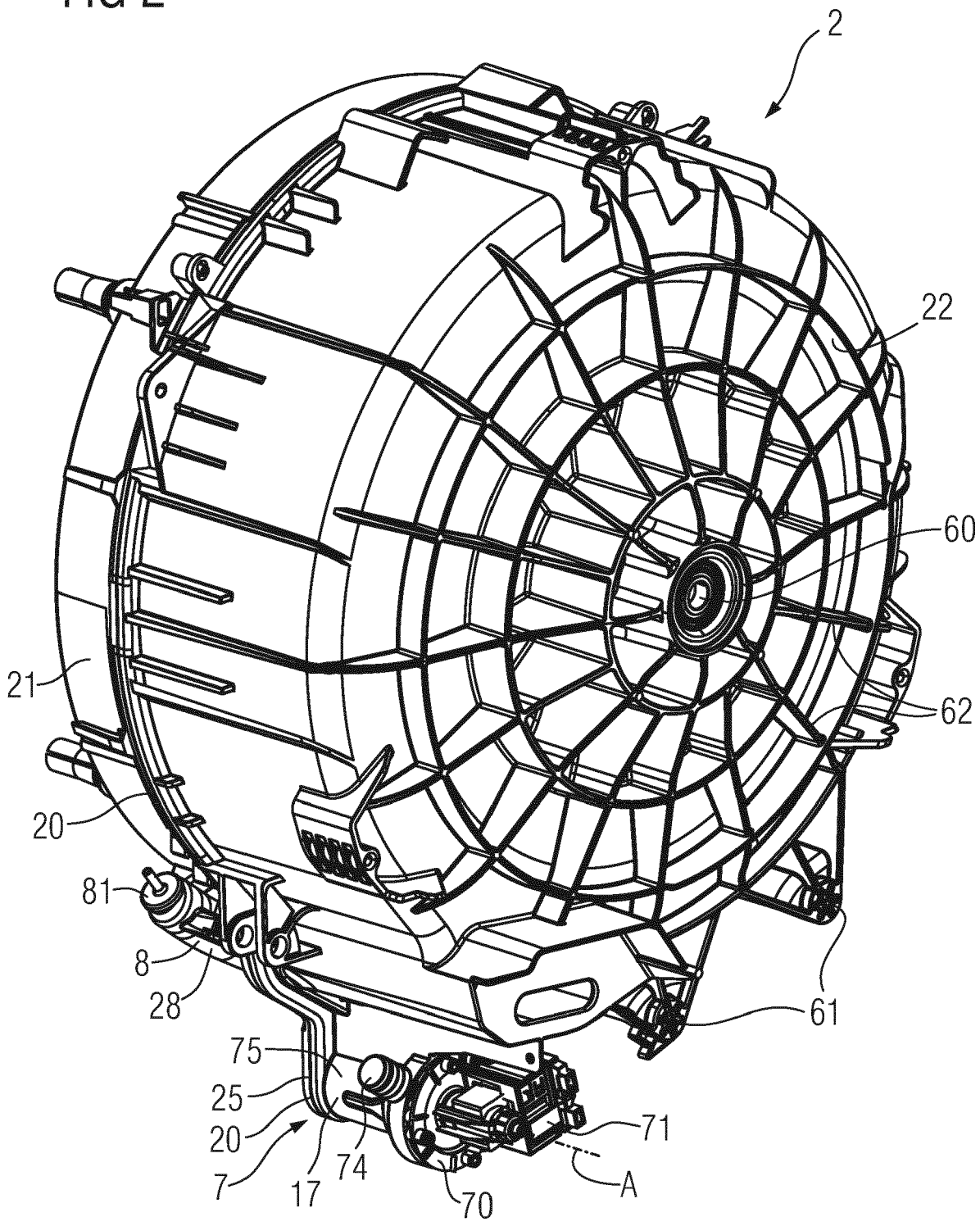


FIG 2



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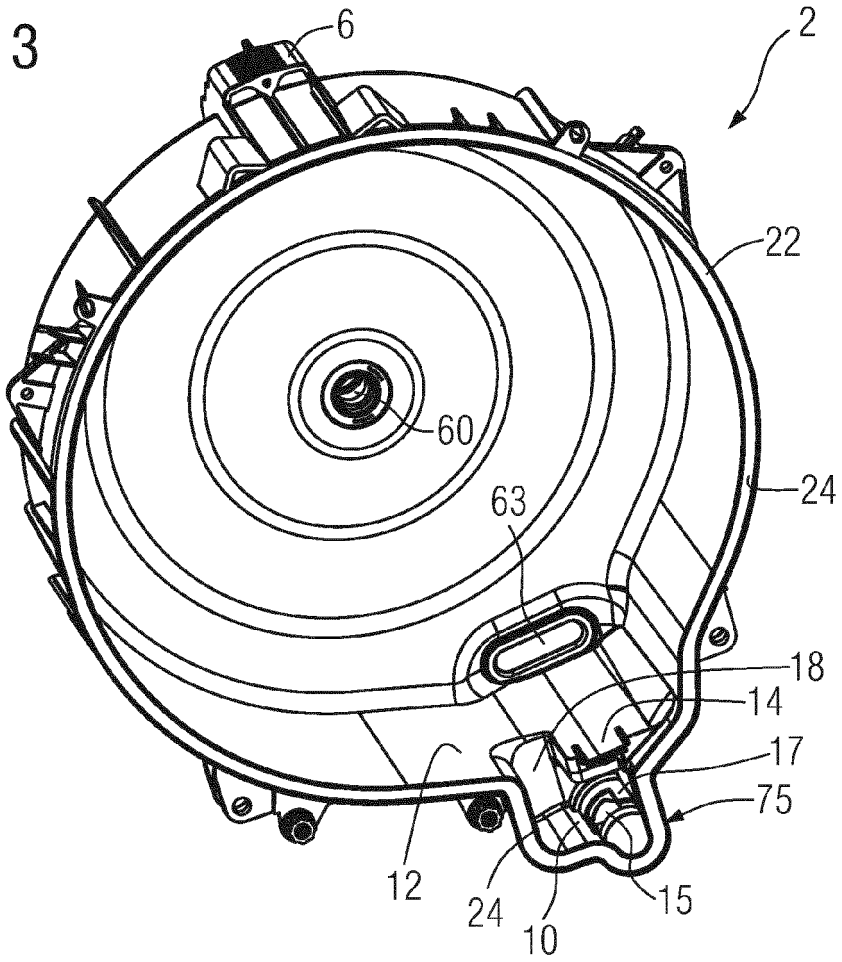
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2
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FIG 4

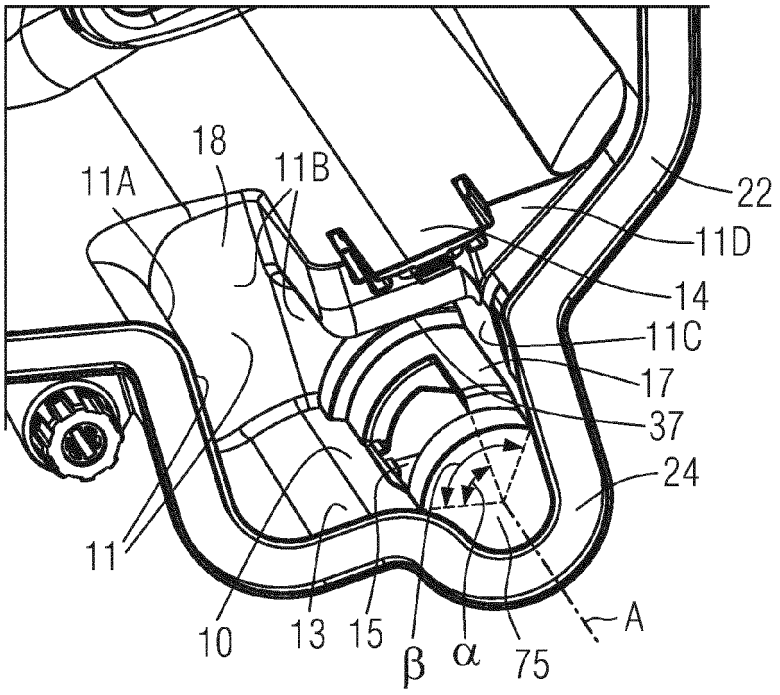
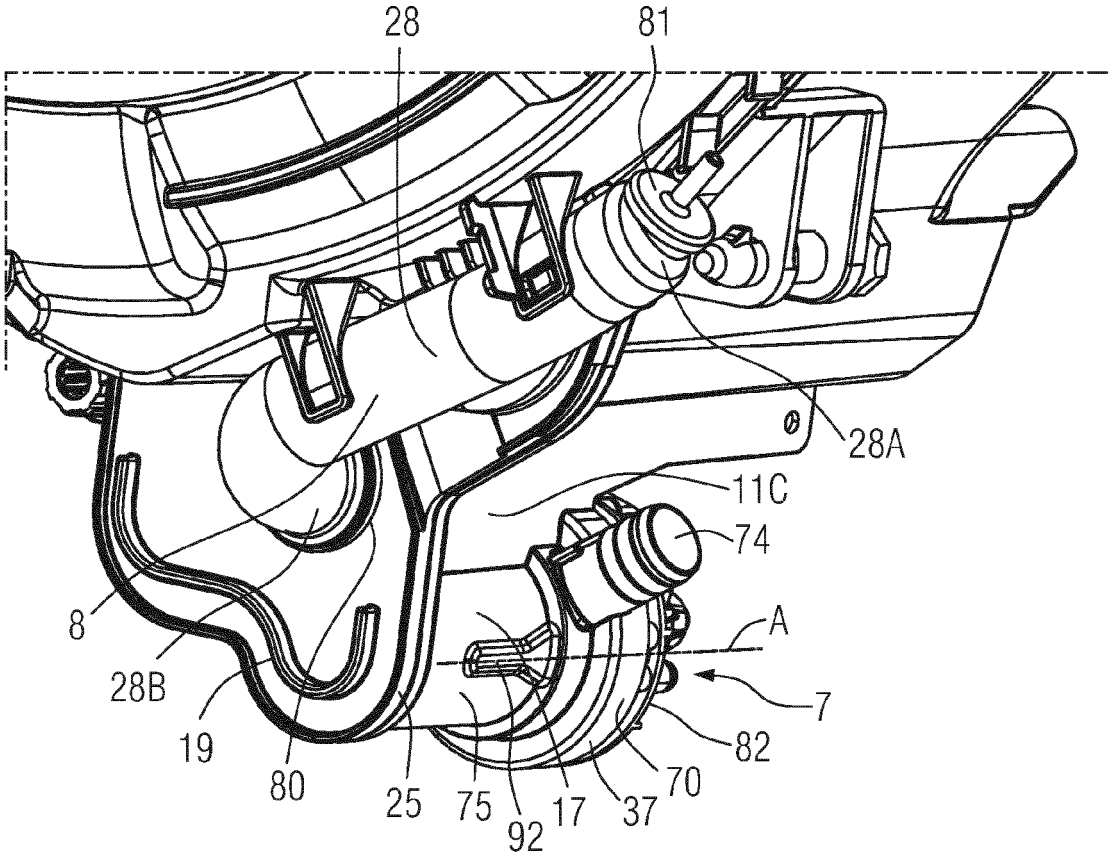

18
11A
11B
22
11D
14
11C
17
37
24
11
10
13
15
β
α
75
A

FIG 5


28
81
28A
11C
74
8
A
28B
7
19
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80
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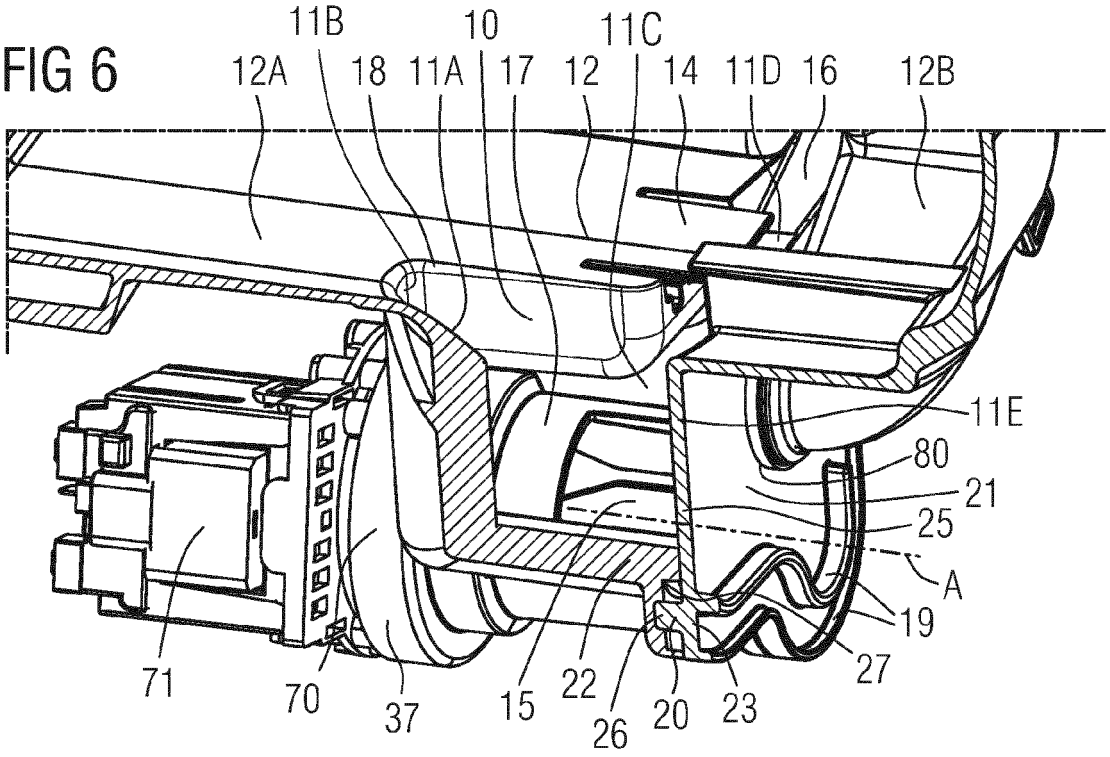
75
92
17
37

FIG 6


11B
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12A
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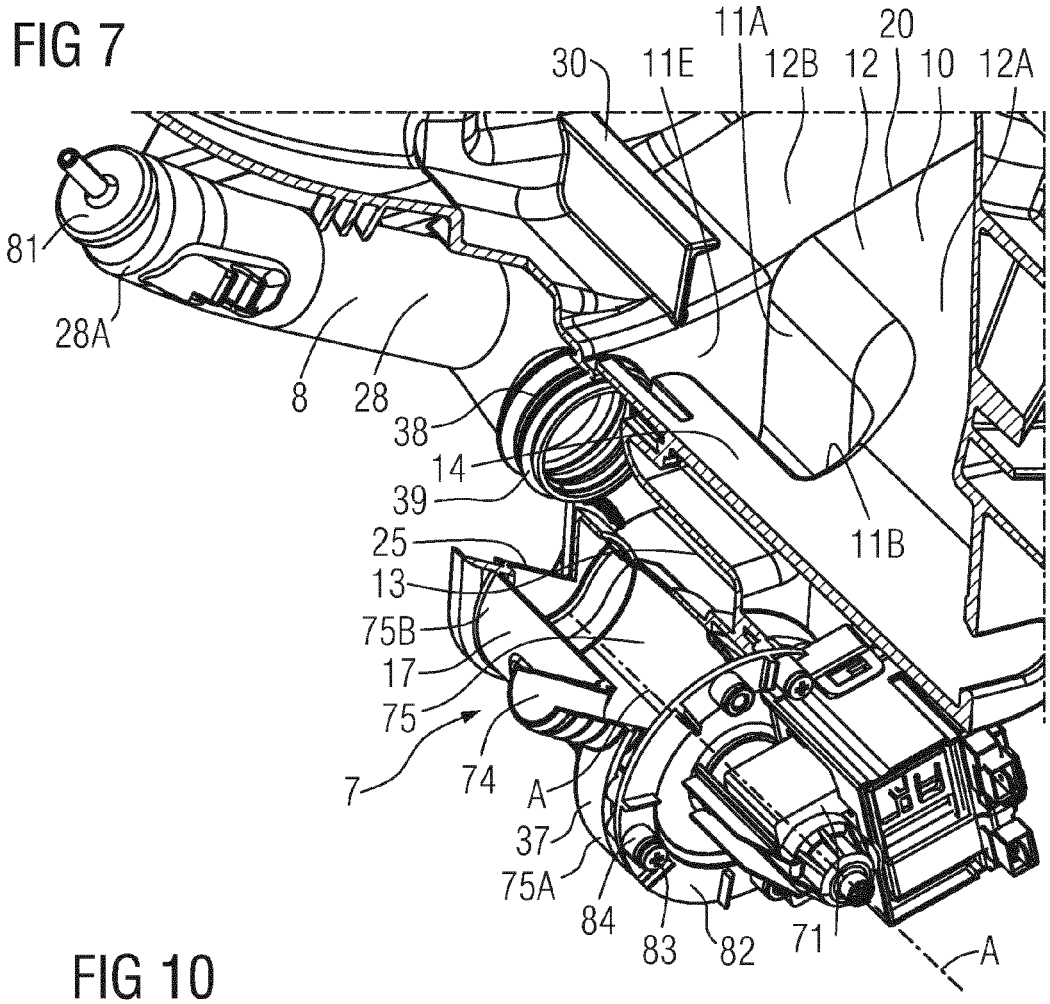
FIG 7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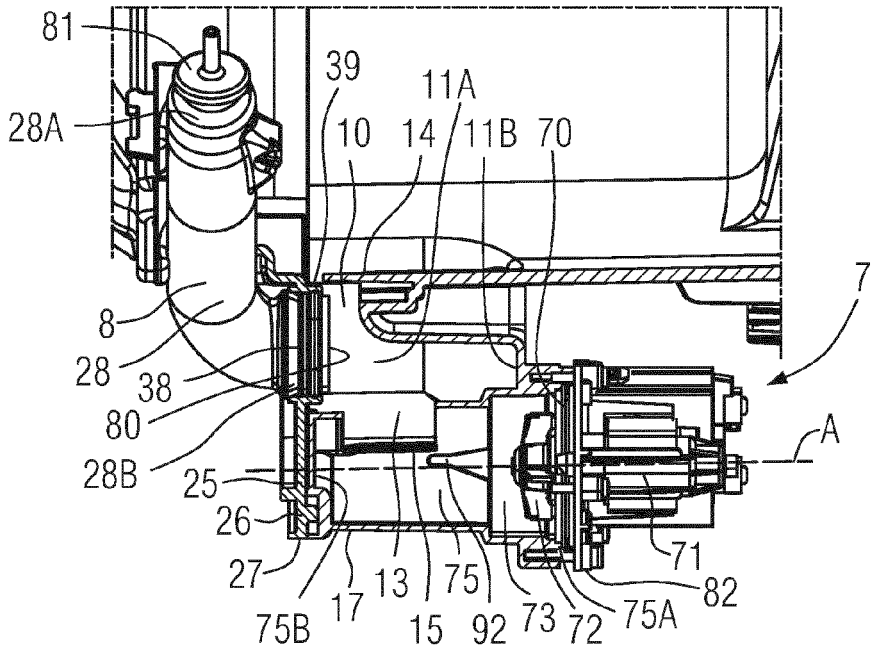
74
A
37
75A
84
83
82
71
11B
A

FIG 10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75
92
73
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75A
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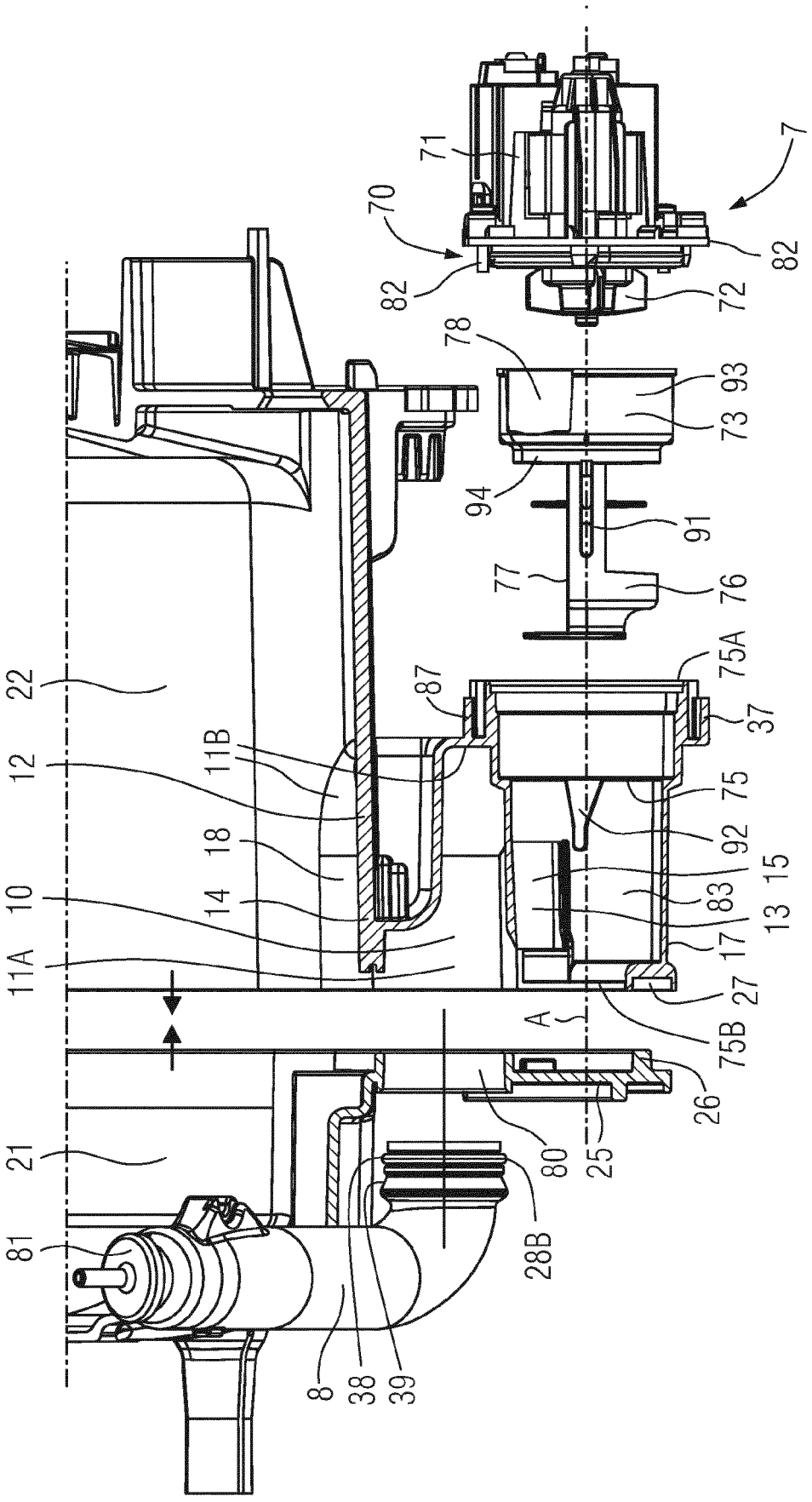
82
A

FIG 8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75B
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28B
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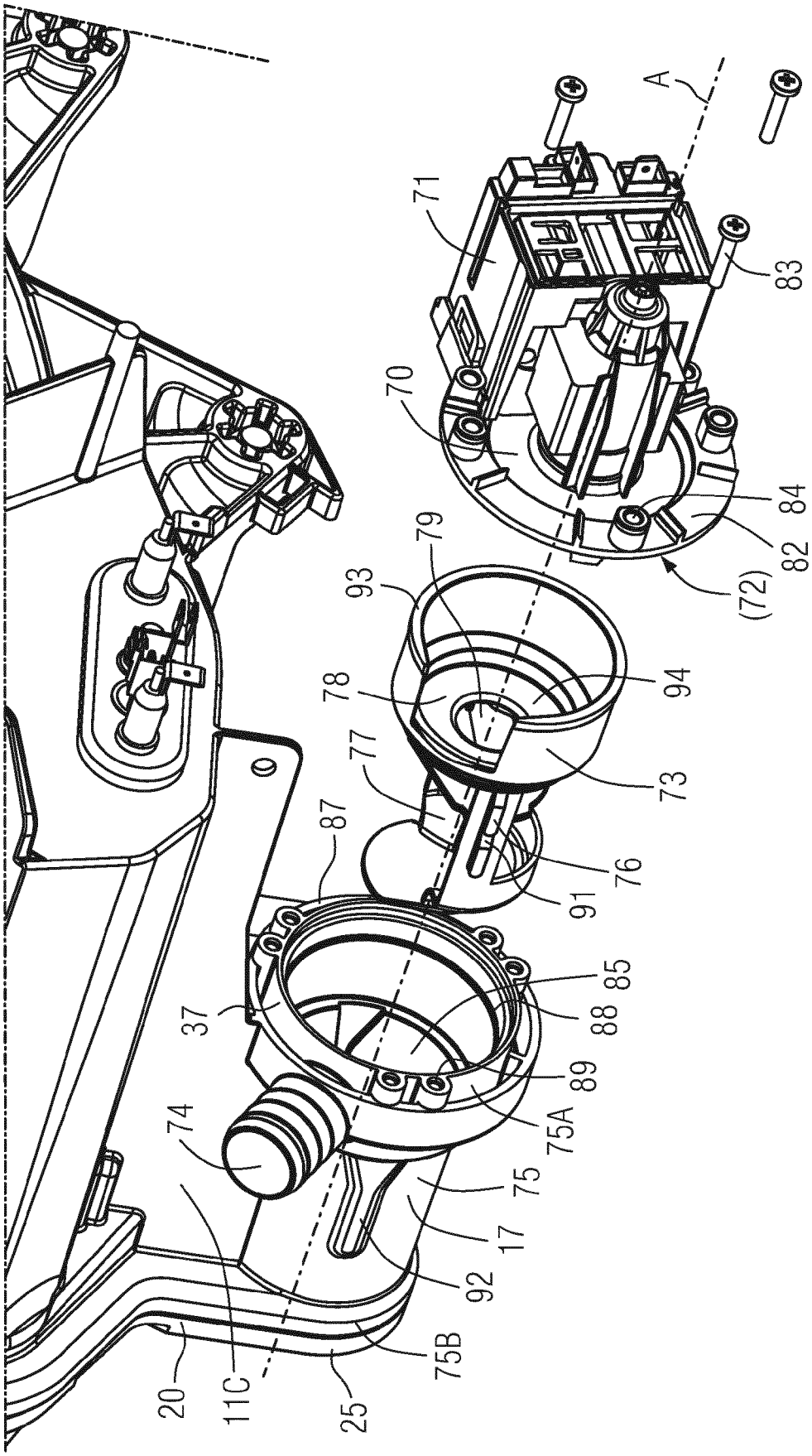
FIG 9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75A
75
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92
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11C
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75B

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EUROPEAN SEARCH REPORT

Application Number
EP 12 15 7033

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	EP 2 405 050 A1 (ELECTROLUX HOME PROD CORP [BE]) 11 January 2012 (2012-01-11) * abstract; figures 1-3 * * paragraphs [0027], [0036] *	1,3-11, 14,15	INV. D06F39/08
A	EP 2 392 720 A1 (ELECTROLUX HOME PROD CORP [BE]) 7 December 2011 (2011-12-07) * abstract; figures 1, 2 *	1-15	
A	US 2007/107475 A1 (HILL GREGORY P [NZ]) 17 May 2007 (2007-05-17) * abstract; figures 2, 4 *	1-15	
A,D	EP 0 267 837 A1 (CIAPEM [FR]) 18 May 1988 (1988-05-18) * abstract; figure 1 *	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	3 August 2012	Westermayer, Wilhelm

CATEGORY OF CITED DOCUMENTS

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1

EPO FORM 1503 03.82 (P04C01)

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03-08-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2405050 A1	11-01-2012	CN 102312368 A	11-01-2012
		EP 2405050 A1	11-01-2012
EP 2392720 A1	07-12-2011	NONE	
US 2007107475 A1	17-05-2007	NONE	
EP 0267837 A1	18-05-1988	EP 0267837 A1	18-05-1988
		FR 2605652 A1	29-04-1988

EPO FORM P0459

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Patent documents cited in the description

- EP 2198081 B1 **[0005]**
- EP 0110482 A1 **[0006]**
- EP 0267837 A1 **[0007]**
- EP 0026018 A1 **[0008]**