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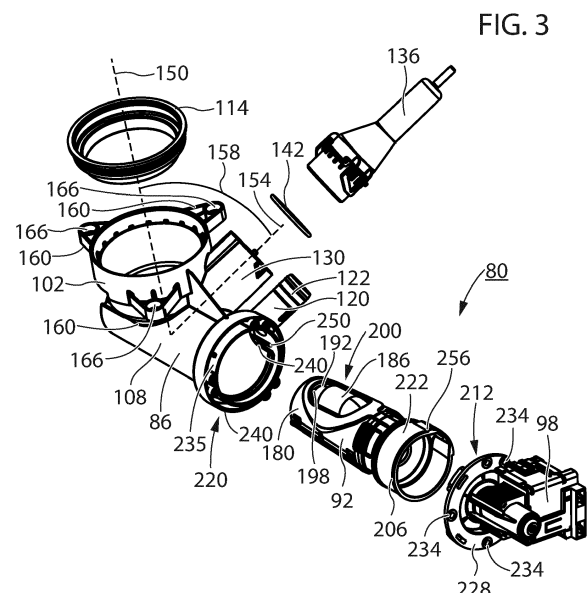
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(54) **HOUSEHOLD APPLIANCE AND METHOD FOR MANUFACTURING A HOUSEHOLD APPLIANCE**

(57) Household appliance (2), comprising a casing (6) in which a tub (30) is arranged, further comprising a drum (36) rotatable mounted in said tub (30), further comprising a tub outlet through which washing liquid can be drained from said tub (30), further comprising an air chamber (136) which is suitable to be associated to water level sensor for measuring the level of said washing liquid in said tub (30), further comprising a drain hose for draining washing liquid to the outside of said appliance (2), whereby a filter assembly (80) is provided comprising: an assembly housing (86), a tub inlet (102) fluidly connected/connectable to said tub outlet, an air chamber (136) inlet fluidly connected/connectable to said air chamber (136), a drain outlet (120) fluidly connected/connectable to said drain hose, said filter assembly (80) further comprising a filter (92) and a pump (98), whereby said assembly housing is configured to receive said filter (92) and to get connected to said pump (98).



## Description

### Field of the invention

**[0001]** The invention relates to a household appliance and to a method for manufacturing such a household appliances.

### Background Art

**[0002]** Nowadays the use of household appliances is widespread. Household appliance are, for example, refrigerators, cooling appliances, as well as laundry treatment machines, both "simple" laundry washing machines (i.e. laundry washing machines which can only wash and rinse laundry) and laundry washing-drying machines (i.e. laundry washing machines which can also dry laundry), or drying machines (i.e. drying machines which can dry laundry).

**[0003]** Washing machines in households, also called domestic washing machines, are well-known and usually are used for washing laundry. 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]** In the present description the term "laundry treatment appliance" will refer to simple laundry washing machines, laundry washing-drying machines or drying machines. Laundry treatment appliances such as washing or washing drying machines generally comprise an external casing provided with a washing tub which contains a rotatable perforated drum where the laundry is placed. A loading/unloading door ensures access to the drum. Laundry treatment appliances typically comprise a water supply unit and a products supply unit, preferably a drawer, for the introduction of water and washing/rinsing products (i.e. detergent, softener, rinse conditioner, etc.) into the tub. Known laundry treatment appliances are also provided with water draining devices that may operate during different phases of the washing program to drain the dirty water.

**[0005]** According to the known art, a complete laundry treating program typically includes different phases during which the laundry to be washed is subjected to adequate treatments. A treating cycle usually comprises a main washing phase during which the laundry is treated by means of water and a detergent. The water is typically heated to a predetermined temperature based on the washing program selected by the user. It is also possible that hot water is introduced into the tub from the hot water mains. During the main washing phase the drum is rotated, so as to apply also a mechanical cleaning action on the laundry. At the end of the main washing phase the drum is typically rotated at high rotational speed, so

in such a way that dirty washing liquid (i.e. water mixed with detergent) is extracted from the laundry, and this dirty washing liquid is drained to the outside by the water draining devices.

**[0006]** Usually at the bottom of the washing tub a draining device is arranged for draining the washing liquid from the tub in order to either feed back the washing liquid into the washing tub again, often being heated by a heating element arranged in or near the tub bottom, 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. Usually the washing tub has a sump at the tub bottom which is in fluid connection to the draining device. A water level detector is often provided to detect the water level in the drum. The water level detector is typically realized by means of an air chamber connected to a pipe. A filter is usually provided between a tub outlet and a draining hose which is configured to transport washing liquid or water to the outside of the appliance. The filter removes fluff and dirt and contaminating particles from the water / washing liquid and holds them within the filter housing.

**[0007]** Known solutions have the disadvantage that in order to realize these functionalities, in a relatively small spatial region of the appliance, several components have to be provided and have to be connected to each other, causing an increasing complexity in the manufacturing and configuring of the appliance. This results in increased manufacturing costs and an increase in assembly failure probabilities.

### Summary of the invention

**[0008]** The aim of the invention is to provide a household appliance in which components needed for allowing draining and filter washing liquid from the tub are convenient to install and replace.

**[0009]** It is a further aim of the invention to provide a household appliance with a high reliability of the water liquid circuit.

**[0010]** It is a further aim of the invention to provide a method for manufacturing such a household appliance which allows a cheaper and easier assembly process.

**[0011]** In a first aspect, the invention relates to a household appliance, comprising a casing in which a tub is arranged, further comprising a drum rotatable mounted in the tub, further comprising a tub outlet through which washing liquid can be drained from the tub, further comprising an air chamber which is suitable to be associated to water level sensor for measuring the level of said washing liquid in said tub, further comprising a drain hose for draining washing liquid to the outside of said appliance, with a filter assembly comprising: an assembly housing, a tub inlet fluidly connected/connectable to the tub outlet, an air chamber inlet fluidly connected/connectable to the air chamber, a drain outlet fluidly connected/connectable to the drain hose, a filter and a pump, whereby the assembly housing is configured to receive the filter and to

get connected to said pump.

**[0012]** Preferred embodiments of the invention are described in relation to the dependent claims and the description of the enclosed drawings.

**[0013]** The invention is based on the consideration that the functionalities of draining washing liquid from the tub if needed and filtering the washing liquid are performed in essentially the spatial same region of the appliance. In this region, a pump, a filter, a connection to an air chamber, a connection to a drain hose and a connection to the tub outlet need to be installed. The assembly of all these components and their spatial arrangement with respect to each other can lead to difficulties of their installation and maintenance and an exchange of components can get cumbersome.

**[0014]** Applicant has found that it is possible and feasible to build an integrated solution which encompasses all these functionalities by providing a common housing which encompasses the various inlets or outlets and allows the arrangement of filter and pump in or at the common housing.

**[0015]** The term "washing liquid" comprises water as well as a mixture of water and additive, especially water and detergent or water and a cleaning agent. The terms fluidly connectable / connected of two parts means that a fluid is allowed to pass from one part to the other part, especially without losing part of its stream, preferably in a fluid-tight manner, i.e., for example, water-tight and/or gas-tight and/or steam-tight manner.

**[0016]** The pump is preferably a drain pump for transporting washing liquid from the tub to the outside of the appliance. The pump can alternatively by a recirculation pump for recirculating washing liquid from a first region of the tub to a second region of the tub. In a first preferred embodiment, the first region is located essentially at the bottom of the tub, while the second region is also located essentially at the bottom of the tub. In a second preferred embodiment, the first region is essentially located at the bottom of the tub, while the second region is located at a higher region of the tub, preferably at a top region of the tub. The recirculation pump transports the washing liquid from the first region of the tub to the second region of the tub.

**[0017]** The filter assembly is preferably an independent component with respect to the other components, i.e. the tub and/or the air chamber and/or the drain hose; in other words, the filter assembly is preferably not integrated with other components such as the tub.

**[0018]** Preferably, said assembly housing has at least one open extremity, and is configured to get connected to the pump at said open extremity.

**[0019]** Preferably, in a mounted configuration, the filter is arranged essentially fully inside the assembly housing, whereby the pump is arranged at the open extremity of the assembly housing facing the filter such that the filter is arranged upstream of the pump. The washing liquid thereby enters the filter assembly through the tub inlet, flows through the filter and is then pumped by the pump

to the draining outlet/recirculation circuit.

**[0020]** In the mounted configuration, preferably an impeller of the pump is arranged at the open extremity or in its proximity and/or an outlet of the pump is arranged in proximity to the open extremity.

**[0021]** The filter advantageously comprises an extremity which is configured as chamber which in the mounted configuration receives an impeller of the pump.

**[0022]** Preferably, the chamber comprises a circumferential wall surrounding the impeller in the mounted configuration, whereby the wall comprises an aperture which in the mounted configuration allows washing liquid to leave the chamber into the drain outlet. The washing liquid is therefore flowing through the chamber and from there through the aperture to the drain outlet. The chamber is preferably built in a water-tight manner with respect to the assembly housing and the pump such that during the activation of the pump washing liquid leaves the chamber only through the dedicated aperture.

**[0023]** The assembly housing preferably comprises a further outlet and/or a further open end fluidly connectable to a further pump. In a preferred embodiment, a drain pump is connected to the first open end, while a recirculation pump is connected to the further open end located opposite to the drain pump in the assembly housing. Alternatively or in combination thereto, the assembly housing can comprise a further outlet which preferably extends radially from the assembly housing and to which a pump, preferably a recirculation pump, is connected / connectable. The assembly housing can comprise a lid or cap provided on the further open end. If needed, the cap is removed and a further pump is provided on the further end.

**[0024]** The assembly housing preferably comprises a cylindrically shaped tube with a tube axis. The tube axis is preferably an axial axis of the tube.

**[0025]** Advantageously, the tub inlet and/or the chamber inlet and/or the drain outlet is protruding from said tube essentially perpendicular to the tube axis.

**[0026]** The air chamber inlet and the drain outlet preferably are essentially arranged adjacent to each other and parallel to each other.

**[0027]** The drain outlet is preferably arranged closer to the open extremity than the air chamber inlet. In this way, the flow of the water liquid through the filter to the drain hose is relatively short.

**[0028]** Preferably, the tub inlet is arranged on or in proximity of an extremity of the assembly housing opposite to the open extremity.

**[0029]** The tub inlet is preferably arranged angled with respect to the drain channel and/or the air chamber inlet. This angle is preferably defined as an angle between an imaginary axis running through the tub inlet and an imaginary axis running through drain channel and/or the air chamber inlet when projected on a plane perpendicular to an axial axis of the assembly housing which is running through filter and pump at the open end /extremity.

**[0030]** The filter preferably is configured to act as a

valve which allows or blocks water passage between the tub inlet and the pump and/or filter. It preferably blocks water if the water level inside the filter is larger than a given threshold.

**[0031]** Advantageously, the filter comprises a filter housing and a floating valve body allowed to float within the filter housing, whereby the filter housing comprises an opening against which the floating valve body can be pressed.

**[0032]** Preferably a sealing element is arranged for sealing the connection between the floating valve body and the opening. Preferably, opening and sealing element realize a valve seat for the floating valve body.

**[0033]** Preferably, the sealing element in the mounted configuration provides a sealed connection of the filter with a valve seat built in the assembly body, which in the mounted configuration faces the tub outlet.

**[0034]** The sealing element is preferably built as a gasket. The gasket is preferably co-molded to the filter housing.

**[0035]** Preferably, the filter housing comprises a shell in which a grid is provided. The grid is preferably mounted in the filter housing or co-molded to the filter housing. The grid is preferably configured and arranged in the filter housing for retaining fluff which is present in the washing liquid entering the filter by flowing from the tub through the tub outlet and through the tub inlet of the assembly housing into the filter.

**[0036]** The assembly housing preferably comprises a first positioning element which in the mounted configuration engages with a second positioning element provided on the filter, thereby rotationally locking the filter in the assembly body. The filter and thereby the filter housing are therefore prevented from rotating with respect to the assembly housing. Preferably the positioning element is provided at the open end of the assembly housing.

**[0037]** In a preferred embodiment, the first positioning element is a recess and the second positioning element is a protrusion or vice versa. The protrusion in the mounted configuration engages with the recess, thereby preventing rotation of the filter with respect to the assembly housing.

**[0038]** The filter preferably comprises a labyrinth facing the pump which is preferably arranged at the open extremity or end of the filter. The labyrinth is preferably configured to remove/hold fluff and/or contaminating particles and/or dirt from the washing liquid.

**[0039]** Advantageously, the labyrinth is built as at least one disk provided in the filter housing. The disk is preferably mounted in the filter housing or co-molded to the filter housing.

**[0040]** Preferably, the household appliance comprises a recirculation pump for recirculation the washing liquid from a first bottom region of the tub to a second region of the tub, whereby the recirculation pump is arranged to the filter housing / the filter housing encompasses the recirculation pump.

**[0041]** In second aspect, the invention relates to a method for manufacturing a household appliance described above, with the steps

- fluidly connecting the tub inlet to the tub outlet;
- fluidly connecting the air chamber inlet to the air chamber;
- fluidly connecting the drain outlet to the drain hose;
- inserting the filter into the assembly housing;
- connecting the pump to the assembly housing on the open extremity.

**[0042]** The advantages of the invention are especially as follows. By providing a common assembly housing which provides all the connections needed to realize a draining and filtering functionality, the complexity of the assembly of the household appliance is drastically reduced. Once the filter assembly has been installed, it only needs to be connected to the respective inlets or outlets and to receive the filter and connect the drain pump. The maintenance of the filter assembly is correspondingly easy. The filter assembly due to its connecting to the air chamber has a double function, namely draining sensing and possibly also recirculating. The filter assembly with the filter providing a valve function is fully interchangeable with machines in which the functionality of a valve is needed and provided with a different system.

#### Brief description of the drawings

**[0043]** Further features and advantages of the present invention shall become clearer from the following detailed description of some of its preferred embodiments, made with reference to the attached schematic drawings and given as an indication and not for limiting purposes.

**[0044]** In particular, the attached drawings are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification. The drawings together with the description explain the principles of the invention. In the drawings, corresponding characteristics and/or components are identified by the same reference numbers. In these drawings:

- |        |   |
|--------|---|
| FIG. 1 | shows a top-loading washing machine in a preferred embodiment;  |
| FIG. 2 | shows the top-loading washing machine of FIG.1 with the door lifted;  |
| FIG.3  | shows a filter assembly with an assembly housing, a filter and a pump in a preferred embodiment in an explosive view; |
| FIG. 4 | shows the filter of FIG. 3 in an exploded and perspective view;   |
| FIG. 5 | shows the filter of FIG. 3 in another exploded and perspective view;  |

- FIG. 6 shows a the filter of FIG. 3 in a front view;
- FIG. 7 shows a section of the front view of the filter according to FIG. 6 along a line A-A;
- FIG. 8 shows the filter of FIG. 3 along a section B-B of FIG. 7 in an open position;
- FIG. 9 shows the filter of FIG. 3 along a section B-B of FIG. 7 in a closed position;
- FIG. 10 shows a detailed view of Fig. 9;
- FIG. 11 shows the washing machine of FIG. 1 with its right sidewall removed;
- FIG. 12 shows a magnified detail of FIG. 11
- FIG. 13 shows the washing machine of FIG. 1 with its left sidewall removed; and
- FIG. 14 shows a detail of FIG. 13

**[0045]** Identical parts are labelled by the same reference numbers.

**[0046]** In FIGs. 1 and 2, a laundry treatment appliance 2 is shown which is built as a top-loading washing machine and comprises housing or casing 6 with a preferable parallelepiped shape, the casing 6 comprising a front wall 10, two side walls 14, a cover plate 20 and a rear wall (not shown). Front wall 10 and side walls 14 are preferably part of a cabinet. A top door 24 or lid is provided which can be opened for loading or unloading laundry through an opening 28 into a washing drum and which can be closed. Door 24 can be preferably operated, especially opened and closed, by a handle 26.

**[0047]** Advantageously a washing tub 30 is contained within casing 6, whereby a rotatable and perforated drum 36 is contained by the washing tub 30. Both washing tub 30 and drum 36 have a substantially cylindrical shape. Advantageously the tub 30 is suspended in a floating manner inside casing 6 by means of a number of coil springs and shock absorbers (not shown). The drum 36 is rotated by an electric motor 68 (see FIGs. 11 and 13), which transmits the rotating motion of a motor shaft to the drum 36 by a belt/pulley system 70. In a different embodiment of the invention, the motor can be directly associated with the shaft of the drum 36. The tub 30 is preferable connected to casing 6 by means of an elastic bellows 52 or gasket. Tub 30 preferably comprises two complementary hemi-shells structured for being reciprocally coupled to form tub 30.

**[0048]** Alternatively, the laundry treatment appliance can be a combined washer and dryer. The laundry treatment appliance can be built as a front-loading washing machine or a front-combined washing and drying machine. The laundry treatment appliance can be built as a top-loading washing machine or combined washing and

drying machine. The laundry treatment appliance can be a horizontal-axis or vertical-axis washing machine or combined washing and drying machine.

**[0049]** The preferred washing machine comprises a detergent dispenser 42 which comprises at least one compartment 44 for detergent or washing additives. On a user interface 62, preferably several user elements 38 are arranged as well as light elements 46 for indicating a selected washing program and/or parameters thereof. A start/pause button 48 is arranged on user interface 62 which when being pressed starts or pauses a selected washing program.

**[0050]** The preferred laundry treatment appliance 2 comprises a filter assembly 80 which comprises an assembly housing 86, a filter 92 and a drain pump 98. Assembly housing 86 comprises a tub inlet 102 which in the mounted configuration is fluidly connected to a tub outlet 360, see FIG. 12. Tub inlet 102 protrudes perpendicular from a part of assembly housing 86 which is essentially built as a tube 108. In the mounted configuration, preferably an O-ring 114 is placed at the interface between tub outlet 360 and tub inlet 102 for providing a water-tight connection.

**[0051]** A water drain outlet 120 preferably protrudes perpendicular from tube 108 and in the mounted configuration is connected to a drain hose. Water drain outlet 120 comprises a corrugated area 122 for a tight and robust connection with the drain hose.

**[0052]** An air chamber inlet 130 is preferably protruding perpendicular to tube 108 and in the mounted configuration is connected to an air chamber 136. For providing a gas-tight connection between air chamber 136 and air chamber inlet 130, preferably an O-ring 142 is arranged. Air chamber 136 is connected to a conduit or pipe and a pressure sensor and provides the detection of the water level inside drum 30.

**[0053]** Air chamber 130 and water drain outlet 120 are preferably arranged parallel to each other. They are preferably arranged angled with respect to tub inlet 102 by an angle 158 between a central axis 150 through tub inlet 102 and a central axis 154 through air chamber inlet 130, whereby angle 158 preferably is between 30 and 90 °, especially 60 °. In the latter case, the tub inlet 102 is inclined with respect to air chamber inlet 130 of roughly 60° if measured in a view in which the axis of the assembly housing 86 is perpendicular to the point of view. Moreover, the tub inlet 102 is preferably inclined with respect to air chamber inlet 130 of roughly 15° if measured from an upper view (from the upper to the bottom portion of the machine).

**[0054]** Tub inlet 102 preferably comprises three peripheral protrusions 160 which respectively comprise a through-hole 166 for insertion of a screw.

**[0055]** Filter 92 preferably comprises a housing 180 in which a floating valve body 186 is moveable. Housing preferably 180 comprises an opening 192 with a gasket 198 co-molded to housing 180 in such a way that if floating valve body 186 is tightly pressed against gasket 198,

fluid is prevented from going through opening 192. Opening 192 and gasket 198 build a valve seat 200 for floating valve body 186. Assembly housing 86 is built to receive filter 92 in such a way that in the mounted configuration, gasket 186 presses against an opening in assembly housing 86 in tube inlet 102. Opening 192 thereby faces tube inlet 102.

**[0056]** Filter 92 preferably comprises a chamber 206 which in the mounted configuration receives an impeller 212 of pump 98. Chamber 206 to that end preferably comprises a circumferential wall 222 surrounding impeller 212 in the mounted configuration.

**[0057]** Filter 92 is preferably inserted into assembly housing 86 and pump 98 is attached to assembly housing 86 at open extremity 220 or pump end. For the connection of pump 98 to assembly housing 86, a flange 228 of pump 98 is connected to a fixing part 235 of assembly housing 86 preferably through screws 170. To this end, flange 228 comprises at least one hole 234 and fixing part 235 comprises at least one corresponding dome 240. For the connection of fixing part and flange 228, the screws can be guided through hole 234 and screwed into dome 240.

**[0058]** According to a preferred embodiment, assembly housing 86 comprises a first positioning element 250 and filter 92 comprises a second positioning element 256 which in the mounted configuration engages with first positioning element 250. This engagement realizes a rotational lock of filter 92 with respect to assembly housing 96. In this way, it is made sure that the opening 192 faces tube inlet 102 so that filter 92 can act as a valve. In the present preferred embodiment shown, first positioning element 250 is a recess and second positioning element 256 is a protrusion. In the preferred embodiment, the first positioning element is provided in wall 222 which is easy to manufacture. Alternatively or in combination, more positioning elements can be provided in wall 222 or within the assembly housing 86 which in the inserted state of filter 92 engage with corresponding positioning elements provided at filter housing 180.

**[0059]** The filter 92 is shown in two explosive and perspective views in FIGs. 4 and 5. Filter 92 preferably comprises a lower shell 270 which is, preferably removably, attached to an upper shell 276. In the present preferred embodiment, this connection is realized by a snap connection. To this end, lower shell 270 comprises snap teeth 280 which engage in corresponding recesses/holes in upper shell 276.

**[0060]** In lower shell 270, a grid wall 290 is arranged. The grid wall 290 is preferably configured to remove/hold fluff and larger particles or dirt from the washing liquid before it gets filtered by a labyrinth, see below.

**[0061]** In FIG. 6, the filter 92 is shown in a front view. Filter 92 preferably comprises gasket 198 as well as gasket 300 and a gasket 310. Preferably, gasket 198 and/or gasket 300 and/or gasket 310 is co-molded to upper shell 276 of filter 92. Preferably, gaskets 198, 300, and 310 are co-molded to upper shell 276 in the same process and basically build one connected gasket. Gasket 310

provides the fluid/water-tight sealing between, as seen in in FIG. 6, the left part of the filter, preferably its upper shell 276, and the right part of the filter in which the impeller chamber is provided. In the mounted configuration, the annular gasket 310 presses against an internal chamber or inner chamber of assembly housing 86.

**[0062]** A cut through the line A-A of FIG. 6 is shown in FIG. 7. Filter 92 comprises an outlet aperture 316 which is formed in the wall of chamber 206 for the impeller of pump 98. An arrow 322 shows the direction in which fluid is sucked by the pump 99 through a suction passage 328, thereby flowing through a labyrinth disk 334 by which fluff, dirt and/or contaminating particles are removed / held from the fluid stream which flows along arrow 322 and leaves filter 92 through outlet aperture 316.

**[0063]** Protrusions 340, 346, 352 merge from gasket 198 and pass through apertures provided in floating valve body 186. Protrusions 340, 346, 352 provide a flexibility which allows floating valve body 186 to pivot around protrusions 340, 346, 352. The flexibility of protrusions 340, 346, 352 is preferably provided by an elastic deformability of their material.

**[0064]** In FIG. 8, filter 92 is shown in a section of line B-B of FIG. 7 in an open position in which floating valve body 186 is not closing opening 192. In this FIG, floating valve body 186 has assumed a rotated position due to the flexibility of the protrusions 340, 346, 352. In this configuration, washing fluid may flow from the tub through the labyrinth disk and through outlet aperture 316

**[0065]** In FIG. 9, filter 92 is shown in a section of line B-B of FIG. 7 in a closed position in which floating valve body 186 is closing opening 192, thereby preventing this flow of water fluid. Filter 92 in this way acts as a valve, Opening 192 is closed if the water level/pressure in the filter is larger than a, preferably prescribed or predetermined, threshold. Floating valve body 186 and opening 192 provide the functionality of a floating valve. The material of the floating valve body 196 comprises a density suitable to allow the buoyancy of the floating valve body 186 on the water / washing liquid; depending of the water level inside the filter 92 and/or a discharge pipe and /or a recirculation pipe, floating valve body 186 reaches the closed position shown in FIG. 9, corresponding to a high water level, or the open position shown in FIG. 8, corresponding to a low water level in which the floating valve body 186 falls / moves down due to its weight.

**[0066]** In FIG. 10, a detailed view of filter 92 is shown in which the connection between upper shell 276 and lower shell 270 is shown. A connection element 366 is provided on lower shell 270 which is preferably built as a pin and which engages in a recess 372 of upper shell 276.

**[0067]** Upper shell 276 and lower shell 270 are preferably connected to each other by snap means 280, 281. The centering of upper shell 276 and lower shell 270 is preferably realized and assured by pin 270 and recess 276. Several pins 270 can be provided. The described snap connection allows a removable attachment of upper

shell 276 and lower shell 270. In this way, the filter housing 86 can be conveniently opened for cleaning or exchange of grid and/or labyrinth disk 334 and/or grid wall 222.

[0068] In FIG. 11, the washing machine according to FIG. 1 is shown with the sidewall 14 removed. The electro motor 68 is rotating the drum 36 by means of a belt/pulley system 70. In this FIG. the extremity 400 of filter assembly housing 180 which is opposite to the open extremity 220 at which pump 98 is arranged is shown. Tub inlet 102 of is fluidly connected to tub outlet 360. In FIG. 12, a detailed view of FIG. 11 is shown.

[0069] In FIG. 13, the washing machine of FIG. 1 is shown with its left sidewall 14 removed. In this FIG. the side of the filter assembly 80 with its open extremity 220 is shown at which pump 98 is arranged. In FIG. 14, a detail of FIG. 13 is shown, in which the connection of air chamber outlet 130 to air chamber 136 is seen.

[0070] The invention thus conceived can be subjected to numerous modifications and variants all falling within the scope of the inventive concept. In addition, all details can be replaced by other technically equivalent elements. In practice, all the materials used, as well as the shapes and contingent dimensions, may vary depending on the requirements without departing from the scope of protection of the following claims.

## Claims

1. Household appliance (2), comprising a casing (6) in which a tub (30) is arranged, further comprising a drum (36) rotatable mounted in said tub (30), further comprising a tub outlet (360) through which washing liquid can be drained from said tub (30), further comprising an air chamber (136) which is suitable to be associated to water level sensor for measuring the level of said washing liquid in said tub (30), further comprising a drain hose for draining washing liquid to the outside of said appliance (2),  
**characterized in**  
a filter assembly (80) comprising:
  - an assembly housing (86),
  - a tub inlet (102) fluidly connected/connectable to said tub outlet,
  - an air chamber (136) inlet fluidly connected/connectable to said air chamber (136),
  - a drain outlet (120) fluidly connected/connectable to said drain hose,
said filter assembly (80) further comprising a filter (92) and a pump (98), whereby said assembly housing is configured to receive said filter (92) and to get connected to said pump (98).
2. Household appliance (2) according to claim 1, whereby said assembly housing (86) has at least one open extremity (220), and is configured to get

connected to said pump (98) at said open extremity (220).

3. Household appliance (2) according to claim 2, whereby in a mounted configuration, said filter (92) is arranged essentially fully inside said assembly housing (86), and whereby said pump (98) is arranged at said open extremity (220) of said assembly (86) housing facing said filter (92) such that said filter (92) is arranged upstream of said pump (98).
4. Household appliance (2) according to claim 2 or 3, whereby in the mounted configuration, an impeller of said pump (98) is arranged at said open extremity (220) and/or an outlet of said pump (98) is arranged in proximity to said open extremity (220).
5. Household appliance (2) according to claim 4, whereby said filter (92) comprises an extremity which is configured as chamber (206) which in the mounted configuration receives an impeller (212) of said pump (98).
6. Household appliance (2) according to claim 5, whereby said chamber (206) comprises a circumferential wall (222) surrounding said impeller in the mounted configuration, whereby said wall (222) comprises an aperture (316) which in the mounted configuration allows washing liquid to leave said chamber (206) into said drain outlet (120).
7. Household appliance (2) according to one of the claims 1 to 6, whereby said assembly housing (86) comprises a cylindrically shaped tube (108) with a tube axis.
8. Household appliance (2) according to claim 7, whereby said tub inlet (102) and/or said air chamber inlet (130) and/or said drain outlet (120) is protruding from said tube essentially perpendicular to said tube axis.
9. Household appliance (2) according to one of the claims 1 to 8, whereby said filter (92) is configured to act as a valve which allows or blocks water passage between said tub inlet (102) and said pump (98) and/or said open extremity (220).
10. Household appliance (2) according to claim 9, whereby said filter (92) comprises a filter housing (180) and a floating valve body (186) allowed to float within said filter housing (180), and whereby said filter housing (180) comprises an opening (192) against which said floating valve body (186) can be pressed.
11. Household appliance (2) according to claim 10, whereby a sealing element (198) is arranged for

sealing the connection between said floating valve body (186) and said opening (192).

12. Household appliance (2) according to claim 11, whereby said sealing element (198) in the mounted configuration provides a sealed connection of the filter (92) with a valve seat (200) built in said assembly body, which in the mounted configuration faces said tub outlet. 5
13. Household appliance (2) according to one of the claims 1 to 12, whereby said filter housing (180) comprises a shell (270) in which a grid (290) is provided. 10
14. Household appliance (2) according to one the claims 1 to 13, whereby said assembly housing (86) comprises a first positioning element (250) which in the mounted configuration engages with a second positioning element (256) provided on said filter (92), thereby rotationally locking said filter (92) in said assembly body (86). 15
15. Method for manufacturing a household appliance (2) according to one of the previous claims, with the steps 20
  - fluidly connecting said tub inlet (102) to said tub outlet (360);
  - fluidly connecting said air chamber inlet (130) to said air chamber (136); 25
  - fluidly connecting said drain outlet (120) to said drain hose;
  - inserting said filter (92) into said assembly housing (86);
  - connecting said pump (98) to said assembly housing (86) on said open extremity (220). 30

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FIG. 1

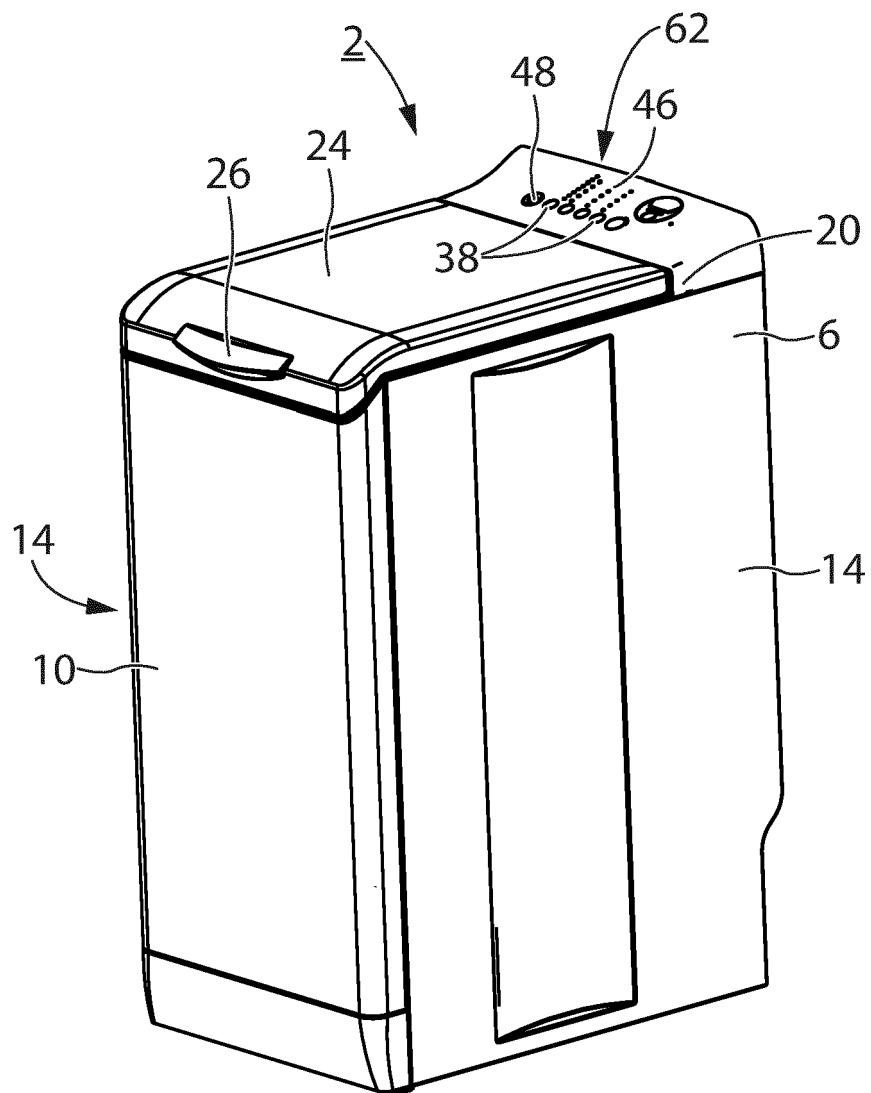


FIG. 2

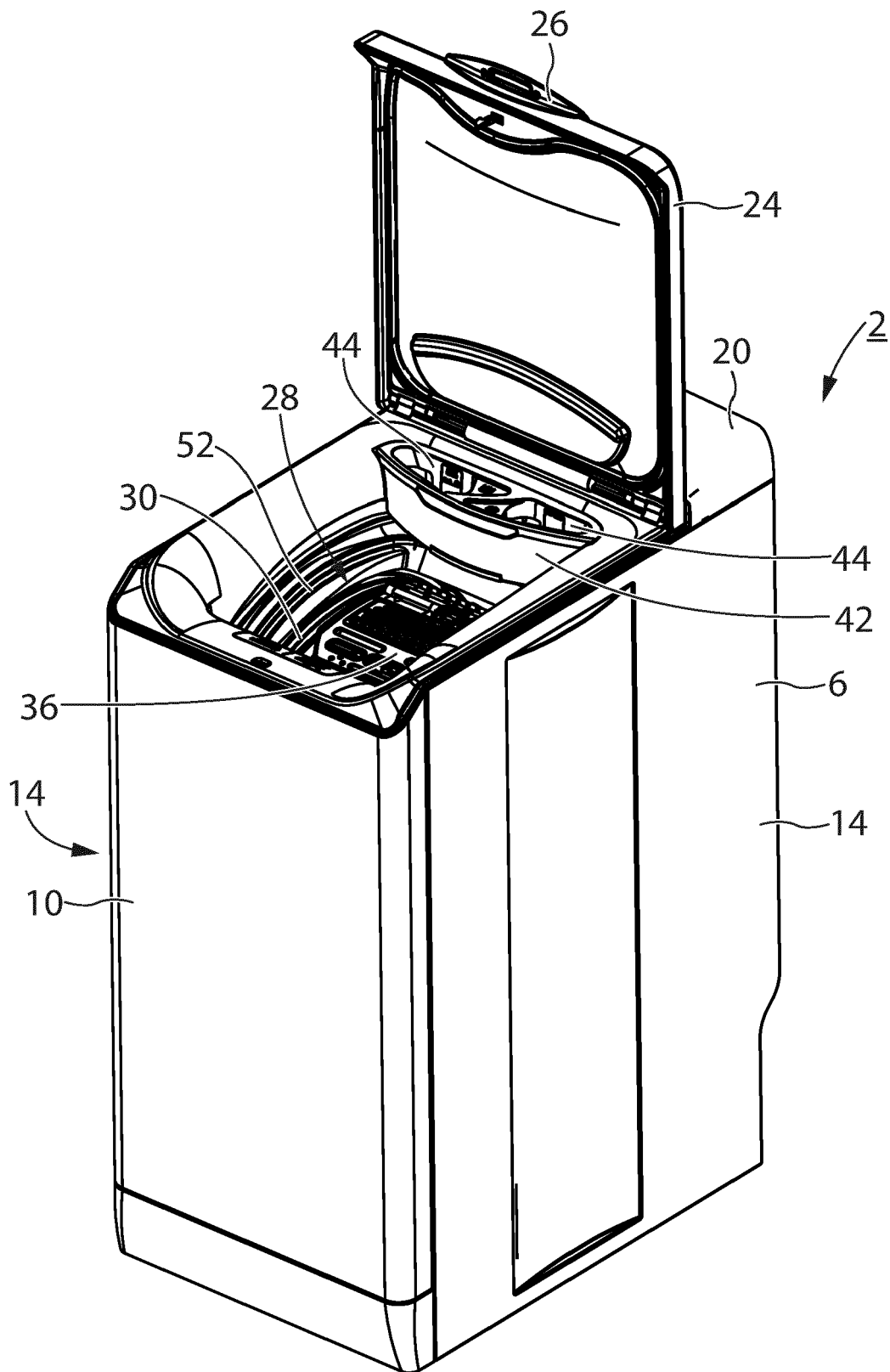
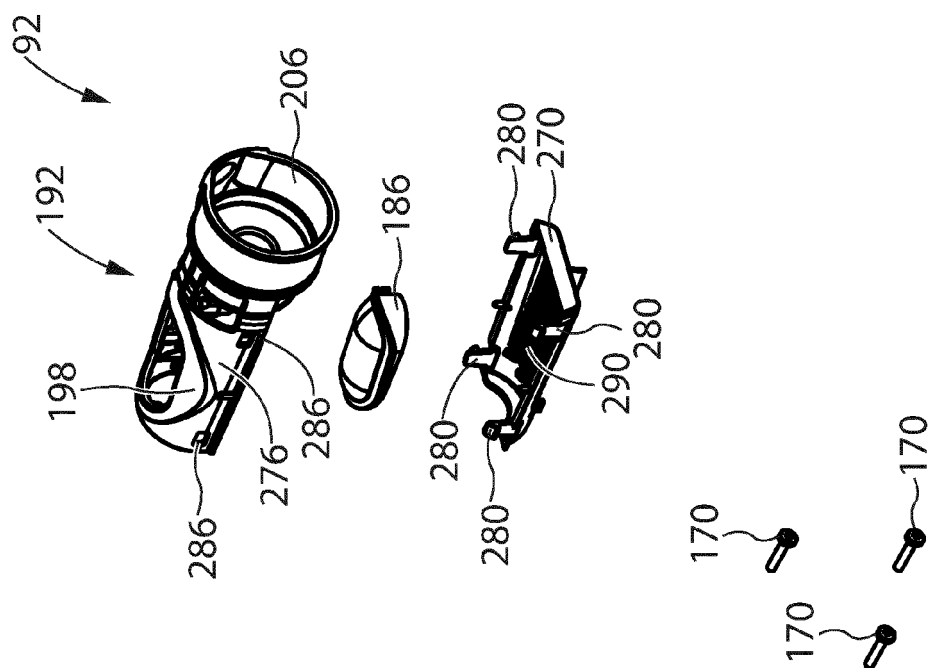


FIG. 4



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G.  
F

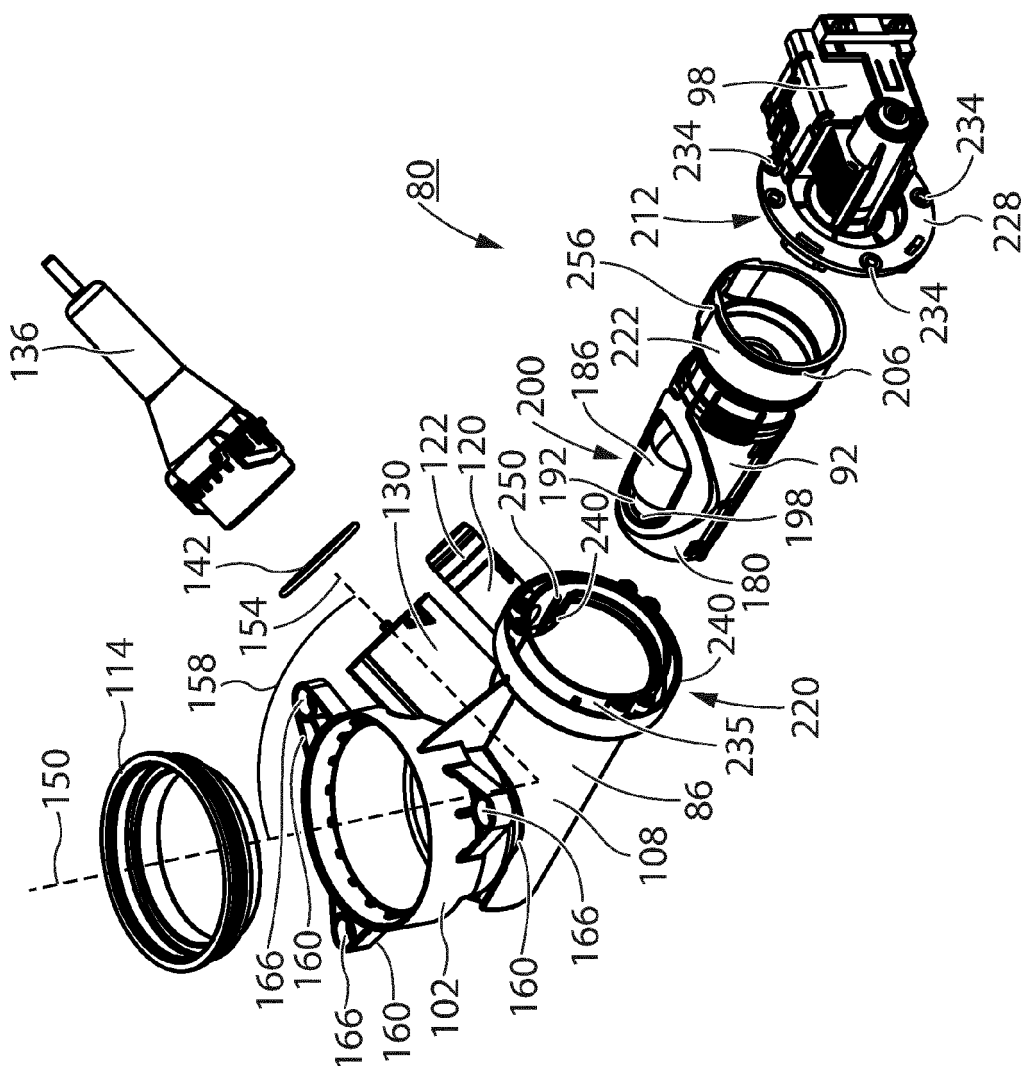


FIG. 5

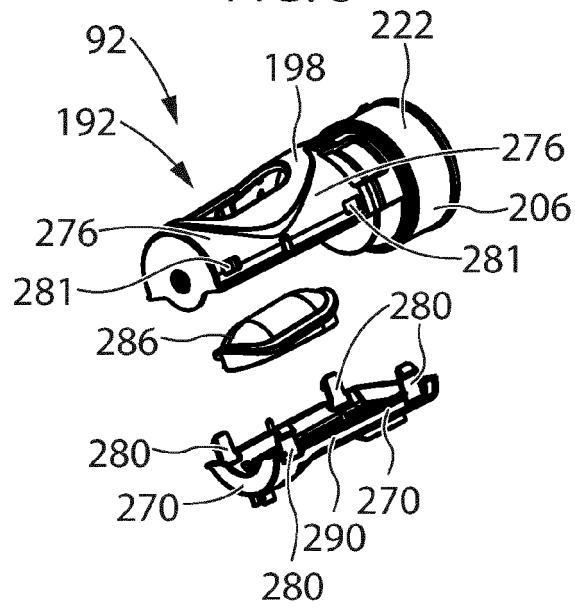


FIG. 6

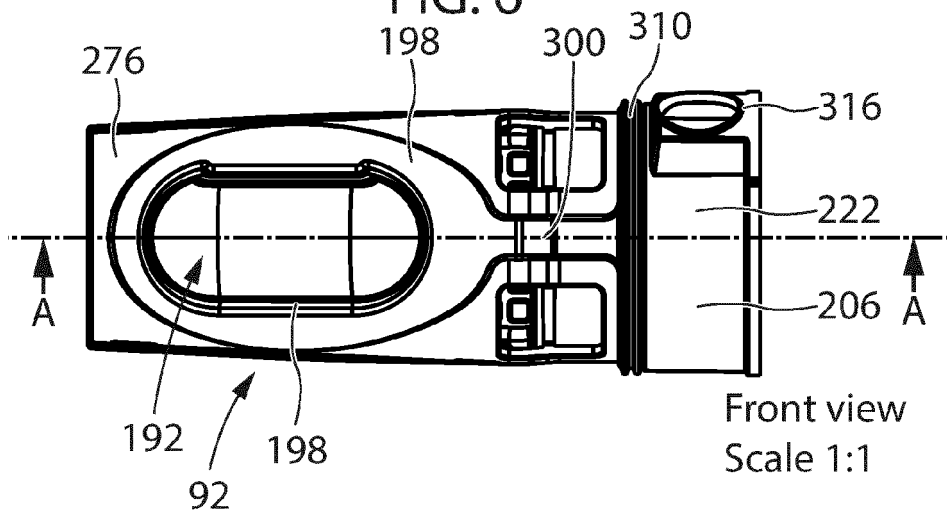


FIG. 7

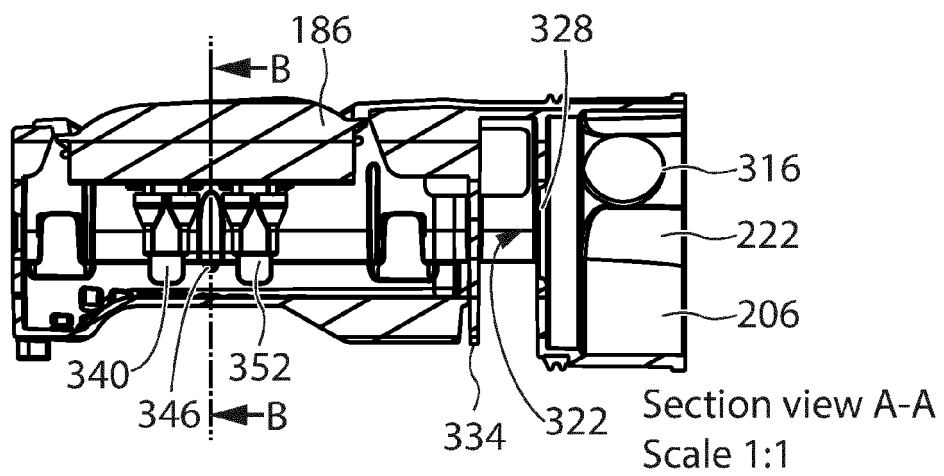


FIG. 8

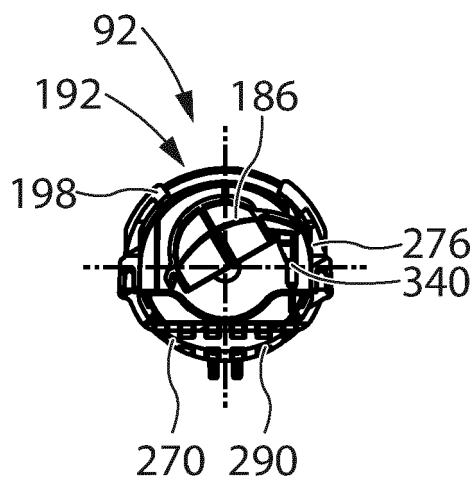


FIG. 9

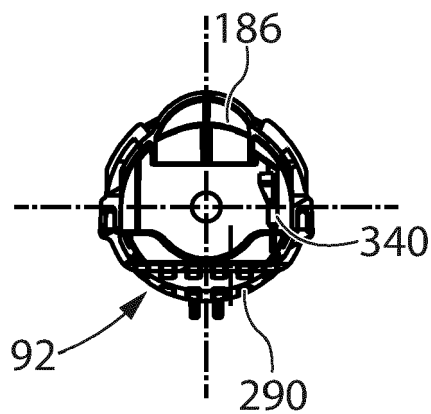


FIG. 10

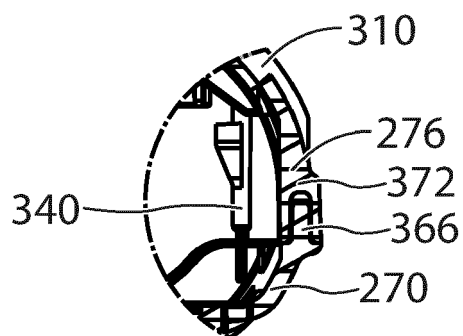


FIG. 11

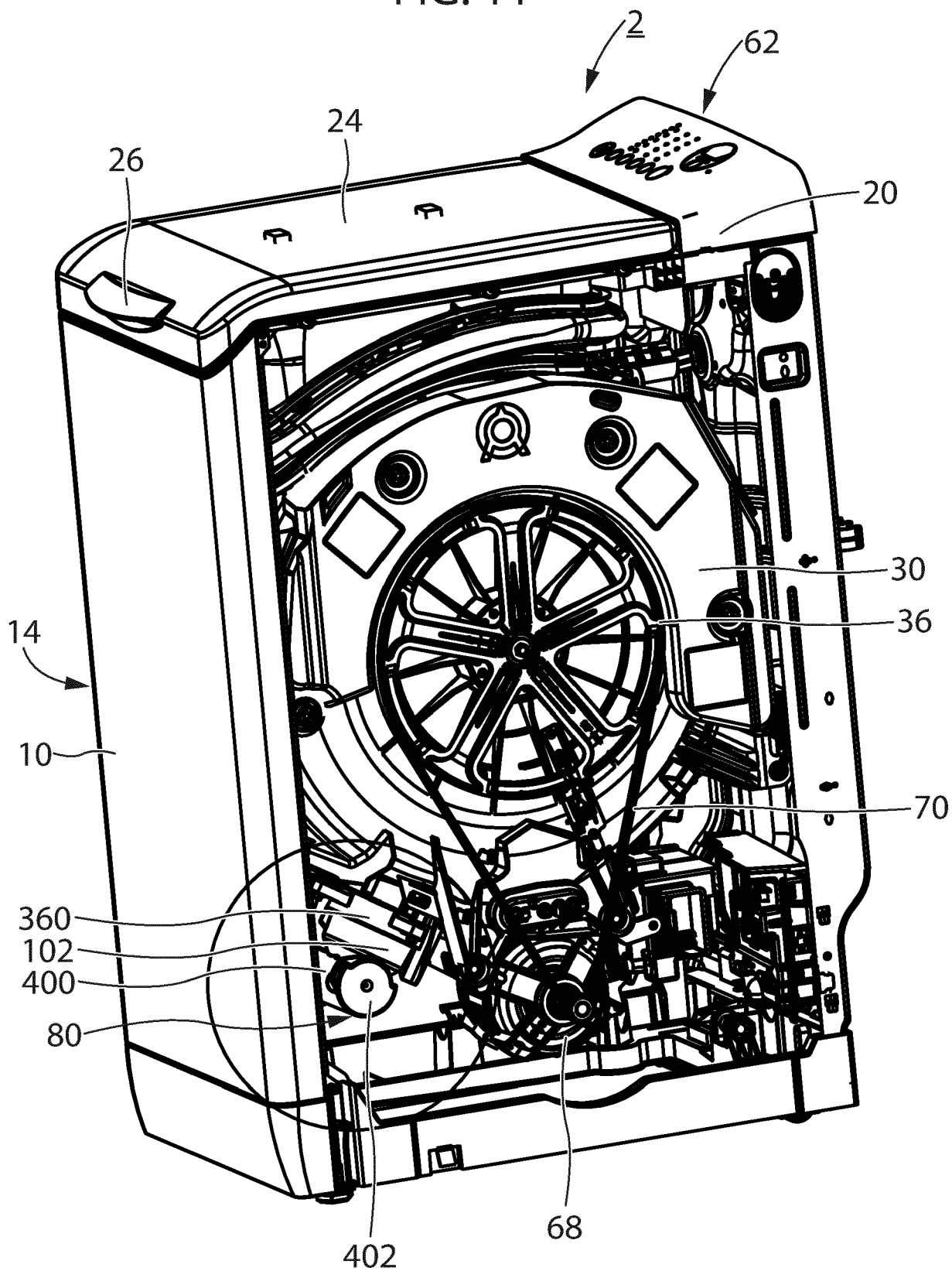


FIG. 12

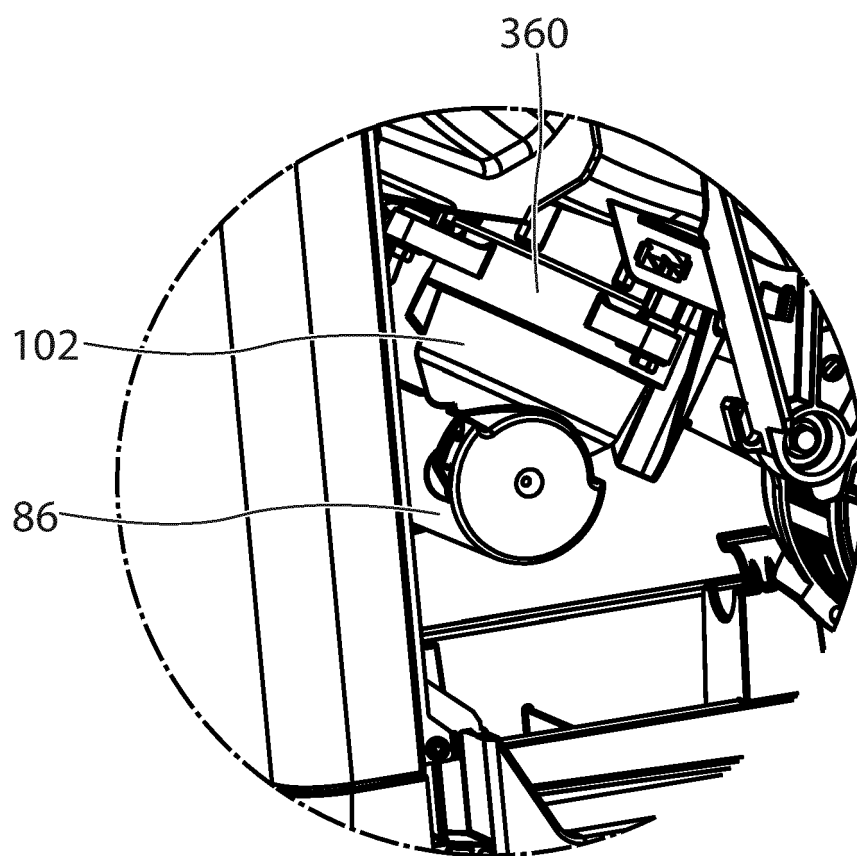


FIG. 13

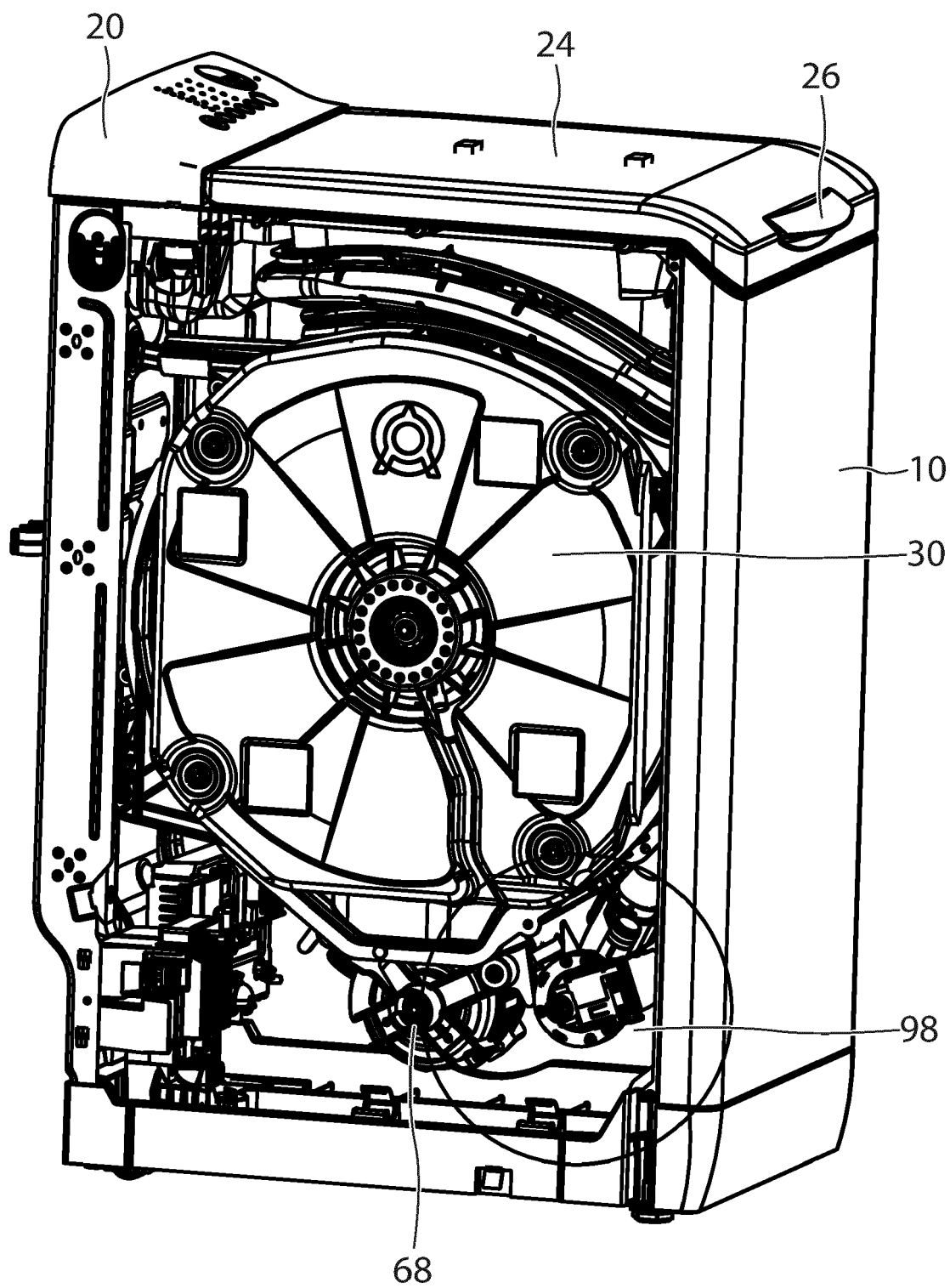
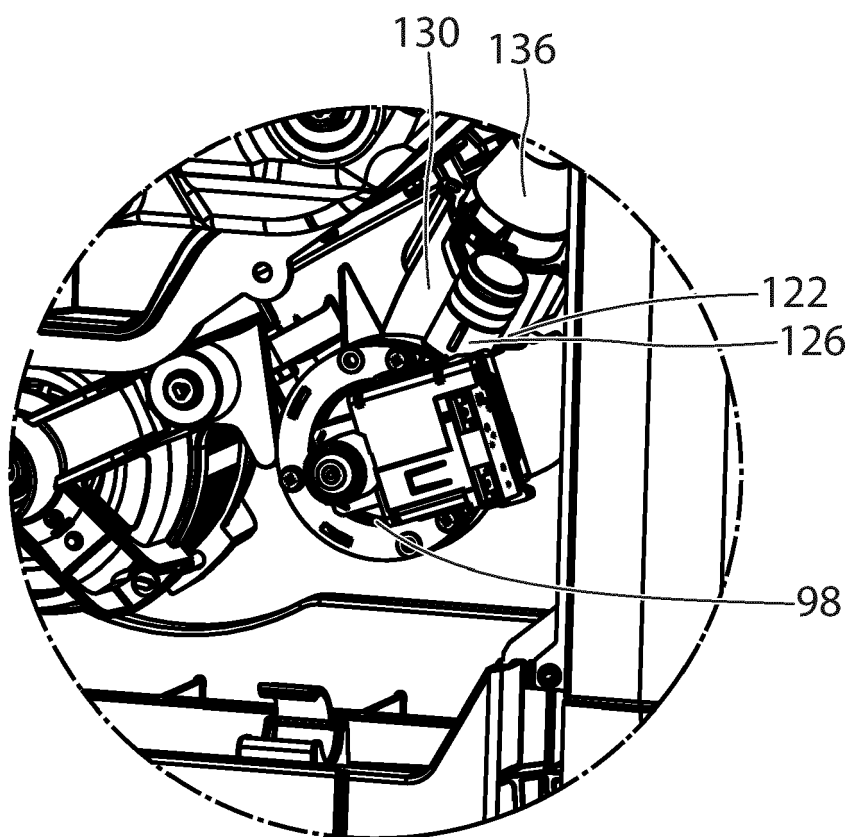




FIG. 14





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Application Number  
EP 20 16 3679

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Y	* paragraphs [0047] - [0049] * * paragraphs [0054] - [0056] * * paragraphs [0061] - [0070] * * figures 1-10 *	9-12	ADD. D06F39/08
Y	EP 2 455 534 A1 (ELECTROLUX HOME PROD CORP [BE]) 23 May 2012 (2012-05-23) * paragraphs [0020] - [0028] * * figures 1-3b *	9-12	
A	EP 3 026 166 A1 (BSH HAUSGERÄTE GMBH [DE]) 1 June 2016 (2016-06-01) * paragraphs [0017] - [0022] * * figures 1-4 *	1-8, 13-15	
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The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>22 June 2020</b>	Examiner <b>Weidner, Maximilian</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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22-06-2020

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