



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.08.2023 Bulletin 2023/35

(51) International Patent Classification (IPC):
D06F 37/26 ^(2006.01) **D06F 39/08** ^(2006.01)
D06F 39/10 ^(2006.01) **D06F 25/00** ^(2006.01)

(21) Application number: **23156162.2**

(52) Cooperative Patent Classification (CPC):
D06F 37/267; D06F 39/085; D06F 39/10;
D06F 25/00

(22) Date of filing: **10.02.2023**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(30) Priority: **28.02.2022 US 202217682686**

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(54) **LAUNDRY TREATING APPLIANCE WITH FOREIGN OBJECT BARRIER**

(57) A laundry treating appliance (10) includes a tub (34) having a wall (16) with an outer surface (84) and an inner surface (82). The inner surface (82) of the wall (84) at least partially defines a liquid chamber (80). An outlet (61) is formed in the wall (16). The laundry treating ap-

pliance (10) further includes a foreign object barrier (100) at least partially extending through the outlet (61) and into the liquid chamber (80). A pump case (65) fluidly couples to the outlet (61).

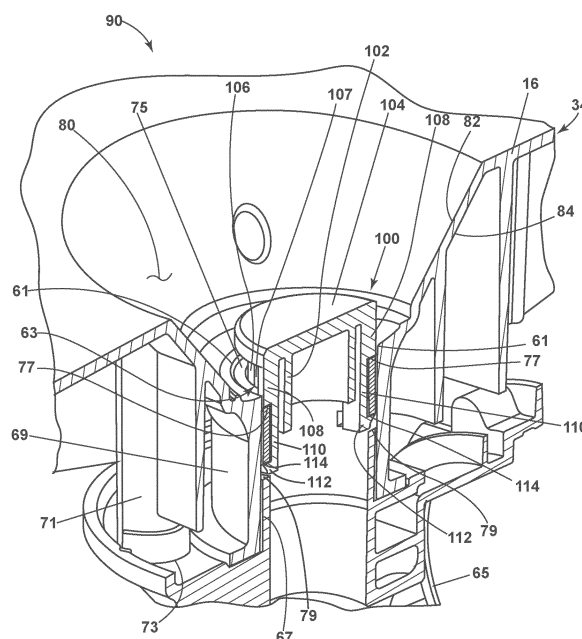


FIG. 5

Description

TECHNICAL BACKGROUND

[0001] The present disclosure relates to a laundry treating appliance having a foreign object barrier.

BACKGROUND

[0002] Laundry treating appliances, such as washing machines, refreshers, and non-aqueous systems, can have a configuration based on a rotating container that at least partially defines a treating chamber in which laundry items are placed for treating and that can be provided within a tub. The laundry treating appliance can have a controller that implements a number of user-selectable, pre-programmed cycles of operation. Hot water, cold water, or a mixture thereof along with various treating chemistries, or detergents, can be supplied to the treating chamber in accordance with the cycle of operation.

[0003] Laundry treating appliances typically operate to treat laundry items by placing the laundry items in contact with cleaning fluid such as soapy water, and providing relative motion between the laundry items and the fluid. Commonly, a fabric mover, such as an agitator, provides mechanical energy to a load of laundry items immersed in the cleaning fluid by agitating the laundry load in a manner that both jostles the laundry items in the fluid and circulates the fluid through the laundry items. A laundry treating appliance for home use can perform a select programmed series of operations on fabric placed in a basket or drum located within the tub. The tub can include a sump with an outlet.

[0004] At the conclusion of a cycle of operation or of a phase of a cycle of operation, the fluid can be drained from the tub by a drain pump that fluidly couples to the outlet. However, in some cases, foreign objects that may be inadvertently introduced to the laundry treating appliance in the laundry load or the fluid can be carried with the drained fluid to the drain pump, resulting in interference with the operation of the laundry treating appliance if such foreign objects enter the drain pump. Therefore, a barrier can be provided at the interface between the tub outlet and the drain pump to prevent such objects from entering the drain pump. Such barriers prevent small items, such as keys, coins, clips, and the like, from entering the pump, such as the drain pump.

BRIEF SUMMARY

[0005] An aspect of the present disclosure relates to a laundry treating appliance comprising a tub having a wall having an outer surface and an inner surface, with the inner surface at least partially defining a liquid chamber, an outlet formed in the wall, a foreign object barrier having a filter portion at least partially extending through the outlet and into the liquid chamber, and a pump case fluidly coupled to the outlet and having at least one catch con-

figured to couple with at least a portion of the foreign object barrier such that the foreign object barrier forms a snap fit attachment with the pump case.

[0006] Another aspect of the present disclosure relates to a method of assembling a pump case to a tub in a laundry treating appliance, the method comprising positioning a foreign object barrier within an inlet defined within the pump case such that the foreign object barrier at least partially extends through the inlet, attaching the foreign object barrier to the inlet of the pump case by a snap fit attachment such that the foreign object barrier is carried by the pump case, inserting the inlet into an outlet formed in a wall of the tub until the foreign object barrier at least partially extends through the outlet, and fastening the pump case to the tub using mechanical fasteners provided adjacent the outlet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In the drawings:

FIG. 1 is a schematic cross-sectional view of a laundry treating appliance in the form of a washing machine including a tub outlet and a pump inlet according to an aspect of the present disclosure.

FIG. 2 is a schematic representation of a control system for controlling the operation of the laundry treating appliance of FIG. 1.

FIG. 3 is a bottom perspective view of an interface between the tub outlet and the pump inlet of the laundry treating appliance of FIG. 1.

FIG. 4 is an exploded perspective view of a pump case, including the pump inlet, and a foreign object barrier for use within the interface between the tub outlet and the pump inlet of FIG. 3.

FIG. 5 is a perspective cross-sectional view of the interface between the tub outlet and the pump inlet of FIG. 3, and illustrating the foreign object barrier of FIG. 4.

FIG. 6 is a flow chart illustrating a method of assembling the interface between the tub outlet, the pump inlet, and the foreign object barrier of FIG. 5.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0008] FIG. 1 is a schematic view of a laundry treating appliance according to aspects of the present disclosure. The laundry treating appliance can be any appliance which performs a cycle of operation to clean or otherwise treat items placed therein, non-limiting examples of which include a horizontal or vertical axis clothes washer; a clothes dryer; a combination washing machine and dryer; a dispensing dryer; a tumbling or stationary refreshing/revitalizing machine; an extractor; a non-aqueous washing apparatus; and a revitalizing machine. While the laundry treating appliance of FIG. 1 is illustrated as a vertical axis, top-load laundry treating appliance, the aspects of the present disclosure can have applicability in laundry treat-

ing appliances with other configurations, including a horizontal axis, front-load laundry treating appliance.

[0009] Washing machines are typically categorized as either a vertical axis washing machine or a horizontal axis washing machine. As used herein, the term "horizontal axis" washing machine refers to a washing machine having a rotatable drum that rotates about a generally horizontal axis relative to a surface that supports the washing machine. The drum can rotate about the axis inclined relative to the horizontal axis, with fifteen degrees of inclination being one example of the inclination. Similar to the horizontal axis washing machine, the term "vertical axis" washing machine refers to a washing machine having a rotatable drum that rotates about a generally vertical axis relative to a surface that supports the washing machine. However, the rotational axis need not be perfectly vertical to the surface. The drum can rotate about an axis inclined relative to the vertical axis, with fifteen degrees of inclination being one example of the inclination.

[0010] In another aspect, the terms vertical axis and horizontal axis are often used as shorthand terms for the manner in which the appliance imparts mechanical energy to the laundry, even when the relevant rotational axis is not absolutely vertical or horizontal. As used herein, the "vertical axis" washing machine refers to a washing machine having a rotatable drum, perforate or imperforate, that holds fabric items and a clothes mover, such as an agitator, impeller, nutator, and the like within the drum. The clothes mover moves within the drum to impart mechanical energy directly to the clothes or indirectly through wash liquid in the drum. The clothes mover can typically be moved in a reciprocating rotational movement. In some vertical axis washing machines, the drum rotates about a vertical axis generally perpendicular to a surface that supports the washing machine. However, the rotational axis need not be vertical. The drum may rotate about an axis inclined relative to the vertical axis.

[0011] As used herein, the "horizontal axis" washing machine refers to a washing machine having a rotatable drum, perforated or imperforate, that holds laundry items and washes the laundry items. In some horizontal axis washing machines, the drum rotates about a horizontal axis generally parallel to a surface that supports the washing machine. However, the rotational axis need not be horizontal. The drum can rotate about an axis inclined or declined relative to the horizontal axis. In horizontal axis washing machines, the clothes are lifted by the rotating drum and then fall in response to gravity to form a tumbling action. Mechanical energy is imparted to the clothes by the tumbling action formed by the repeated lifting and dropping of the clothes. Vertical axis and horizontal axis machines are best differentiated by the manner in which they impart mechanical energy to the fabric articles.

[0012] Regardless of the axis of rotation, a washing machine can be top-loading or front-loading. In a top-loading washing machine, laundry items are placed into

the drum through an access opening in the top of a cabinet, while in a front-loading washing machine laundry items are placed into the drum through an access opening in the front of a cabinet. If a washing machine is a top-loading horizontal axis washing machine or a front-loading vertical axis washing machine, an additional access opening is located on the drum.

[0013] The laundry treating appliance of FIG. 1 is illustrated as a vertical-axis washing machine 10, which can include a structural support system including a cabinet 14, which defines a housing within which a laundry holding system resides. The cabinet 14 can be a housing having a chassis and/or a frame, to which decorative panels can or cannot be mounted, defining an interior enclosing components typically found in a conventional washing machine, such as motors, pumps, fluid lines, controls, sensors, transducers, and the like. Such components will not be described further herein except as necessary for a complete understanding of the present disclosure.

[0014] The laundry holding system of the illustrated exemplary washing machine 10 can include a rotatable basket 30 having an open top 13 that can be disposed within the interior of the cabinet 14 and can define a rotatable treating chamber 32 for receiving laundry items for treatment and an access opening 15 to the treating chamber 32. The basket 30 is configured to receive a laundry load comprising articles for treatment, including, but not limited to, a hat, a scarf, a glove, a sweater, a blouse, a shirt, a pair of shorts, a dress, a sock, and a pair of pants, a shoe, an undergarment, and a jacket. The open top 13 can be aligned with the access opening 15. A tub 34 can also be positioned within the cabinet 14 and can define an interior 24 within which the basket 30 can be positioned. The tub 34 can have a generally cylindrical side or tub peripheral wall 12 closed at its bottom end by a bottom wall or a base 16 that can at least partially define a sump 60. The base 16 further defines a tub outlet opening 61 that is fluidly coupled to the sump 60. The sump 60 can be separate from the tub 34 and disposed adjacent the tub outlet opening 61 and/or can be integrally formed with the tub 34. Additionally, or alternatively, the sump 60 can be mounted as a separate piece to the tub 34.

[0015] The basket 30 can have a generally peripheral side wall 18, which is illustrated as a cylindrical side wall, closed at the basket end by a basket base 20 to at least partially define the treating chamber 32. The basket 30 can be rotatably mounted within the tub 34 for rotation about a vertical basket axis of rotation and can include a plurality of perforations, such that liquid can flow between the tub 34 and the rotatable basket 30 through the perforations. While the illustrated washing machine 10 includes both the tub 34 and the basket 30, with the basket 30 defining the treating chamber 32, it is within the scope of the present disclosure for the laundry treating appliance to include only one receptacle, with the receptacle defining the laundry treatment chamber for receiving

ing the load to be treated.

[0016] The cabinet 14 can further define a top wall 36, which can comprise a shroud 29 or to which the shroud 29 can be coupled. The shroud 29 can define at least a portion of the access opening 15, such that the shroud 29 can at least partially encircle the access opening 15, or the shroud 29 can be located above the access opening 15. The shroud 29 can curve downwards toward the treating chamber 32 to direct laundry items into the basket 30. The shroud 29 can overlie a portion of the basket 30 such that the laundry items do not fall between the basket 30 and the tub 34. A selectively openable cover, illustrated herein as comprising a lid 28 can be movably mounted to the cabinet 14 for selective movement between an opened position and a closed position to selectively open and close the access opening 15 and to provide access into the laundry treating chamber 32 through the access opening 15 of the basket 30.

[0017] A laundry mover 38 can be rotatably mounted within the basket 30 to impart mechanical agitation to a load of laundry placed in the basket 30. The laundry mover 38 can be oscillated or rotated about its vertical axis of rotation during a cycle of operation in order to produce load motion effective to wash the load contained within the treating chamber 32. Other exemplary types of laundry movers include, but are not limited to, an agitator, a wobble plate, and a hybrid impeller/agitator.

[0018] The basket 30 and the laundry mover 38 can be driven by a drive system 40 that includes a motor 41, which can include a gear case, operably coupled with the basket 30 and laundry mover 38. The motor 41 can rotate the basket 30 at various speeds in either rotational direction about the vertical axis of rotation, including at a spin speed wherein a centrifugal force at the inner surface of the basket side wall 18 is 1g or greater. Spin speeds are commonly known for use in extracting liquid from the laundry items in the basket 30, such as after a wash or rinse step in a treating cycle of operation. A loss motion device or clutch (not shown) can be included in the drive system 40 and can selectively operably couple the motor 41 with either the basket 30 and/or the laundry mover 38.

[0019] A suspension system 22 can dynamically hold the tub 34 within the cabinet 14. The suspension system 22 can dissipate a determined degree of vibratory energy generated by the rotation of the basket 30 and/or the laundry mover 38 during a treating cycle of operation. Together, the tub 34, the basket 30, and any contents of the basket 30, such as liquid and laundry items, define a suspended mass for the suspension system 22.

[0020] A liquid supply system can be included to provide liquid, such as water or a combination of water and one or more wash aids, such as detergent, into the treating chamber 32. The liquid supply system can include a water supply 44 configured to supply hot or cold water. The water supply 44 can include a hot water inlet 45 and a cold water inlet 46. A valve assembly can include a hot water valve 48, a cold water valve 50, and various con-

duits 52, 58 for selectively distributing the water supply 44 from the hot water and cold water inlets 45, 46. The valves 48, 50 are selectively openable to provide water, such as from a household water supply (not shown) to the conduit 52. A second water conduit, illustrated as the water inlet 58, can also be fluidly coupled with the conduit 52 such that water can be supplied directly to the treating chamber 32 through the open top of the basket 30. The water inlet 58 can be configured to dispense water, and optionally treating chemistry, into the tub 34 in a desired pattern and under a desired amount of pressure. For example, the water inlet 58 can be configured to dispense a flow or stream of treating chemistry or water into the tub 34 by gravity, i.e. a non-pressurized stream. The valves 48, 50 can be opened individually or together to provide a mix of hot and cold water at a selected temperature. While the valves 48, 50 and conduit 52 are illustrated exteriorly of the cabinet 14, it will be understood that these components can be internal to the cabinet 14.

[0021] A treating chemistry dispenser 54 can be provided for dispensing treating chemistry to the basket 30, either directly or mixed with water from the water supply 44. The treating chemistry dispenser 54, which can be a single use dispenser, a bulk dispenser, or a combination of a single use and bulk dispenser in non-limiting examples, and is fluidly coupled to the treating chamber 32. While the treating chemistry dispenser 54 is illustrated herein as being provided at the top wall 36 or the shroud 29, it will be understood that other locations for the treating chemistry dispenser 54 can be contemplated, such as at a different location within the cabinet 14. Further, the treating chemistry dispenser 54 can be provided in a drawer configuration or as at least one reservoir fluidly coupled to the treating chamber 32.

[0022] The treating chemistry dispenser 54 can include means for supplying or mixing detergent to or with water from the water supply 44. Alternatively, water from the water supply 44 can also be supplied to the tub 34 through the treating chemistry dispenser 54 without the addition of a detergent. The treating chemistry dispenser 54 can be configured to dispense the treating chemistry or water into the tub 34 in a desired pattern and under a desired amount of pressure. For example, the treating chemistry dispenser 54 can be configured to dispense a flow or stream of treating chemistry or water into the tub 34 by gravity, i.e. a non-pressurized stream.

[0023] The treating chemistry dispenser 54 can include multiple chambers or reservoirs fluidly coupled to the treating chamber 32 for receiving doses of different treating chemistries. The treating chemistry dispenser 54 can be implemented as a dispensing drawer that is slidably received within the cabinet 14, or within a separate dispenser housing which can be provided in the cabinet 14. The treating chemistry dispenser 54 can be moveable between a fill position, where the treating chemistry dispenser 54 is exterior to the cabinet 14 and can be filled with treating chemistry, and a dispense position, where the treating chemistry dispenser 54 is interior of the cab-

inet 14.

[0024] Non-limiting examples of treating chemistries that can be dispensed by the dispensing system during a cycle of operation include one or more of the following: water, detergents, surfactants, enzymes, fragrances, stiffness/sizing agents, wrinkle releasers/reducers, softeners, antistatic or electrostatic agents, stain repellants, water repellants, energy reduction/extraction aids, antibacterial agents, medicinal agents, vitamins, moisturizers, shrinkage inhibitors, and color fidelity agents, and combinations thereof. The treating chemistries can be in the form of a liquid, powder, or any other suitable phase or state of matter.

[0025] Additionally, the liquid supply system and treating chemistry dispenser 54 can differ from the configuration shown, such as by inclusion of other valves, conduits, wash aid dispensers, heaters, sensors, such as water level sensors and temperature sensors, and the like, to control the flow of treating liquid through the washing machine 10 and for the introduction of more than one type of detergent/wash aid.

[0026] A liquid recirculation system can be provided for recirculating liquid from the tub 34 into the treating chamber 32. More specifically, the sump 60 can be located in the bottom of the tub 34 and the liquid recirculation system can be configured to recirculate treating liquid from the sump 60 onto the top of a laundry load located in the treating chamber 32. A pump 62 can be housed below the tub 34 and can have a pump inlet 63 fluidly coupled with the sump 60 via the tub outlet opening 61 and a pump outlet configured to fluidly couple to either or both a household drain 64 or a recirculation conduit 66. In this configuration, the pump 62 can be used to drain or recirculate wash water in the sump 60. As illustrated, the recirculation conduit 66 can be fluidly coupled with the treating chamber 32 such that it supplies liquid into the open top of the basket 30. The liquid recirculation system can include other types of recirculation systems.

[0027] It is noted that the illustrated drive system, suspension system, liquid supply system, recirculation and drain system are shown for exemplary purposes only and are not limited to the systems shown in the drawings and described above. For example, the liquid supply, recirculation and pump systems can differ from the configuration shown in FIG. 1, such as by inclusion of other valves, conduits, sensors (such as liquid level sensors and temperature sensors), and the like, to control the flow of liquid through the washing machine 10 and for the introduction of more than one type of treating chemistry. For example, the liquid supply system can be configured to supply liquid into the interior of the tub 34 not occupied by the basket 30 such that liquid can be supplied directly to the tub 34 without having to travel through the basket 30. In another example, the liquid supply system can include a single valve for controlling the flow of water from the household water source. In another example, the recirculation and pump system can include two separate pumps for recirculation and draining, in-

stead of the single pump as previously described.

[0028] The washing machine 10 can also be provided with a heating system (not shown) to heat liquid provided to the treating chamber 32. In one example, the heating system can include a heating element provided in the sump to heat liquid that collects in the sump 60. Alternatively, the heating system can be in the form of an in-line heater that heats the liquid as it flows through the liquid supply, dispensing and/or recirculation systems.

[0029] The washing machine 10 can further include a control system, illustrated herein as a controller 70, which can be thought of as a laundry treating appliance controller 70, coupled with various working components of the washing machine 10 to control the operation of the working components and to implement one or more treating cycles of operation. A user interface 26 can be operably coupled with the controller 70. The user interface 26 can provide an input and output function for the controller 70. The user interface 26 can include one or more knobs, dials, switches, displays, touch screens and the like for communicating with the user, such as to receive input and provide output. For example, the displays can include any suitable communication technology including that of a liquid crystal display (LCD), a light-emitting diode (LED) array, or any suitable display that can convey a message to the user. The user can enter different types of information including, without limitation, cycle selection and cycle parameters, such as cycle options. Other communications paths and methods can also be included in the washing machine 10 and can allow the controller 70 to communicate with the user in a variety of ways. For example, the controller 70 can be configured to receive input from and provide output to the user either through the washing machine 10, the user interface 26, or utilizing another device, such as an app for a mobile phone or other electronic device. Non-limiting examples of such input and output can include sending a text message to the user, sending an electronic mail to the user, providing audio information to the user, or receiving control instructions from a user through an app, text message, electronic mail, or audio input.

[0030] The controller 70 can include the machine controller and any additional controllers provided for controlling any of the components of the washing machine 10. For example, the controller 70 can include the machine controller and a motor controller. Many known types of controllers can be used for the controller 70. It is contemplated that the controller is a microprocessor-based controller that implements control software and sends/receives one or more electrical signals to/from each of the various working components to implement the control software. As an example, proportional control (P), proportional integral control (PI), and proportional derivative control (PD), or a combination thereof, a proportional integral derivative control (PID), can be used to control the various components of the washing machine 10.

[0031] As illustrated in FIG. 2, the controller 70 can be provided with a memory 72 and a central processing unit

(CPU) 74. The memory 72 can be used for storing the control software that can be executed by the CPU 74 in completing a cycle of operation using the washing machine 10 and any additional software. For example, the memory 72 can store a set of executable instructions including at least one user-selectable cycle of operation. Examples, without limitation, of treating cycles of operation include: wash, heavy-duty wash, delicate wash, quick wash, pre-wash, refresh, rinse only, and timed wash, which can be selected at the user interface 26. The memory 72 can also be used to store information, such as a database or table, and to store data received from the one or more components of the washing machine 10 that can be communicably coupled with the controller 70. The database or table can be used to store the various operating parameters for the one or more cycles of operation, including factory default values for the operating parameters and any adjustments to them by the control system or by user input.

[0032] The controller 70 can be operably coupled with one or more components of the washing machine 10 for communicating with and/or controlling the operation of the components to complete a cycle of operation. For example, the controller 70 can be coupled with the hot water valve 48, the cold water valve 50, and the dispenser 54 for controlling the temperature and flow rate of treating liquid into the treating chamber 32; the pump 62 for controlling the amount of treating liquid in the treating chamber 32 or sump 60; drive system 40 at the motor 41 for controlling the direction and speed of rotation of the basket 30 and/or the laundry mover 38; and the user interface 26 for receiving user selected inputs and communicating information to the user. The controller 70 can also receive input from a temperature sensor 76, such as a thermistor, which can detect the temperature of the treating liquid in the treating chamber 32 and/or the temperature of the treating liquid being supplied to the treating chamber 32. The controller 70 can also receive input from various additional sensors 78, which are known in the art and not shown for simplicity. Non-limiting examples of additional sensors 78 that can be communicably coupled with the controller 70 include a weight sensor, a moisture sensor, a chemical sensor, a position sensor, an imbalance sensor, a load size sensor, and a motor torque sensor, which can be used to determine a variety of system and laundry characteristics, such as laundry load inertia or mass.

[0033] Looking now at a portion of the liquid recirculation system in greater detail, reference is made to FIG. 3, which illustrates a bottom perspective view of the tub 34 showing the positioning of the base 16 and the pump 62. The liquid recirculation system can include the tub outlet opening 61 in the base 16. While the tub outlet opening 61 is illustrated herein as a drain outlet, it will be understood that the tub outlet opening 61 can be any suitable outlet connected to any suitable pump. A tub outlet conduit 69 can extend cylindrically downwardly from the tub outlet opening 61. At least one mounting boss 71 can extend downwardly from the base 16 and

can be positioned radially outward of the circumference of the tub outlet conduit 69. In one non-limiting example, a plurality of mounting bosses 71 can be included and can be circumferentially spaced apart about the tub outlet conduit 69.

[0034] A pump case 65 for housing the pump 62 can be included in the liquid recirculation system. The pump case 65 comprises a pump inlet conduit 67 to fluidly connect the tub outlet opening 61 to the pump 62 and to the household drain 64 or recirculation conduit 66. The pump inlet conduit 67 can extend upwardly toward the tub outlet opening 61 to be at least partially received within the tub outlet conduit 69, such that the tub outlet conduit 69 and the tub outlet opening 61 thus receive a portion of the pump case 65 from the side opposite the sump 60. Thus, the pump inlet conduit 67, and therefore also the pump case 65 of which the pump inlet conduit 67 is a part, fluidly couple the sump 60 to the pump 62. Further, the at least one mounting boss 71 extends toward and is configured to allow for fastening of the at least one mounting boss 71 to the pump case 65 to join the pump case 65 and the pump 62 to the base 16 of the tub 34. At least the pump case 65, the pump inlet conduit 67, the tub outlet conduit 69, the at least one mounting boss 71, the tub outlet opening 61, and the pump inlet 63 can be thought of as forming at least a portion of an interface 90 between the tub outlet opening 61 and the pump 62.

[0035] In one non-limiting example, the pump case 65 is a rigid member, like a casing or a housing, though it will be understood that the pump case 65 could alternatively be flexible, like a hose. The pump case 65 can be thought of as part of a pump assembly that includes the pump 62 and the pump case 65. When the pump 62 is provided as two separate pumps 62, such as both a drain pump and a recirculation pump, the pump case 65 can fluidly couple both pumps 62 to the sump 60. In another non-limiting example, the pump case 65 can be integrally formed with the pump 62.

[0036] FIG. 4 illustrates the pump case 65 in greater detail, as well as illustrating a foreign object barrier 100 that is shown as being exploded from the pump case 65. The interface 90 between the tub outlet opening 61 and the pump 62 further comprises the foreign object barrier 100, which is configured to couple with the pump inlet conduit 67. The pump case 65 further comprises at least one fastener opening 73 that is configured for coupling with the at least one mounting boss 71. It is contemplated that the same number of fastener openings 73 and mounting bosses 71 can be included, and further that the fastener openings 73 are positioned to be aligned with the mounting bosses 71 when the pump case 65 is coupled to the base 16 in an installed position. When the fastener openings 73 and the mounting bosses 71 are aligned, fasteners (not shown) can extend from the mounting bosses 71 to fasten through the fastener openings 73 to fix the pump case 65 to the base 16 of the tub 34.

[0037] The pump inlet conduit 67 can be seen as ex-

tending upwardly from the pump case 65 toward the tub outlet opening 61 and can have a generally cylindrical profile, though it will be understood that such a shape is not limiting. The pump inlet conduit 67 terminates at an upper surface 75 that at least partially defines the pump inlet 63. The upper surface 75 further defines at least one catch, illustrated herein as at least one notch 77 in the upper surface 75. By way of non-limiting example, the at least one notch 77 is illustrated herein as comprising a pair of opposing notches 77 spaced apart about the upper surface 75, though it will be understood that any suitable number of notches 77 can be included. The pump inlet conduit 67 further defines at least one catch illustrated herein as at least one retaining opening 79 provided in the cylindrical sidewall of the pump inlet conduit 67. By way of non-limiting example, the at least one retaining opening 79 is illustrated herein as comprising a pair of opposing retaining openings 79 spaced apart about the pump inlet conduit 67, which will be better seen in FIG. 5. Both the at least one notch 77 and the at least one retaining opening 79 are configured for coupling the foreign object barrier 100 with the pump case 65, and specifically with the pump inlet conduit 67.

[0038] The foreign object barrier 100 comprises a generally cylindrical body 102 that terminates at a cap portion 104 positioned at an uppermost end of the body 102, such that the body 102 extends downwardly from the cap portion 104. In one example, the body 102 can have a diameter that is less than the diameter of the cap portion 104. At least one deflectable finger 110 further extends downwardly from the cap portion 104 and is positioned radially outwardly of the body 102. By way of non-limiting example, the at least one deflectable finger 110 is illustrated herein as comprising a pair of opposing deflectable fingers 110 spaced apart from one another about the body 102, though it will be understood that any suitable number of deflectable fingers 110 can be included. As illustrated herein, the deflectable fingers 110 are deflectable radially inwardly toward the body 102.

[0039] Each of the deflectable fingers 110 extend downwardly from the cap portion 104 to terminate in a retaining flange 112 provided at a lowermost end of the deflectable finger 110. The retaining flange 112 extends radially outwardly from the deflectable finger 110 to define an upper surface, illustrated herein as a catch surface 114. The catch surface 114 is configured to engage with the retaining opening 79 of the pump inlet conduit 67 when the foreign object barrier 100 is in an installed position relative to the pump inlet conduit 67.

[0040] The foreign object barrier 100 further comprises a plurality of circumferentially spaced ribs 106, 108 that extend downwardly from the cap portion 104 and are positioned further radially outwardly from the deflectable fingers 110, and therefore also radially outwardly from the body 102. In one example, the circumferentially spaced ribs 106, 108 extend downwardly from the cap portion 104 to define a vertical height, but do not extend downwardly as far as either the body 102 or the deflecta-

ble fingers 110. The spacing between the multiple circumferentially spaced ribs 106, 108 defines multiple channels 107 between the circumferentially spaced ribs 106, 108 that allow for the flow of liquid between the circumferentially spaced ribs 106, 108. The spacing between the circumferentially spaced ribs 106, 108 defining the channels 107 for liquid flow can be determined to have a width that is narrow enough to keep foreign objects that could be harmful to the pump 62 from passing through the pump inlet 63, but not so narrow that the flow of liquid through the channels 107 is impeded or is easily clogged by lint. More specifically, in one non-limiting example, each of the circumferentially spaced ribs 106, 108 can be further described as either a barrier rib 106 or a retaining rib 108. In such an example, the foreign object barrier 100 comprises a plurality of barrier ribs 106, in addition to at least one retaining rib 108.

[0041] The at least one retaining rib 108 is illustrated herein as comprising a pair of opposing retaining ribs 108 spaced apart from one another about the body 102, though it will be understood that any suitable number of retaining ribs 108 can be included. It is contemplated that the number of retaining ribs 108 provided with the foreign object barrier 100 can be the same as the number of notches 77 provided within the upper surface 75 of the pump inlet conduit 67, such that each of the retaining ribs 108 is aligned with a notch 77 when the foreign object barrier 100 is coupled to the pump inlet conduit 67 and is configured to be at least partially received and retained within a notch 77. When the at least one retaining rib 108 is at least partially received within the at least one notch 77, relative rotation between the foreign object barrier 100 and the pump inlet conduit 67 can be restricted or prevented.

[0042] The plurality of barrier ribs 106 can be circumferentially spaced about the body 102 and about the deflectable fingers 110 to extend downwardly from the portions of the circumference of the cap portion 104 between the opposing retaining ribs 108. The barrier ribs 106 can be evenly spaced between the opposing retaining ribs 108, or the barrier ribs 106 can vary in their spacing along the circumference of the cap portion 104 between the opposing retaining ribs 108. The plurality of barrier ribs 106 can be thought of as forming a filter portion of the foreign object barrier 100. For example, when the foreign object barrier 100 is coupled to the pump inlet conduit 67, the foreign object barrier 100 is positioned at least partially within the pump inlet 63 such that the foreign object barrier 100, and specifically the filter portion of the foreign object barrier 100 comprising at least the barrier ribs 106, can prevent foreign objects, especially more rigid objects like coins, keys, etc., from passing through the pump inlet 63.

[0043] In the illustrated example, the opposing retaining ribs 108 have a width that is greater than the width of the barrier ribs 106, though it will be understood that this is not limiting and that the retaining ribs 108 and the barrier ribs 106 could be provided to all have the same

width, or that the retaining ribs 108 could have a width that is less than the width of the barrier ribs 106. Further, in the illustrated example, the opposing retaining ribs 108 extend radially outwardly to the outermost edges of the cap portion 104, while the barrier ribs 106 have a smaller radial depth than the opposing retaining ribs 108 and do not extend radially outwardly all the way to the outermost periphery of the cap portion 104. However, it will be understood that the opposing retaining ribs 108 could alternatively have a radial depth that is greater than that of the barrier ribs 106, but without the retaining ribs 108 extending radially outwardly all the way to the outermost periphery of the cap portion 104, or the barrier ribs 106 and the retaining ribs 108 could have the same radial depth. Further yet, it will be understood that the barrier ribs 106 and the retaining ribs 108 can have differing vertical heights or can have the same vertical heights.

[0044] Turning now to FIG. 5, a cross-sectional view illustrates the interface 90 between the tub outlet opening 61 and the pump 62 with the tub outlet opening 61, the pump case 65, and the foreign object barrier 100 in a fully assembled and installed condition and wherein the details of the base 16 adjacent the tub outlet opening 61 can better be seen. The bottom wall or base 16 of the tub 34 surrounding the tub outlet opening 61 has an inner surface 82 and an outer surface 84. The inner surface 82 can at least partially define a liquid chamber 80 surrounding the tub outlet opening 61. The liquid chamber 80 can comprise a portion of the sump 60. Alternatively, or additionally, the liquid chamber 80 can be thought of as an extension of the sump 60 or as a separate portion from the sump 60 that is fluidly coupled with the sump 60. In one non-limiting example, the portion of the wall or base 16 defining the liquid chamber 80 can slope downwardly toward the tub outlet opening 61 such that the liquid chamber 80 is defined at a lowermost portion of the inner surface 82 of the base 16 to aid in providing the liquid within the tub 34 toward the tub outlet opening 61.

[0045] When the foreign object barrier 100 is coupled with and carried by the pump inlet conduit 67, as in the fully assembled and installed condition as illustrated, at least a portion of the foreign object barrier 100 extends through the pump inlet 63 into an interior of the pump inlet conduit 67 to be partially received within the pump inlet conduit 67, while another portion of the foreign object barrier 100 remains exterior of the pump inlet conduit 67, extending beyond the upper surface 75 of the pump inlet conduit 67 to protrude into the liquid chamber 80. In one example, the at least a portion of the foreign object barrier 100 that is received within the pump inlet conduit 67 comprises at least a portion of the deflectable fingers 110 that extend through the pump inlet 63 into the pump inlet conduit 67 such that the retaining flanges 112 are received and retained within the retaining openings 79 of the pump inlet conduit 67. Specifically, when the retaining flanges 112 are received within the retaining openings 79, the catch surfaces 114 can bear against the retaining open-

ings 79 to prevent upward withdrawal of the foreign object barrier 100 from the pump inlet conduit 67. The engagement between the retaining flanges 112 and the retaining openings 79 can also restrict rotational and/or downward movement of the foreign object barrier 100 relative to the pump inlet conduit 67.

[0046] The portion of the foreign object barrier 100 that remains exterior of the pump inlet conduit 67 can include the cap portion 104 and at least a portion of the filter portion comprising the barrier ribs 106 and the retaining ribs 108. Specifically, the retaining ribs 108 are received within the notches 77 in the upper surface 75 of the pump inlet conduit 67, which serves to further restrict rotational and/or downward movement of the foreign object barrier 100 relative to the pump inlet conduit 67. While the retaining ribs 108 extend beyond an inner diameter of the pump inlet conduit 67 so as to extend into and be received within the notches 77, the barrier ribs 106 are not required to extend beyond an inner diameter of the pump inlet conduit 67. Rather, in one non-limiting example, the barrier ribs 106 can be at least partially received within the inner diameter of the pump inlet conduit 67 such that liquid to be drained through the tub outlet opening 61 must flow into the channels 107 between the circumferentially spaced ribs 106, 108 in order to be able to flow downwardly through the pump inlet 63 and into the pump inlet conduit 67. Thus, any foreign objects that may be present within the liquid would need to pass through the filter portion of the foreign object barrier 100 before reaching the pump 62.

[0047] Further, when the interface 90 in the fully assembled and installed condition as illustrated, the pump inlet conduit 67 extends upwardly and is received within at least a portion of the tub outlet conduit 69. In one non-limiting example, the pump inlet conduit 67 and the tub outlet conduit 69 can have vertical heights that are the same or nearly the same as one another. In this way, while the tub outlet conduit 69 extends downwardly from the tub outlet opening 61, and specifically from the outer surface 84 of the base 16 that forms the tub outlet opening 61, the pump inlet conduit 67 can extend upwardly within the tub outlet conduit 69 until the upper surface 75 of the pump inlet conduit 67 is positioned adjacent and substantially even with the tub outlet opening 61. As a portion of the foreign object barrier 100 extends upwardly beyond the upper surface 75, the portion of the foreign object barrier 100 would therefore also extend upwardly through and beyond the tub outlet opening 61 to partially extend into the liquid chamber 80. In order to extend through the tub outlet opening 61 in this way, both the pump inlet conduit 67 and the widest portion of the foreign object barrier 100, such as the cap portion 104, has a maximum diameter that is less than an inner diameter of the tub outlet conduit 69.

[0048] Further yet, when the interface 90 in the fully assembled and installed condition as illustrated, the mounting bosses 71 that extend downwardly from the outer surface 84 of the portion of the base 16 forming the

liquid chamber 80 are aligned with and can at least partially surround the fastener openings 73 of the pump case 65. Fasteners can be at least partially received within the mounting bosses 71 to extend through and couple with the fastener openings 73, thereby fixing the pump case 65 to the base 16 to maintain the interface 90 in the fully assembled and installed condition and to maintain the foreign object barrier 100 in the appropriate position for filtering out foreign objects that could otherwise flow directly through the pump inlet 63.

[0049] Turning now to the process of bringing the interface 90 to the fully assembled and installed condition as illustrated, and referring now to FIG. 6, a method 200 for assembling the pump case 65 to the base 16 of the tub 34 is illustrated. At a first step 202, prior to coupling the pump case 65 to the base 16, the foreign object barrier 100 is first attached to the pump case 65. In one non-limiting example, the foreign object barrier 100 can attach to the pump case 65, and specifically to the pump inlet conduit 67, by way of a snap fit attachment. The foreign object barrier 100 can be aligned with the pump inlet 63, then can be moved through the pump inlet 63 so as to be positioned within the pump inlet 63 and to at least partially extend through the pump inlet 63. As the foreign object barrier 100 is inserted through the pump inlet 63, the pump inlet conduit 67 deflects the deflectable fingers 110 inwardly toward one another. Once the foreign object barrier 100 is inserted far enough into the pump inlet conduit 67 that the retaining flanges 112 reach the position of the retaining openings 79, the deflectable fingers 110 will return to a non-deflected position wherein the retaining flanges 112 are at least partially received within the retaining openings 79 and the deflectable fingers 110 are no longer deflected by the pump inlet conduit 67. Once the foreign object barrier 100 is attached to the pump case 65 by the snap fit attachment in this manner, the foreign object barrier 100 is then carried by the pump case 65.

[0050] At a second step 204, the pump case 65, and specifically the pump inlet conduit 67, carrying the foreign object barrier 100 is inserted into the tub outlet conduit 69 until the pump inlet conduit 67 reaches the tub outlet opening 61, such that the foreign object barrier 100 at least partially extends through the tub outlet opening 61 and into the liquid chamber 80.

[0051] At a third step 206, the pump case 65 is fastened to the base 16 of the tub 34 using mechanical fasteners (not shown) that extend through and couple the mounting bosses 71 with the fastener openings 73. This fastening assembles the pump case 65 to the tub 34, as well as positioning the foreign object barrier 100 in its intended place relative to the tub outlet opening 61 and to the pump inlet 63 so as to prevent foreign objects from entering the pump case 65 and potentially impairing the functioning of the pump 62.

[0052] The aspects of the present disclosure provide a foreign object barrier that can serve as a cap for an outlet or drain opening of a tub for a washing machine,

while also having a filter portion that is positioned specifically relative to the tub outlet and pump inlet so as to allow fluid to pass into the pump case, while preventing foreign objects from passing through the pump inlet. Small, hard objects such as coins, screws, wires, clips, or rocks can inadvertently be introduced into a washing machine along with laundry items. These hard objects can damage the pump if they pass through the tub outlet into the pump inlet. The foreign object barrier disclosed herein can prevent these objects from entering the liquid recirculation system. In addition, the foreign object barrier as disclosed herein can improve assembly and service functions related to the foreign object barrier. Since the foreign object barrier is easily snap fit to the pump case and can be inserted up through the tub outlet, but does not include any features that interact with the tub outlet to prevent subsequent withdrawal of the foreign object barrier from the tub outlet, the foreign object barrier can be easily removed in the same fashion, if needed, for cleaning or maintenance purposes in a much simpler way than with foreign object barriers that are attached by way of screws or the like. Further, the snap fit attachment allows for pre-assembly of the foreign object barrier with the pump case, further simplifying assembly of the washing machine.

[0053] To the extent not already described, the different features and structures of the various aspects of the present disclosure can be used in combination with each other as desired. That one feature may not be illustrated in all of the aspects of the disclosure is not meant to be construed that it cannot be, but is done for brevity of description. Thus, the various features of the different aspects of the present disclosure can be mixed and matched as desired to form new aspects, whether or not the new aspects are expressly described. All combinations or permutations of features described herein are covered by this disclosure.

[0054] While the aspects of the present disclosure have been specifically described in connection with certain specific aspects thereof, it is to be understood that this is by way of illustration and not of limitation. Reasonable variation and modification are possible within the scope of the forgoing disclosure and drawings without departing from the spirit of the present disclosure which is defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the aspects of the present disclosure are not to be considered as limiting, unless expressly stated otherwise.

[0055] Further aspects of the disclosure are provided by the subject matter of the following clauses:

A laundry treating appliance comprising a tub having a wall having an outer surface and an inner surface, with the inner surface at least partially defining a liquid chamber, an outlet formed in the wall, a foreign object barrier having a filter portion at least partially extending through the outlet and into the liquid chamber, and a pump case fluidly coupled to the outlet and having at least one catch configured to couple with at least a portion of the foreign

object barrier such that the foreign object barrier forms a snap fit attachment with the pump case.

[0056] The laundry treating appliance of the preceding clause wherein the liquid chamber includes a sump and the outlet is in the sump.

[0057] The laundry treating appliance of any of the preceding clauses wherein the sump is at least partially defined by the wall.

[0058] The laundry treating appliance of any of the preceding clauses wherein the wall is a bottom wall of the tub.

[0059] The laundry treating appliance of any of the preceding clauses wherein the outlet is positioned at a lowermost portion of the bottom wall.

[0060] The laundry treating appliance of any of the preceding clauses wherein the filter portion comprises multiple circumferentially spaced ribs.

[0061] The laundry treating appliance of any of the preceding clauses wherein the spacing of the multiple circumferentially spaced ribs defines multiple channels for liquid to pass through.

[0062] The laundry treating appliance of any of the preceding clauses wherein the foreign object barrier comprises at least one finger extending into the pump case to couple with the at least one catch.

[0063] The laundry treating appliance of any of the preceding clauses wherein the at least one finger is deflectable.

[0064] The laundry treating appliance of any of the preceding clauses wherein the at least one finger comprises a pair of opposing fingers and the at least one catch comprises a pair of opposing catches.

[0065] The laundry treating appliance of any of the preceding clauses wherein the pump case defines an inlet fluidly coupled with the outlet.

[0066] The laundry treating appliance of any of the preceding clauses wherein the foreign object barrier at least partially extends through the inlet.

[0067] The laundry treating appliance of any of the preceding clauses wherein the inlet is at least partially covered by the foreign object barrier such that at least a portion of the foreign object barrier serves as a cap for the inlet.

[0068] The laundry treating appliance of any of the preceding clauses wherein the diameter of the foreign object barrier is less than the diameter of the outlet.

[0069] A method of assembling a pump case to a tub in a laundry treating appliance, the method comprising positioning a foreign object barrier within an inlet defined within the pump case such that the foreign object barrier at least partially extends through the inlet, attaching the foreign object barrier to the inlet of the pump case by a snap fit attachment such that the foreign object barrier is carried by the pump case, inserting the inlet into an outlet formed in a wall of the tub until the foreign object barrier at least partially extends through the outlet, and fastening the pump case to the tub using mechanical fasteners provided adjacent the outlet.

[0070] The method of the preceding clause wherein

the wall of the tub has an outer surface and an inner surface, with the inner surface at least partially defining a liquid chamber.

[0071] The method of any of the preceding clauses wherein the foreign object barrier at least partially extending through the outlet comprises the foreign object barrier at least partially extending into the liquid chamber.

[0072] The method of any of the preceding clauses wherein the attaching the foreign object barrier to the inlet of the pump case by the snap fit attachment comprises at least a portion of the foreign object barrier coupling with at least one catch defined by the pump case.

[0073] The method of any of the preceding clauses wherein the inserting the inlet into the outlet formed in the wall of the tub until the foreign object barrier at least partially extends through the outlet fluidly couples the pump case with the outlet.

[0074] The method of any of the preceding clauses wherein the foreign object barrier at least partially extending through the outlet comprises a filter portion of the foreign object barrier at least partially extending through the outlet.

Claims

1. A laundry treating appliance (10) comprising:

a tub (34) having a wall (16) having an outer surface (84) and an inner surface (82), with the inner surface (84) at least partially defining a liquid chamber (80);
an outlet (61) formed in the wall (16);
a foreign object barrier (100) having a filter portion (106) at least partially extending through the outlet (61) and into the liquid chamber (80); and
a pump case (65) fluidly coupled to the outlet (61) and having at least one catch configured to couple with at least a portion of the foreign object barrier (100) such that the foreign object barrier (100) forms a snap fit attachment with the pump case (65).

2. The laundry treating appliance (10) of claim 1, wherein the liquid chamber (80) includes a sump (60) and the outlet (61) is in the sump (60).

3. The laundry treating appliance (10) of claim 2, wherein the sump (60) is at least partially defined by the wall (16).

4. The laundry treating appliance (10) of claim 1, wherein the wall (16) is a bottom wall of the tub (34).

5. The laundry treating appliance (10) of claim 4, wherein the outlet (61) is positioned at a lowermost portion of the bottom wall (16).

6. The laundry treating appliance (10) of any of previous claims, wherein the filter portion (106) comprises multiple circumferentially spaced ribs (106, 108).
7. The laundry treating appliance (10) of claim 6, wherein the spacing of the multiple circumferentially spaced ribs (106, 108) defines multiple channels (107) for liquid to pass through. 5
8. The laundry treating appliance (10) of any of previous claims, wherein the foreign object barrier (100) comprises at least one finger (110) extending into the pump case (65) to couple with the at least one catch. 10
9. The laundry treating appliance (10) of claim 8, wherein the at least one finger (110) is deflectable. 15
10. The laundry treating appliance (10) of claim 8 or 9, wherein the at least one finger (110) terminates in a retaining flange (112) defining a catch surface (114), the pump case (65) at least one catch is formed as a retaining opening (79) and the catch surface (114) is configured to engage with the retaining opening (79). 20 25
11. The laundry treating appliance (10) of any of previous claims, wherein the pump case (65) defines a pump inlet (63) fluidly coupled with the outlet (61). 30
12. The laundry treating appliance (10) of claim 11, wherein the foreign object barrier (100) at least partially extends through the pump inlet (63).
13. The laundry treating appliance (10) of claim 11 or 12, wherein the pump inlet (63) is at least partially covered by the foreign object barrier (100) such that at least a portion of the foreign object barrier (100) serves as a cap for the pump inlet (63). 35 40

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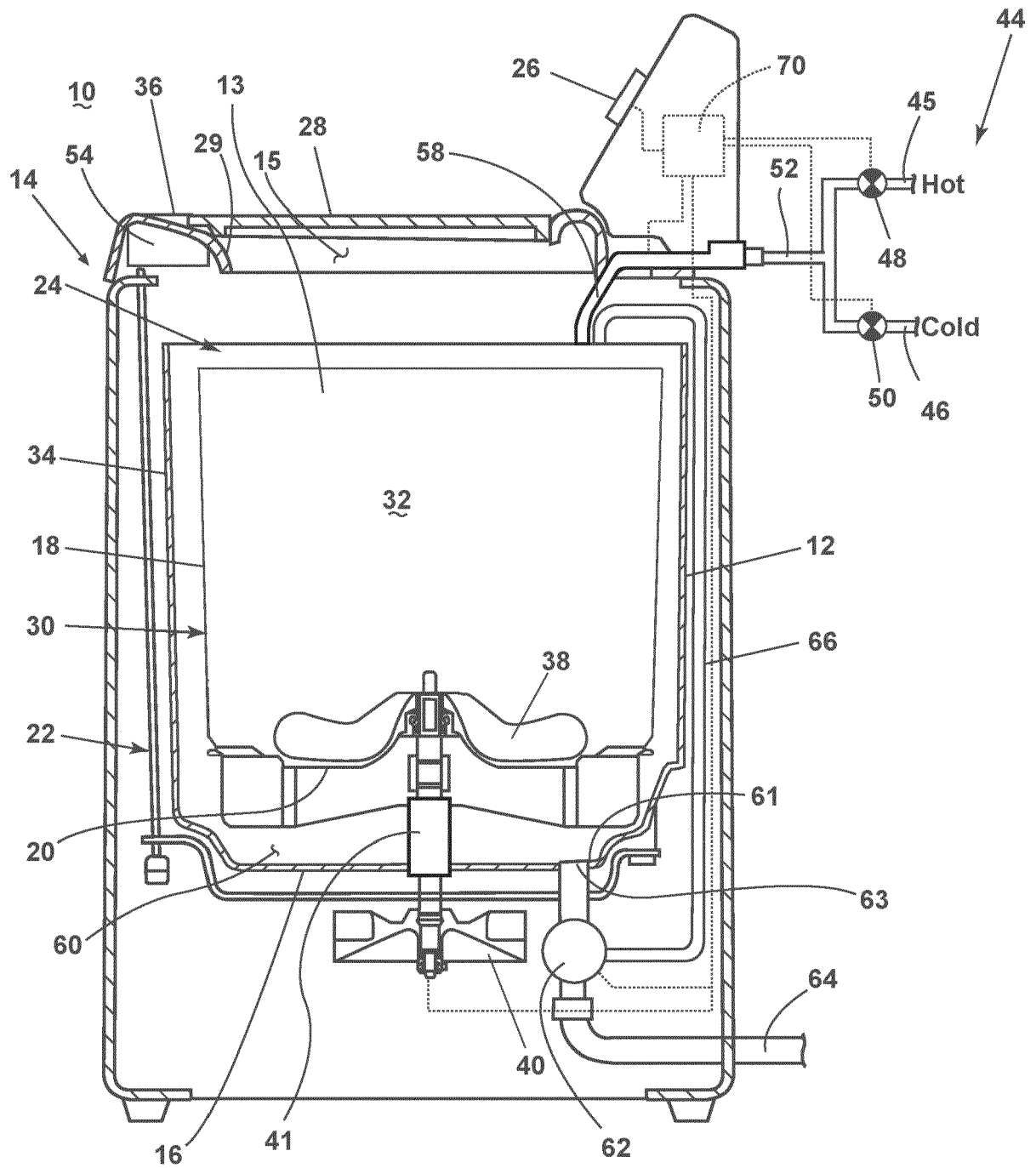


FIG. 1

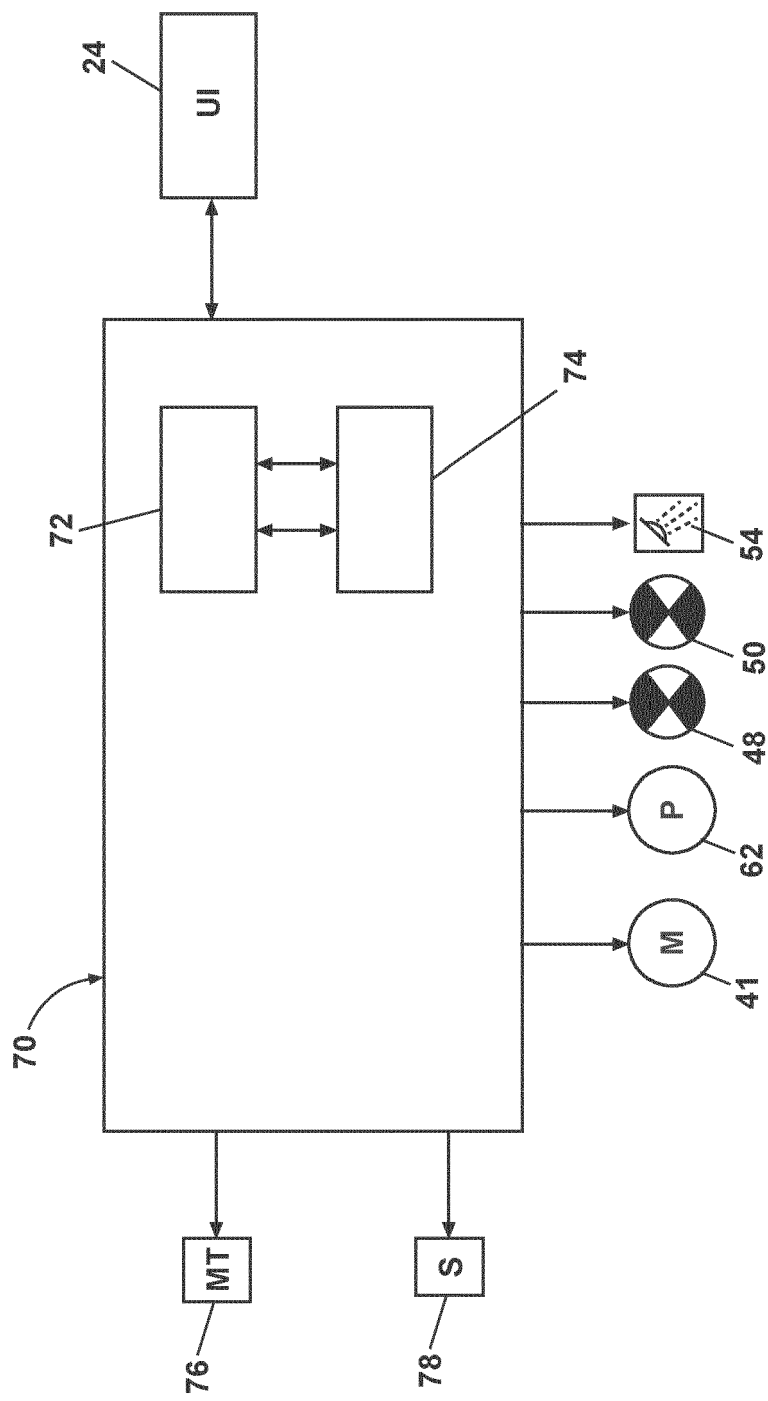


FIG. 2

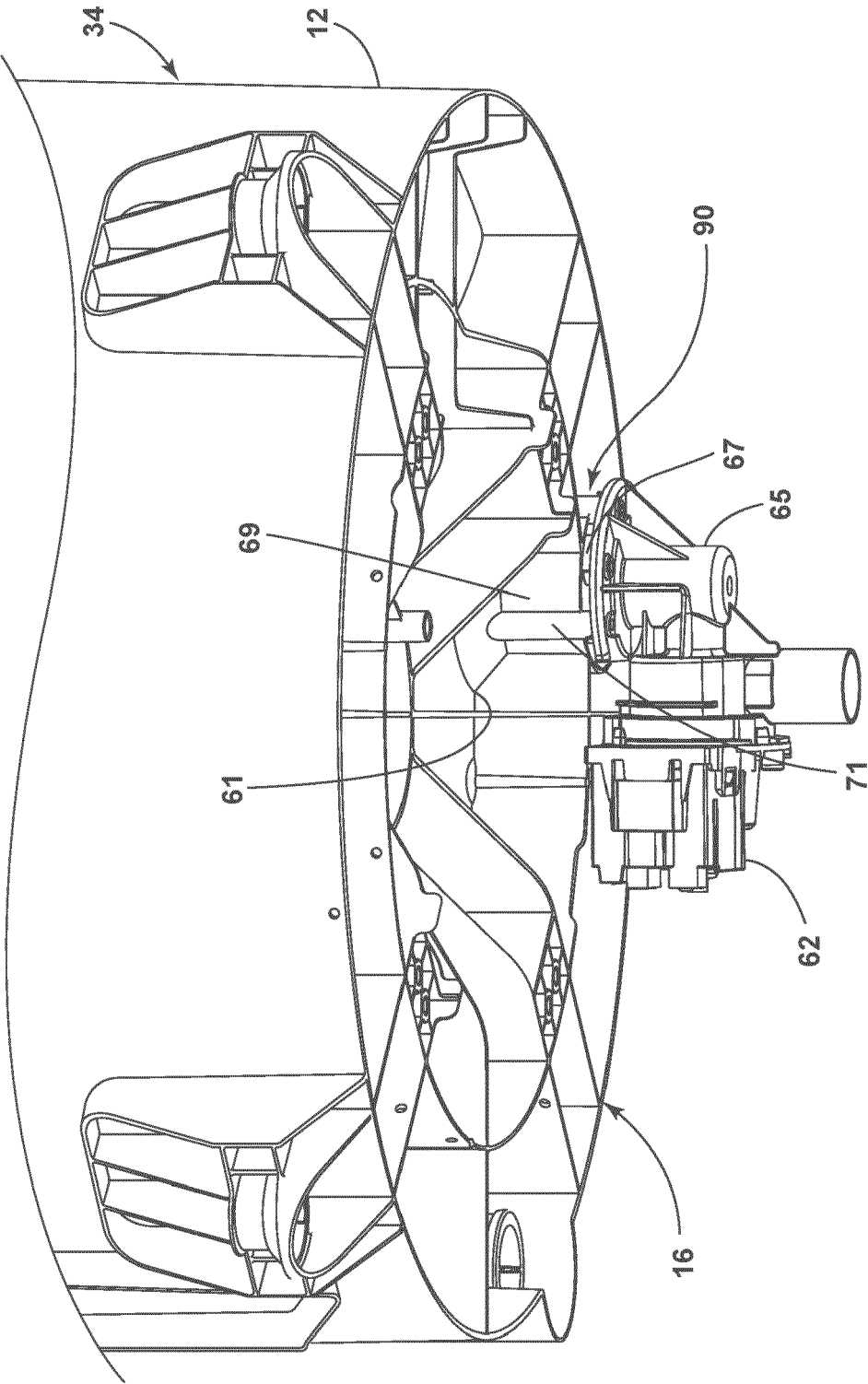


FIG. 3

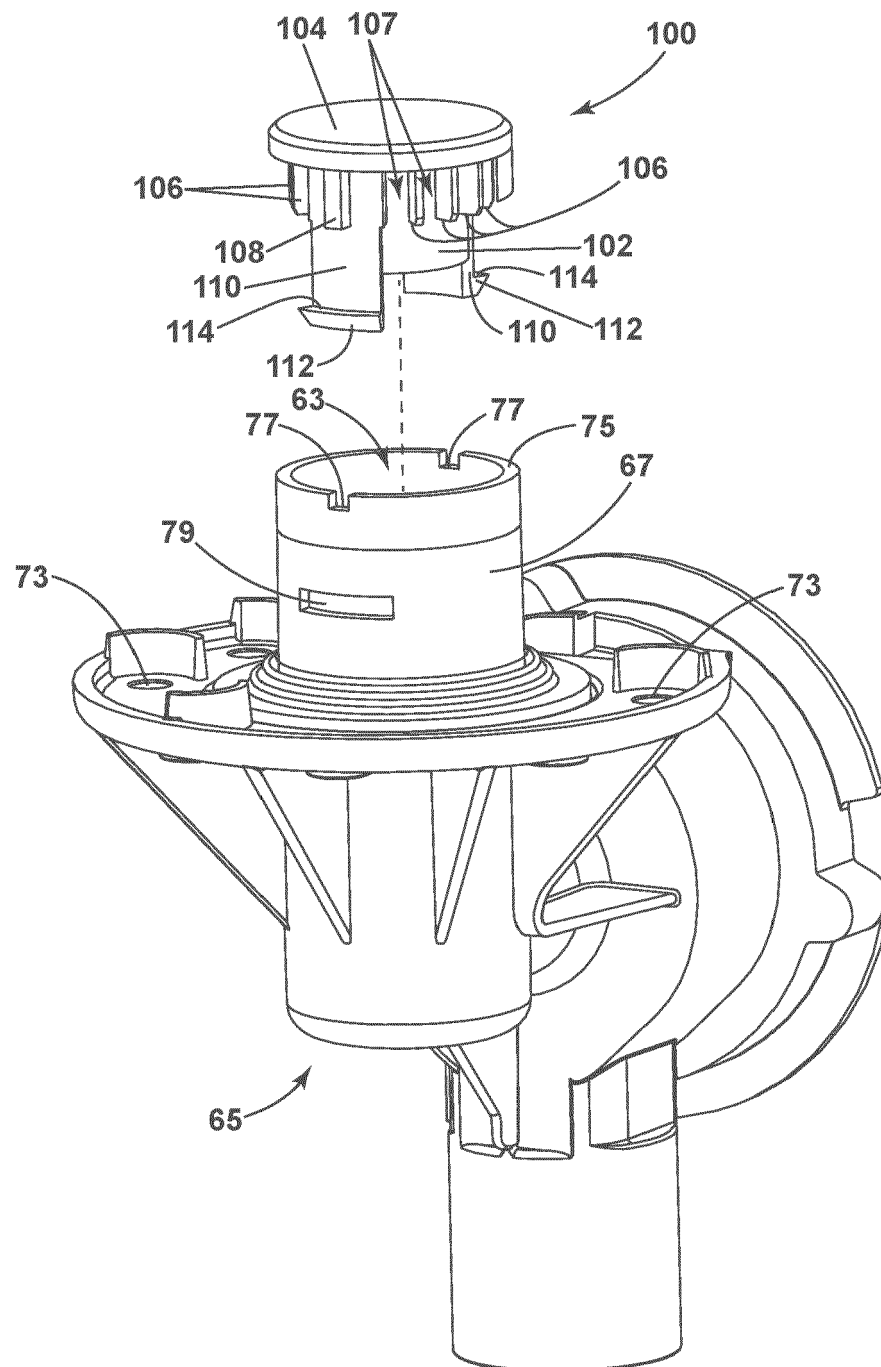


FIG. 4

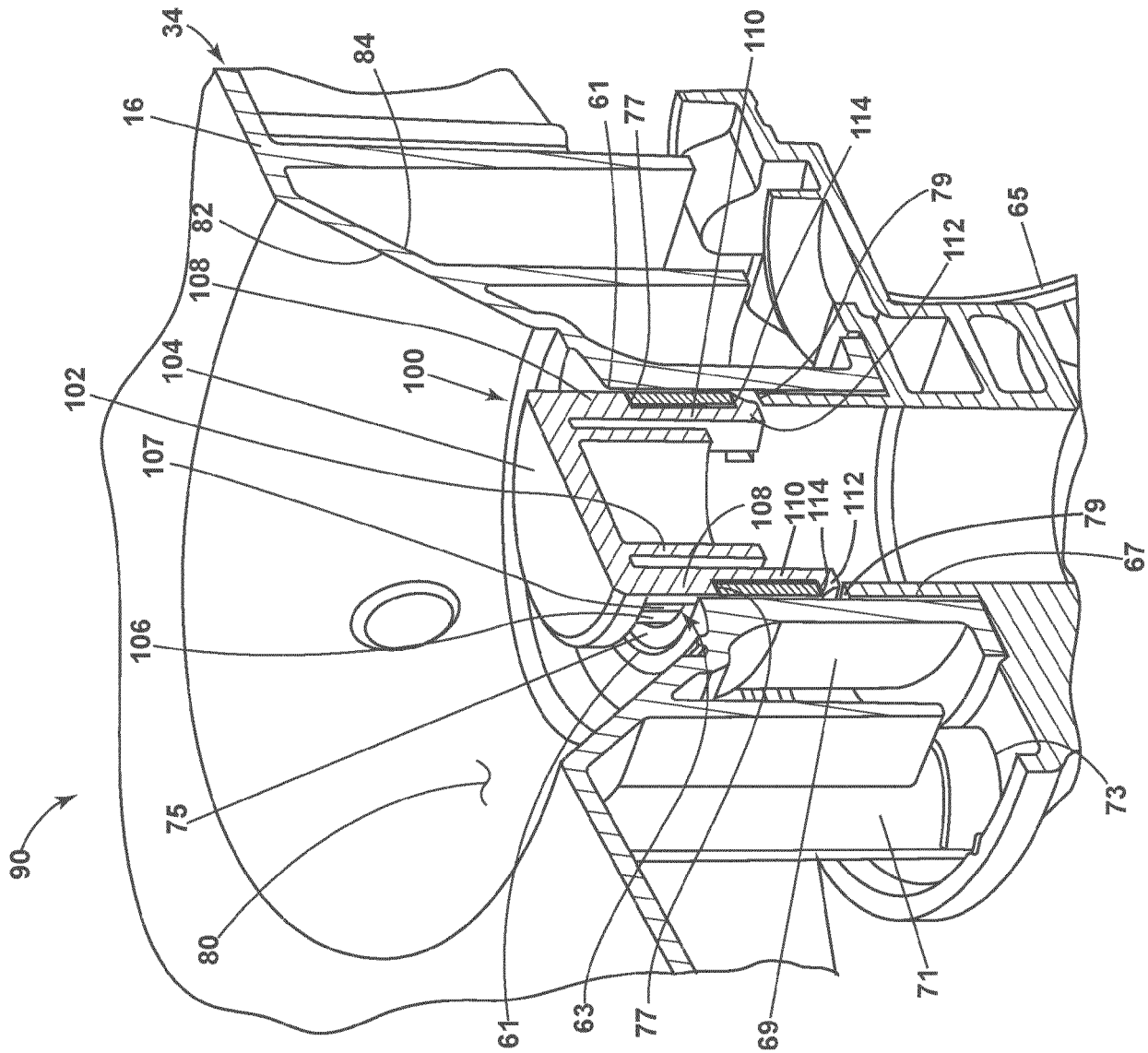


FIG. 5

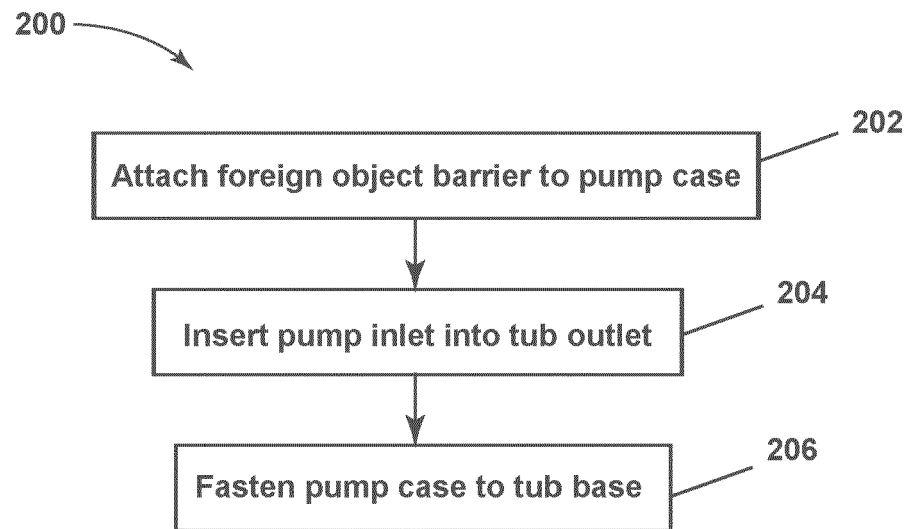


FIG. 6



EUROPEAN SEARCH REPORT

Application Number

EP 23 15 6162

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 0 534 381 A1 (WHIRLPOOL EUROP [NL]) 31 March 1993 (1993-03-31) * figures 1-3 * -----	1-7, 11, 13	INV. D06F37/26 D06F39/08 D06F39/10
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) D06F
Place of search Munich		Date of completion of the search 11 July 2023	Examiner Werner, Christopher
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			

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 23 15 6162

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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11-07-2023

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