(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 749 686 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.07.2014 Bulletin 2014/27

(51) Int Cl.:
D06F 39/08 *(2006.01)* ***A47L 15/42*** *(2006.01)*

(21) Application number: **13194156.9**

(22) Date of filing: **22.11.2013**

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **27.12.2012 KR 20120154985**

(71) Applicant: **Dongbu Daewoo Electronics Corporation**
Seoul 100-031 (KR)

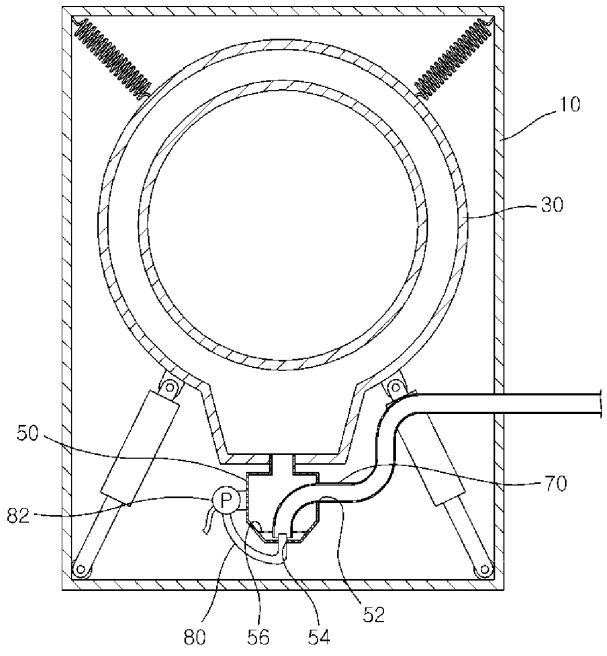
(72) Inventor: **Kim, In Dong**
Seoul (KR)

(74) Representative: **Michalski Hüttermann & Partner Patentanwälte**
Speditionstraße 21
40221 Düsseldorf (DE)

(54) Drain device for washing machine

(57) A drain device for a washing machine includes a water storage unit (50) connected to a tub (30) and configured to receive wash water discharged from the tub; a drain pipe (70) connected to the water storage unit and extending to an outside of a cabinet (10); and a supply pipe (80) connected to the water storage unit and guiding external air to an inlet (72) of the drain pipe.

FIG. 1



EP 2 749 686 A1

Description

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] The present application claims priority to Korean application number 10-2012-0154985, filed on December 27, 2012, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a drain device for a washing machine, and more particularly, to a drain device for a washing machine, which is capable of reducing the amount of wash water remaining in the washing machine after a washing process has ended.

[0003] A general washing machine includes a cabinet, a tub in the cabinet and capable of storing wash water, a drum rotatably installed in the tub and capable of containing laundry therein, a driving unit rotating the drum to perform a washing process, a water supply device supplying wash water to the tub, and a drain device discharging wash water from the tub to the outside of the cabinet after the washing process has ended.

[0004] When a user puts laundry items into the drum and starts a washing process, the water supply device supplies wash water into the tub. When the wash water supply operation is completed, the washing process is performed while the drum is rotated by operation of the driving unit.

[0005] After the washing process has ended, the drain device is operated to discharge the wash water from the tub to the outside of the cabinet.

[0006] The related art of the present invention is disclosed in Korean Patent Laid-open Publication No. 10-2008-0100542 published on November 19, 2008 and titled "Drain device for drum washing machine and control method thereof".

[0007] Since the conventional washing machine drain device includes a pump installed on a drain pipe extending from the tub, and the drain pipe bends upward, wash water may remain in the drain pipe even though the drain process or operation has ended. Thus, bacteria may breed, or a bad smell may occur.

[0008] Therefore, there is a demand for a structure capable of solving such a problem.

SUMMARY OF THE INVENTION

[0009] Embodiments of the present invention are directed to a drain device for a washing machine, which is capable of reducing the amount of wash water remaining in the washing machine after a washing process has ended.

[0010] In one embodiment, a drain device for a washing machine includes a water storage unit connected to a tub (e.g., of the washing machine) and configured to receive wash water from the tub; a drain pipe connected to the water storage unit and extending to the outside of a cabinet (e.g., of the washing machine); and a supply pipe connected to the water storage unit and guiding external air to an inlet of the drain pipe.

[0011] The water storage unit may have a first insertion hole at a side surface thereof, the drain pipe passing through the first insertion hole, and a second insertion hole at a bottom or lowermost surface thereof, the supply pipe passing through the second insertion hole.

[0012] The water storage unit may be under the tub.

[0013] The drain device may further include a pump configured to introduce external air into the inlet of the drain pipe through the supply pipe.

[0014] The water storage unit may include a support configured to fix the inlet of the drain pipe (e.g., in a general or predetermined location).

[0015] The supply pipe may have an outer diameter less than an inner diameter of the drain pipe, and may be partially inserted into the inlet of the discharge pipe.

[0016] The drain device may further include a pump that pumps and/or forces the external air through the drain pipe.

[0017] In another embodiment, a drain device for a washing machine includes a water storage unit connected to a tub (e.g., of the washing machine) and configured to receive wash water from the tub; a drain pipe receiving external air and extending through the water storage unit to the outside of a cabinet (e.g., of the washing machine); and a diverging pipe inside the water storage unit, the diverging pipe diverging from the drain pipe and guiding wash water in the water storage unit to the drain pipe.

[0018] The drain pipe may pass into the water storage unit through a bottom or lowermost surface of the water storage unit, and extend to the outside of the water storage unit through a side surface of the water storage unit.

[0019] The diverging pipe may extend toward the bottom or lowermost surface of the water storage unit.

[0020] The diverging pipe may be at an angle of $\geq 15°$ to $\leq 85°$ with respect to the drain pipe. Preferably the angle is $\geq 30°$ to $\leq 80°$ more preferred $\geq 45°$ to $\leq 75°$ and most preferred $\geq 57°$ to $\leq 63°$.

[0021] The drain device may further include a pump that pumps and/or forces the external air through the drain pipe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is a diagram illustrating a washing machine including an exemplary drain device in accordance with an embodiment of the present invention.

[0023] FIG. 2 is a cross-sectional view of the exemplary drain device for a washing machine in accordance with one or more embodiments of the present invention.

[0024] FIG. 3 is a cross-sectional view of another exemplary drain device for a washing machine in accordance with one or more other embodiments of the present invention.

DESCRIPTION OF SPECIFIC EMBODIMENTS

[0025] Embodiments of the invention will hereinafter be described in detail with reference to the accompanying drawings. It should be noted that the drawings are not necessarily to precise scale and may be exaggerated in thickness of lines or sizes of components for descriptive convenience and clarity only. Furthermore, the terms as used herein may be defined by taking functions of the invention into account and can be changed according to the custom or intention of users or operators. Therefore, any definition of the terms should be made according to the overall disclosures set forth herein.

[0026] FIG. 1 is a diagram illustrating a washing machine including an exemplary drain device in accordance with embodiment(s) of the present invention. FIG. 2 is a cross-sectional view of the exemplary drain device for a washing machine in accordance with embodiment(s) of the present invention.

[0027] Referring to FIGS. 1 and 2, the exemplary drain device for a washing machine in accordance with embodiment(s) of the present invention includes a water storage unit 50, a drain pipe 70, and a supply pipe 80.

[0028] The water storage unit 50 is connected to a tub 30. Thus, wash water discharged from the tub 30 is received by and temporarily stored in the water storage unit 50. For example, the wash water discharged from the tub 30 may flow through the water storage unit 50. The drain pipe 70 is connected to a side surface of the water storage unit 50 and extends to the outside of the cabinet 10. The supply pipe 80 is connected to the bottom or lowermost surface of the water storage unit 50, and guides external air to an inlet 72 of the drain pipe 70. The external air is introduced into the inlet 72 of the drain pipe 70 through the supply pipe 80 by operation of a pump 82.

[0029] The water storage unit 50 is under the tub 30 and configured to communicate with (e.g., receive wash water discharged from) the tub 30. Thus, wash water discharged from the tub 30 is flows into and may be stored in the water storage unit 50, and is then discharged to the outside of the cabinet 10 along the drain pipe 70 extended to the outside of the cabinet 10 from the water storage unit 50.

[0030] The external air supplied through the supply pipe 80 by the operation of the pump 82 is output to the inlet 72 of the drain pipe 70. As the external air is pumped to the inlet 72, foam or air bubbles are formed in the wash water that enters the drain pipe 70.

[0031] Since the foam or air bubbles tend to rise within the wash water, the wash water is pushed upward by the rising foam or air bubbles. As the wash water is pushed upward by the rising foam or air bubbles, the wash water is introduced to the inlet 72 of the drain pipe 70. Then, the wash water flows through the discharge pipe 70 and discharged to the outside of the cabinet 10.

[0032] Furthermore, when high-pressure external air is pumped through the supply pipe 80 into the discharge pipe 70, a large amount of wash water and air bubbles can be introduced into the drain pipe 70. Thus, a Venturi effect may occurs because the pressure at the inlet 72 of the drain pipe 70 is lower than the internal pressure of the drain pipe 70.

[0033] Thus, the wash water in the water storage unit 50 is taken up through the inlet 72 of the discharge pipe 70 due to the Venturi effect, and is then discharged to the outside of the cabinet 10 along the drain pipe 70.

[0034] The water storage unit 50 has a first insertion hole 52 in a side surface thereof, into which the drain pipe 70 is inserted and/or through which the drain pipe 70 passes. The water storage unit 50 also has a second insertion hole 54 at the bottom or lowermost surface of the water storage unit 50, into which the supply pipe 80 is inserted and/or through which the supply pipe 80 passes. There may be a sealing member between each of (1) the drain pipe 70 and the first insertion hole 52 and (2) the supply pipe 80 and the second insertion hole 54 to inhibit or block leakage of water out of the water storage unit 50.

[0035] When the washing machine is seen from the front side (based on and/or looking straight at FIG. 2), the outlet of the supply pipe 80 is inserted upward from the bottom surface of the water storage unit 50 through the second insertion hole 54 (and/or any seal or other sealing member therein). Thus, the external air supplied through the supply pipe 80 passes through the wash water in the water storage unit 50, and air bubbles may be formed in the wash water.

[0036] For example, since the external air is supplied from the bottom of the water storage unit 50, the external air may pass through the wash water even when a small amount of wash water is in the water storage unit 50. That is, since an area and/or location of the water storage unit 50 in which wash water collects corresponds to the area and/or location of the water storage unit 50 in which external air passes, foam or air bubbles may be easily formed in the wash water, even though only a small amount of wash water is in the water storage unit 50.

[0037] The inlet 72 to the drain pipe 70 is inserted into the side surface of the storage unit 50 through the first insertion hole 52 (and/or any seal or other sealing member therein). The drain pipe 70 extends in a downward direction, and the inlet 72 of the drain pipe 70 reaches the vicinity of the bottom or lowermost surface of the water storage unit 50. The supply pipe 80 is inserted through the second insertion hole 54 in the bottom surface of the water storage unit 50 until an outlet 81 of the supply pipe 80 enters the water storage unit 50.

[0038] In one embodiment, the outlet 81 of the supply pipe 80 is inserted into the inlet 72 of the drain pipe 70. As a result, external air supplied to the bottom of the water storage unit 50 through the supply pipe 80 is transferred to the inlet 72 of the drain pipe 70 through the outlet 81 of the supply pipe 80. Then, the external air is discharged to the outside of the water storage unit 50 while moving or flowing along the drain pipe 70.

[0039] The water storage unit 50 includes a support 56

to fix, hold or secure the inlet 72 of the drain pipe 70 in place over the outlet 81 of the supply pipe 80. Specifically, the support 56 is fixed to an inner surface of the water storage unit 50 and connected to the inlet 72 of the drain pipe 70. Thus, the pressure of the external air passing through the supply pipe 80 may prevent the discharge pipe 70 from moving or dislodging, and may maintain the inlet 72 of the drain pipe 70 over and/or surrounding the outlet 81 of the supply pipe 80 (e.g., the outlet 81 of the supply pipe 80 remains in the inlet 72 of the drain pipe 70). The support 56 may have one or more holes or openings (e.g., a plurality of holes or openings) therein to allow the wash water to pass through to the inlet 72 of the drain pipe 70. In various embodiments, the hole(s) or opening(s) occupy for 20 to 80% of the surface area of the support 56, or any percentage or percentage range therein (e.g., from 30 to 70%, from 35 to 60%, about 50%, etc.).

[0040] The supply pipe 80 has an outer diameter smaller than the inner diameter of the drain pipe 70, and may be inserted into the inlet 72 of the drain pipe 70.

[0041] Thus, when the external air pumped through the supply pipe 80 is supplied to the drain pipe 70, wash water is introduced into the drain pipe 70 through a gap between the supply pipe 80 and the drain pipe 70. Then, the wash water is removed from the water storage unit 50 (e.g., by vacuum and/or aspiration) along the drain pipe 70 and is then discharged to the outside of the cabinet 10.

[0042] The operation of the drain device for a washing machine in accordance with embodiment(s) of the present invention will be described as follows.

[0043] When a washing process ends, the pump 82 is operated or turned on to supply external air through the supply pipe 80. The external air pumped through the supply pipe 80 (e.g., at a relatively high rate or velocity, such as 50-100 km/hour, or possibly higher) is transferred to the drain pipe 70 and then discharged to the outside of the cabinet 10 along the drain pipe 70.

[0044] The external air supplied through the supply pipe 80 may form foam and/or air bubbles in the wash water in the water storage unit 50. The foam and/or air bubbles push and/or pull the wash water at the inlet 72 of the drain pipe 70 upward, and the wash water enters the drain pipe 70 and/or the inlet 72 thereof. Then, the wash water is discharged to the outside of the cabinet 10 through the drain pipe 70. As such, the wash water in the water storage unit 50 may be easily discharged to the outside through the drain pipe 70.

[0045] Furthermore, when the external air supplied through the supply pipe 80 is output into the drain pipe 70, the pressure at the inlet 72 of the drain pipe 70 becomes lower than the internal pressure of the drain pipe 70 (e.g., due to the smaller cross-sectional area at the inlet 72 available for wash water and/or air to enter the drain pipe 70 from the water storage unit 50 than in the remainder of the drain pipe 70). Thus, wash water in the vicinity of the inlet 72 of the drain pipe 70 is pulled into the inlet 72 of the drain pipe 70, perhaps due to the Venturi effect and/or aspiration. Then, the wash water introduced into the drain pipe 70 is discharged to the outside of the cabinet 10 after moving through the discharge pipe 70.

[0046] Through the above-described operation, wash water in the water storage unit 50 flowing to the bottom of the discharge pipe 70, or specifically, the bottom of the inlet 72, is discharged to the outside through the drain pipe 70. Thus, it is possible to reduce the amount of wash water remaining in the tub 30 or/and the water storage unit 50. Furthermore, it is also possible to reduce the amount of wash water remaining in the drain pipe 70.

[0047] FIG. 3 is a cross-sectional view of an exemplary drain device for a washing machine in accordance with one or more other embodiment(s) of the present invention.

[0048] Referring to FIG. 3, the exemplary drain device for a washing machine in accordance with embodiment(s) of the present invention includes a water storage unit 150, a diverging pipe 170, and a drain pipe 180.

[0049] The water storage unit 150 is connected to the tub 130, and receives and/or stores wash water discharged from the tub 130. In one embodiment, the water storage unit 150 allows wash water from the tub 130 to flow through it, into the diverging pipe 170 and/or drain pipe 180.

[0050] The drain pipe 180 receives external air, passes through the water storage unit 150, and extends to the outside of the cabinet 10 (refer to FIG. 1). The drain pipe 180 passes into the water storage unit 150 through the bottom or lowermost surface of the water storage unit 150, and extends to the outside of the water storage unit 150 through a side surface of the water storage unit 150.

[0051] The diverging pipe 170 diverges or splits from the drain pipe 180 inside the water storage unit 150, and guides wash water in the water storage unit 150 toward the drain pipe 180. Specifically, the diverging pipe 170 diverges from the drain pipe 180 and extends toward the bottom of the water storage unit 150.

[0052] When a washing process ends, the pump 182 is operated or turned on to discharge external air to the outside of the cabinet 10 through the drain pipe 180.

[0053] The pressure at the inlet of the diverging pipe 170 becomes lower than the internal pressure of the discharge pipe 180 as a result of the air passing through the discharge pipe 180. Consequently, wash water in the water storage unit 150 enters the diverging pipe 170 and passes into the discharge pipe 180. Then, the wash water passing into the drain pipe 180 moves or flows along the drain pipe 180 and is discharged to the outside of the cabinet 10.

[0054] While wash water enters into the drain pipe 180 through the diverging pipe 170, foam or air bubbles may be formed in the wash water. The foam or air bubbles push and/or pull the wash water at the inlet of the diverging pipe 170 upward, and the wash water enters the inlet of the diverging pipe 170. Then, the wash water is guided to the drain pipe 180 through the diverging pipe 170 and discharged to the outside of the washing machine

through the drain pipe 180.

[0055] In some embodiments, the diverging pipe 170 has a smaller diameter than that of the drain pipe 180. Also, in additional or alternative embodiments, the inlet of the diverging pipe 170 is below the outlet of the diverging pipe 170 where it joins the drain pipe 180. In further or other embodiments, the diverging pipe 170 is at an angle of 15° to 85° with respect to the drain pipe 180, or any angle or range of angles therein (e.g., 30° to 80°, 45° to 75°, about 60°, etc.).

[0056] Thus, it is possible to reduce the amount of wash water remaining in the washing machine, or specifically, the tub 130 and/or the water storage unit 150, after a washing operation ends.

[0057] In accordance with embodiments of the present invention, the drain device injects external air into the drain pipe to perform and/or facilitate a process of draining wash water from the tub. Since foam and/or air bubbles may be formed in the drain pipe, wash water may be effectively discharged through the buoyancy of the foam and/or air bubbles. As the pressure of the inlet of the drain pipe decreases (e.g., due to a local vacuum, aspiration, and/or the Venturi effect), the wash water may be more effectively discharged. Therefore, the amount of wash water remaining in the drain pipe may be reduced.

[0058] Embodiments of the present invention have been disclosed above for illustrative purposes. Those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

[0059] In embodiments of the present invention, the drain device for a washing machine has been taken as an example for description. However, this is only an example, and the drain device for a washing machine in accordance with the disclosed embodiments of the present invention may be applied to other products.

Claims

1. A drain device for a washing machine, comprising:

   a water storage unit connected to a tub and configured to receive wash water discharged from the tub;
   a drain pipe connected to the water storage unit and extending to an outside of a cabinet; and
   a supply pipe connected to the water storage unit and guiding external air to an inlet of the drain pipe.

2. The drain device of claim 1, wherein the water storage unit has a first insertion hole at a side surface thereof, and a second insertion hole at a bottom or lowermost surface thereof, wherein the drain pipe passes through the first insertion hole, and the supply pipe passes through the second insertion hole.

3. The drain device of claim 1 or 2, wherein the water storage unit is under the tub.

4. The drain device of any of the claims 1 to 3, further comprising a pump configured to introduce the external air through the supply pipe and into the inlet of the drain pipe.

5. The drain device of any of the claims 1 to 4, wherein the water storage unit comprises a support configured to fix the inlet of the drain pipe.

6. The drain device of any of the claims 1 to 5, wherein the supply pipe has an outer diameter less than an inner diameter of the drain pipe, and is at least partially in the inlet of the discharge pipe.

7. The drain device of any of the claims 1 to 6, further comprising a pump that pumps and/or forces the external air through the drain pipe.

8. A drain device for a washing machine, comprising:

   a water storage unit connected to a tub and configured to receive wash water discharged from the tub;
   a drain pipe receiving external air and extending through the water storage unit to an outside of a cabinet; and
   a diverging pipe inside the water storage unit, the diverging pipe diverging from the drain pipe and guiding wash water in the water storage unit to the drain pipe.

9. The drain device of claim 8, wherein the drain pipe passes into the water storage unit through a bottom or lowermost surface of the water storage unit, and extending outside of the water storage unit through a side surface of the water storage unit.

10. The drain device of claim 8 or 9, wherein the diverging pipe extends toward the bottom or lowermost surface of the water storage unit.

11. The drain device of any of the claims 8 to 10, wherein the diverging pipe is at an angle of $\geq 15°$ to $\leq 85°$ with respect to the drain pipe.

12. The drain device of any of the claims 8 to 11, further comprising a pump that pumps and/or forces the external air through the drain pipe.

FIG. 1

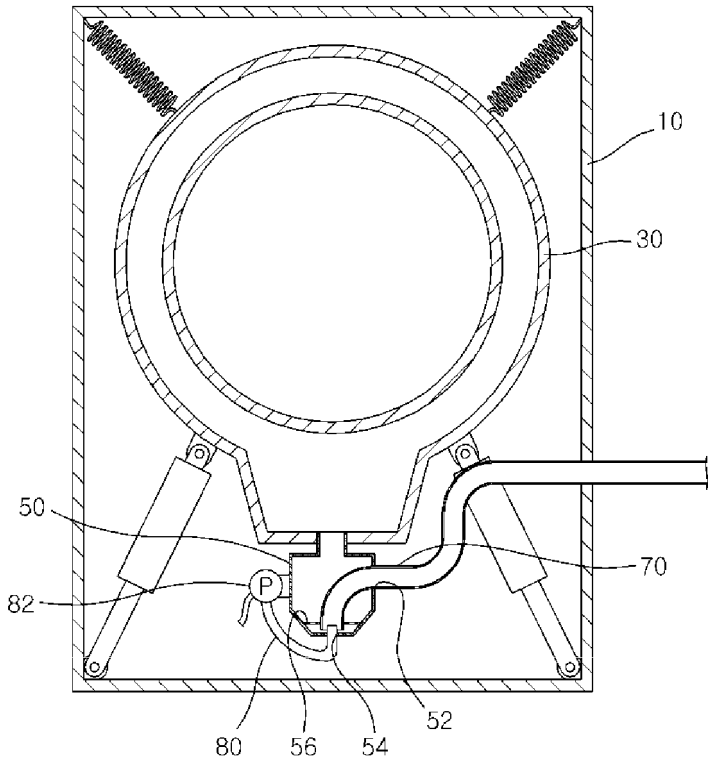


FIG. 2

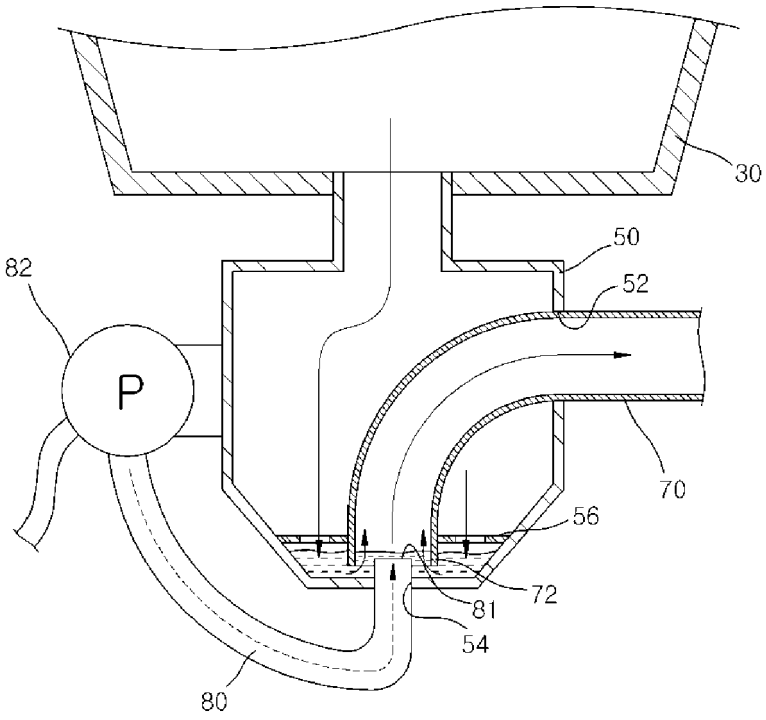
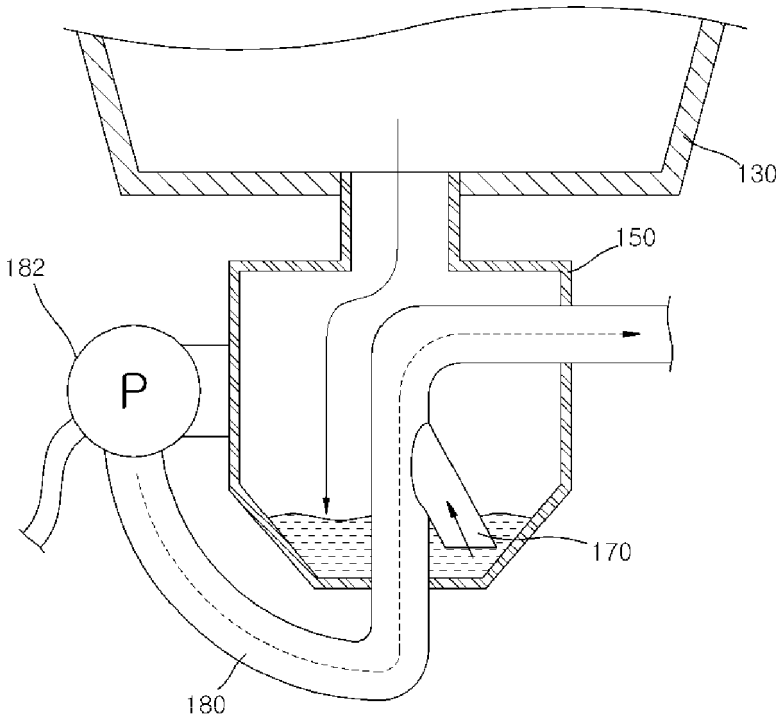


FIG. 3



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 13 19 4156

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	DE 80 08 161 U1 (LICENTIA PATENTVERWALTUNGS GMBH) 18 September 1980 (1980-09-18) * page 7, paragraph 1-2 * * page 8, paragraph 1 * * page 9, paragraph 2 * * figures 1-3 * -----	1-12	INV. D06F39/08 A47L15/42
A	EP 0 437 735 A1 (MIELE & CIE [DE]) 24 July 1991 (1991-07-24) * column 2, line 41 - column 3, line 17 * * column 3, lines 30-54 * * figures 1, 2 * -----	1-12	

TECHNICAL FIELDS SEARCHED (IPC)

D06F
A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 March 2014	Weidner, Maximilian

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 19 4156

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-03-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 8008161 U1	18-09-1980	NONE	
EP 0437735 A1	24-07-1991	DE 3942979 A1	27-06-1991
		EP 0437735 A1	24-07-1991
		ES 2051446 T3	16-06-1994

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 1020120154985 **[0001]**
- KR 1020080100542 **[0006]**