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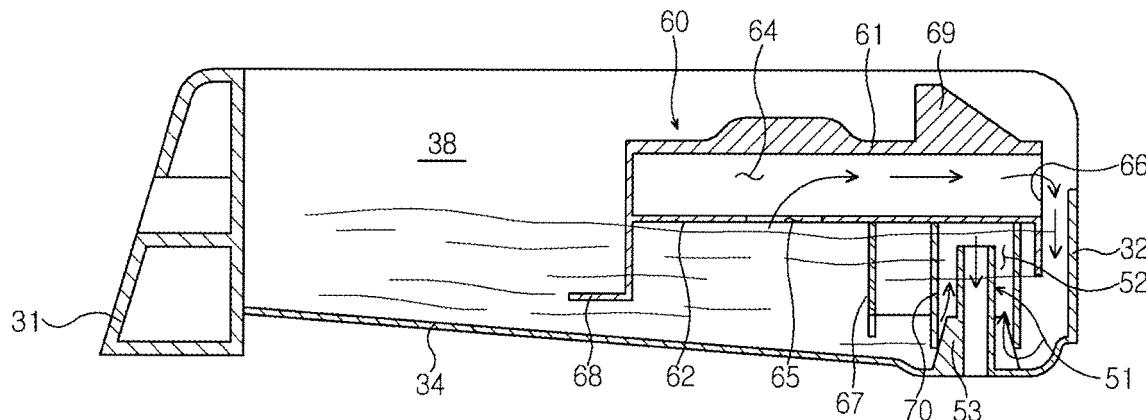
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### (54) Detergent supply apparatus for a washing machine

(57) A detergent supply apparatus (20) for a washing machine, which prevents water, which is not discharged from a detergent tub (30) through a siphon unit (50), from overflowing the detergent tub (30) and being discharged to the outside of the washing machine. The siphon unit (50) includes a siphon pipe (51) formed on a bottom (34) of a chamber (38) of the detergent supply apparatus (20),

and a cover member (60) installed above the siphon pipe (51). The cover member (60) includes a siphon cap (70) surrounding an outer circumferential surface of the siphon pipe (51) so that a siphon channel (52) is provided between the siphon pipe (51) and the siphon cap (70), and a bypass channel (64) for circulating water overflowing the siphon channel (52) to the siphon channel (52).

Fig.4



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**Description****BACKGROUND OF THE INVENTION****1. Field of the Invention**

**[0001]** The present invention relates to a detergent supply apparatus of a washing machine. More particularly, to a detergent supply apparatus of a washing machine which prevents water supplied to a detergent tub having a siphon unit installed therein from overflowing the detergent tub and being discharged to an outside of the washing machine.

**2. Description of the Related Art**

**[0002]** Generally, a conventional washing machine washes laundry using water, which is supplied through a water supply apparatus, is mixed with a detergent by a detergent supply apparatus, and is supplied to a tub of the washing machine.

**[0003]** Japanese Patent Laid-open Publication No. Hei-sei 11-290581 discloses a drum washing machine including a tub for containing washing water, and a water supply apparatus and a detergent supply apparatus installed above the tub for supplying the washing water mixed with a detergent to the tub.

**[0004]** The detergent supply apparatus includes a detergent case provided with an opened front surface and installed in a housing, and a detergent tub slidably attached to and detached from the detergent case. Partitions are installed in a longitudinal direction in the detergent tub, thereby dividing the detergent tub into a plurality of chambers.

**[0005]** The chambers include chambers for storing liquids, such as a liquid detergent and a rinsing solution, and a chamber for storing a powdered detergent. A siphon unit is installed in each of the chambers for storing liquids, thereby allowing the stored liquid together with the washing water to be effectively supplied to the tub.

**[0006]** The siphon unit includes a siphon pipe orthogonally extended from the bottom of the corresponding chamber, and a siphon cap covering the siphon pipe. A siphon channel defining a small gap is formed between the siphon pipe and the siphon cap. Water containing a detergent solution or a rinsing solution stored in the chamber is discharged to the tub through the siphon channel.

**[0007]** Since the siphon channel of the above conventional detergent supply apparatus defines a comparatively small gap, when a large amount of water is suddenly supplied to the chamber, the water containing the detergent solution or the rinsing solution cannot be discharged to the tub through the siphon channel and thus overflows the chamber, thereby being discharged to the outside of the washing machine. Thereby, the water overflowing the chamber contaminates environment of a place on which the washing machine is installed, thus deteriorat-

ing the quality of the washing machine.

**SUMMARY OF THE INVENTION**

**5** **[0008]** Accordingly, it is an aspect of the present invention to provide a detergent supply apparatus of a washing machine, which prevents water, which is not discharged from a detergent tub through a siphon unit, from overflowing the detergent tub and being discharged to an outside of the washing machine when washing water is supplied to the detergent tub having the siphon unit for supplying a detergent solution or a rinsing solution to a tub.

**[0009]** Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the invention.

**[0010]** The foregoing and/or other aspects of the present invention are achieved by providing a detergent supply apparatus of a washing machine comprising a detergent tub having a plurality of chambers and a siphon unit installed in at least one of the plurality of the chambers, wherein the siphon unit includes a siphon pipe formed on the bottom of the chamber, and a cover member installed above the siphon pipe, and comprising a siphon cap surrounding an outer circumferential surface of the siphon pipe such that a siphon channel is installed between the siphon pipe and the siphon cap, and a bypass channel for circulating water overflowing the siphon channel, to the siphon channel.

**[0011]** The cover member further includes an upper plate, a lower plate, and a front plate connecting the upper plate and the lower plate wherein a rear surface of the cover member is opened, and the bypass channel may be provided between the upper plate and the lower plate.

**[0012]** The siphon cap is downwardly extended from a rear end of the lower plate, and at least one bypass hole connected to the bypass channel is formed through a front portion of the lower plate so that a liquid, which is not discharged to the siphon pipe, is supplied to the bypass channel through the bypass hole and is circulated to the siphon pipe through the opened rear surface of the cover member.

**[0013]** The cover member further includes a barrier extended from the lower plate between the siphon cap and the bypass hole towards the bottom of the chamber so as to prevent the sudden overflowing of the liquid.

**[0014]** The cover member further includes an indicator extended downwardly from the front plate such that the indicator is separated from the bottom of the chamber by a designated interval so as to restrict the maximum supply amount of a detergent solution or a rinsing solution.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**55** **[0015]** These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodi-

ments, taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic view illustrating a drum washing machine having a detergent supply apparatus in accordance with an embodiment of the present invention;

FIG. 2 is an exploded perspective view illustrating the detergent supply apparatus of the present invention having a detergent tub and a siphon unit in accordance with an embodiment of the present invention;

FIG. 3 is a perspective view illustrating a cover member of the siphon unit shown in FIG.

2; and

**[0016]** FIG. 4 is a sectional view taken along the line IV-IV of FIG. 2.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0017]** Reference will now be made in detail to the embodiment of the present invention, an example of which is illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiment is described below to explain the present invention by referring to the figures.

**[0018]** FIG. 1 is a schematic view illustrating a drum washing machine having a detergent supply apparatus in accordance with an embodiment of the present invention. As shown in FIG. 1, the drum washing machine of the present invention comprises a housing 1 defining the external appearance of the washing machine, a tub 2 installed in the housing 1 for containing washing water, a rotary drum 3 rotatably disposed in the tub 2 so that laundry in the rotary drum 3 can be washed, and a door 4 hinged to the front surface of the housing 1.

**[0019]** A water supply apparatus 10 and a detergent supply apparatus 20 for respectively supplying washing water and detergent to the tub 2 are installed above the tub 2, and a drain pipe 5 and drain pump 6 for discharging the washing water contained in the tub 2 to the outside of the housing 1 when the washing of the laundry is completed are installed below the tub 2.

**[0020]** The water supply apparatus 10 comprises a plurality of water supply valves 11 and a plurality of water supply pipes 12, thereby supplying the washing water to the detergent supply apparatus 20 and the tub 2.

**[0021]** The detergent supply apparatus 20 comprises a detergent case 21 fixedly installed in an upper portion of the housing 1 and provided with an opened front surface, and a detergent tub 30 slidably attached to and detached from the detergent case 21 through the opened front surface of the detergent case 21, thereby supplying a detergent and a rinsing solution to the tub 2.

**[0022]** FIG. 2 illustrates the detergent tub 30 of the detergent supply apparatus 20 in a state in which a siphon

unit 50 is disassembled from the detergent tub 30, FIG. 3 illustrates a cover member 60 of the siphon unit 50, and FIG. 4 illustrates the detergent tub 30 of the detergent supply apparatus 20 in a state in which the siphon unit 50 is assembled with the detergent tub 30.

**[0023]** As shown in FIG. 2, the detergent tub 30, which is slidably attached to and detached from the detergent case 21 (see FIG. 1), comprises a front hand grip portion 31, a rear plate 32, side plates 33, and a bottom plate 34 so that the detergent and the rinsing solution can be put into the detergent tub 30, and the upper portion of the detergent tub 30 is opened.

**[0024]** The detergent tub 30 further comprises a plurality of partitions 35, which are vertically installed on the bottom plate 34, for dividing the detergent tub 30 into a plurality of storage chambers and are provided with both ends, respectively connected to the front hand grip portion 31 and the rear plate 32. Accordingly, the detergent tub 30 is divided into a preliminary detergent chamber 36, a main detergent chamber 37, and a rinsing solution chamber 38.

**[0025]** The preliminary detergent chamber 36 and the main detergent chamber 37 store powdered detergents, and sequentially supply the detergents to the tub 2 according to the washing procedure. The rinsing solution chamber 38 stores a rinsing solution, such as a fabric softener, and supplies the rinsing solution to the tub 2.

**[0026]** The bottom plate 34 of the detergent tub 30 is slanted such that a height of the bottom plate 34 is decreased from the front hand grip portion 31 to the rear plate 32. Thereby, the powdered detergents stored in the preliminary detergent chamber 36 and the main detergent chamber 37 and the rinsing solution stored in the rinsing solution chamber 38 are mixed with the water supplied from the upper part of the detergent case 21 (see FIG. 1) to the detergent tub 30, and the water containing the detergents and the rinsing solution flows down to a lower part of the detergent tub 30.

**[0027]** Discharge holes 39 are formed through the rear plate 32 at positions corresponding to the preliminary detergent chamber 36 and the main detergent chamber 37, thereby supplying the water containing the detergents from the preliminary detergent chamber 36 and the main detergent chamber 37 to the tub 2 through the lower part of the detergent case 21.

**[0028]** The siphon unit 50 for supplying the rinsing solution stored in the rinsing solution chamber 38 to the tub 2 using a siphon phenomenon is installed in the rear portion of the rinsing solution chamber 38.

**[0029]** The preliminary detergent chamber 36 and the main detergent chamber 37 store a liquid detergent or another rinsing solution. In this case, the siphon unit 50 may be installed in the preliminary detergent chamber 36 and the main detergent chamber 37.

**[0030]** The siphon unit 50 comprises a siphon pipe 51 upwardly extended from the bottom plate 34 at a position close to the rear plate 32, and the cover member 60 for generating a siphon phenomenon together with the si-

phon pipe 51.

**[0031]** The siphon pipe 51 comprises a circular cross section having a designated diameter, and is disposed vertically from the bottom plate 34 at a height slightly lower than that of the detergent tub 30. The siphon pipe 51 allows the rinsing solution stored in the rinsing solution chamber 38 to be mixed with the water supplied from the upper part of the detergent case 21 and the obtained mixture to be supplied to the lower part of the detergent case 21.

**[0032]** In FIG. 3, the cover member 60 comprises an upper plate 61, a lower plate 62, a front plate 63 connecting the upper plate 61 and the lower plate 62, thereby forming a bypass channel 64 between the upper plate 61 and the lower plate 62. An opening 66 for discharging a liquid, supplied to the bypass channel 64, from the cover member 60 is formed through the rear portion of the bypass channel 64.

**[0033]** The cover member 60 further comprises a siphon cap 70 downwardly extended from the rear end of the lower plate 62, and a plurality of bypass holes 65 formed through the front end of the lower plate 62.

**[0034]** In FIG. 4, the siphon cap 70 has a circular cross section having a diameter slightly larger than an outer diameter of the siphon pipe 51, and surrounds the outer circumferential surface of the siphon pipe 51 under the condition that the outer circumferential surface of the siphon pipe 51 is separated from the inner circumferential surface of the siphon cap 70 by a designated interval, thereby forming a siphon channel 52 between the siphon pipe 51 and the siphon cap 70.

**[0035]** The liquid, which is not discharged from the siphon pipe 51 through the siphon channel 52 formed between the siphon pipe 51 and the siphon cap 70, is supplied to the bypass channel 64 through the bypass holes 65, and is circulated again to the siphon channel 52 through the opening 66 formed through the rear end of the cover member 60.

**[0036]** The cover member 60 further comprises a barrier 67 downwardly extended from the lower plate 62 between the siphon cap 70 and the bypass holes 65, and an indicator 68 downwardly extended from the front plate 63.

**[0037]** The barrier 67, which has a plate-shape and is separated from the bottom plate 34 of the detergent tub 30 (or the bottom of the rinsing solution chamber 38) by a designated interval, prevents a liquid, which does not pass through the siphon channel 52, from being suddenly pushed to the front portion of the detergent tub 30, thereby assisting the liquid to be supplied to the bypass channel 64 through the bypass holes 65.

**[0038]** Further, the barrier 67 prevents the rinsing solution stored in the rinsing solution chamber 38 from temporarily rising and being discharged through the siphon channel 65, when the detergent tub 30 collides with the detergent case 21 during a process of inserting the detergent tub 30 into the detergent case 21.

**[0039]** The indicator 68 is extended downwardly from

the front end of the cover member 60 such that the indicator 68 is separated from the bottom plate 34 of the detergent tub 30 by a designated interval, and serves to indicate to a user that the level of the rinsing solution is not higher than the height of the indicator 68.

**[0040]** The cover member 60 further comprises a protrusion 69 protruded upwardly from the upper plate 61, thereby being easily attached to and detached from the siphon pipe 51. Accordingly, when a user holds the protrusion 69 of the cover member 60 and presses the protrusion 69 so that the siphon pipe 51 is inserted into the siphon cap 70, the lower end of the siphon cap 70 is connected to a plurality of ribs 53 protruded outwardly from the lower end of the siphon pipe 51. On the other hand, when the user holds the protrusion 69 and pulls the protrusion 69 upwardly with designated force, the cover member 60 is separated from the siphon pipe 51.

**[0041]** In FIG. 4, when a large amount of water is suddenly supplied to the rinsing solution chamber 38 and is not discharged through the siphon channel 52, the water containing the rinsing solution is supplied to the bypass channel 64 through the bypass holes 65 and is circulated to the siphon channel 52 through the opening 66, such that the water is not pushed towards the front hand grip portion 31 of the detergent tub 30.

**[0042]** The barrier 67 prevents the water from being suddenly pushed towards the front hand grip portion 31 of the detergent tub 30. The water, which are first restricted by the barrier 67, is pushed towards the right and left surfaces and the rear surface of the detergent tub 30, and flows towards the detergent case 21, thereby not being discharged to the outside of the detergent supply apparatus 20 (or to the outside of the housing 1) (with reference to FIG. 1).

**[0043]** Although this embodiment describes the detergent supply apparatus installed in a drum washing machine, the detergent supply apparatus of the present invention is not limited thereto, but may be installed in an agitation-type washing machine, which washes laundry by a pulsator or the like.

**[0044]** As apparent from the above description, the present invention provides a detergent supply apparatus of a washing machine, which prevents water containing a detergent solution or a rinsing solution from flowing towards the front surface of a detergent tub and being discharged to the outside of the detergent supply apparatus even when a large amount of water is supplied to the detergent tub having a chamber with a siphon unit for supplying the detergent solution or the rinsing solution to a tub, thereby not contaminating environment of a place on which the washing machine is installed, and thus improving the reliability of the washing machine.

**[0045]** Although an embodiment of the invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

**Claims**

1. A detergent supply apparatus of a washing machine comprising a detergent tub having a plurality of chambers and a siphon unit installed in at least one of a plurality of the chambers, wherein the siphon unit comprises:

a siphon pipe formed on a bottom of the chamber; and

a cover member installed above the siphon pipe, and comprising a siphon cap surrounding an outer circumferential surface of the siphon pipe so that a siphon channel is provided between the siphon pipe and the siphon cap, and a bypass channel for circulating water overflowing the siphon channel, to the siphon channel.

2. The detergent supply apparatus as set forth in claim 1, wherein the cover member further comprises an upper plate, a lower plate, and a front plate connecting the upper plate and the lower plate so that a rear surface of the cover member is opened, and the bypass channel is provided between the upper plate and the lower plate.

3. The detergent supply apparatus as set forth in claim 2, wherein the siphon cap is downwardly extended from a rear end of the lower plate, and at least one bypass hole connected with the bypass channel is formed through a front portion of the lower plate such that a liquid, which is not discharged to the siphon pipe, is supplied to the bypass channel through the bypass hole and is circulated to the siphon pipe through the opened rear surface of the cover member.

4. The detergent supply apparatus as set forth in claim 3, wherein the cover member further comprises a barrier extended from the lower plate between the siphon cap and the bypass hole towards the bottom of the chamber so as to prevent the sudden overflowing of the liquid.

5. The detergent supply apparatus as set forth in claim 2, wherein the cover member further comprises an indicator extended downwardly from the front plate such that the indicator is separated from a bottom of the chamber by a designated interval, to thereby restrict a maximum supply amount of a detergent solution or a rinsing solution.

6. A detergent supply apparatus comprising:

a detergent tub having a plurality of chambers; and

a siphon unit installed in at least one chamber and comprising a pipe formed on a bottom of

the chamber, and a cover member installed above the pipe, such that a first portion of the cover member covers an outer surface of the pipe, to thereby form a siphon channel, and a second portion of the cover member includes a bypass channel for circulating water overflowing the siphon channel back to the siphon channel.

7. The detergent supply apparatus of claim 6, wherein the cover member comprises an indicator extended downwardly from a front end of the cover member, to indicate a height of the water.

8. The detergent supply apparatus of claim 6, wherein the cover member further comprises a bypass hole to circulate the water overflowing the siphon channel to the bypass channel.

9. The detergent supply apparatus of claim 8, wherein cover member further comprises a barrier positioned a predetermined distance from the first portion of the cover member covering the pipe, such that the barrier prevents an overflow of water towards the pipe.

10. The detergent supply apparatus of claim 9, wherein the cover member further comprises a protrusion formed at an upper portion thereof, to allow the cover member to be attached to and detached from the pipe.

11. The detergent supply apparatus of claim 10, wherein the pipe comprises a plurality of ribs protruded outwardly from a lower end of the pipe, such that the ribs contact with the first portion of the cover member when the cover member is attached to the pipe.

12. A detergent supply apparatus comprising:

a siphon unit formed in a channel of the detergent supply apparatus and comprising:

a pipe installed at a bottom of the channel to supply water and detergent therethrough, and

a cover member formed above the pipe, to circulate water therethrough, and to cover the pipe,

wherein the siphon unit redirects water overflowing the pipe, back to the pipe

Fig.1

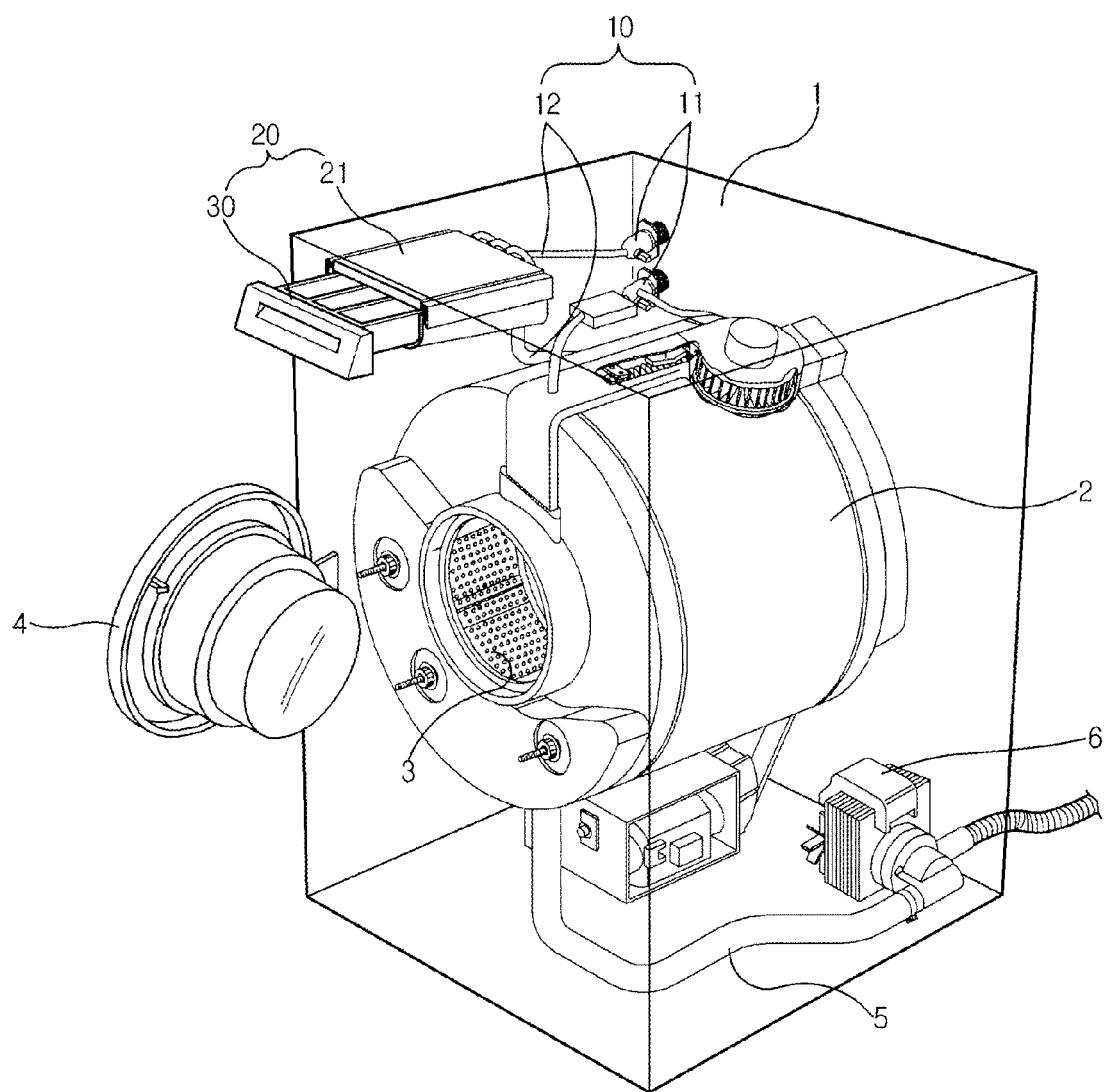


Fig.2

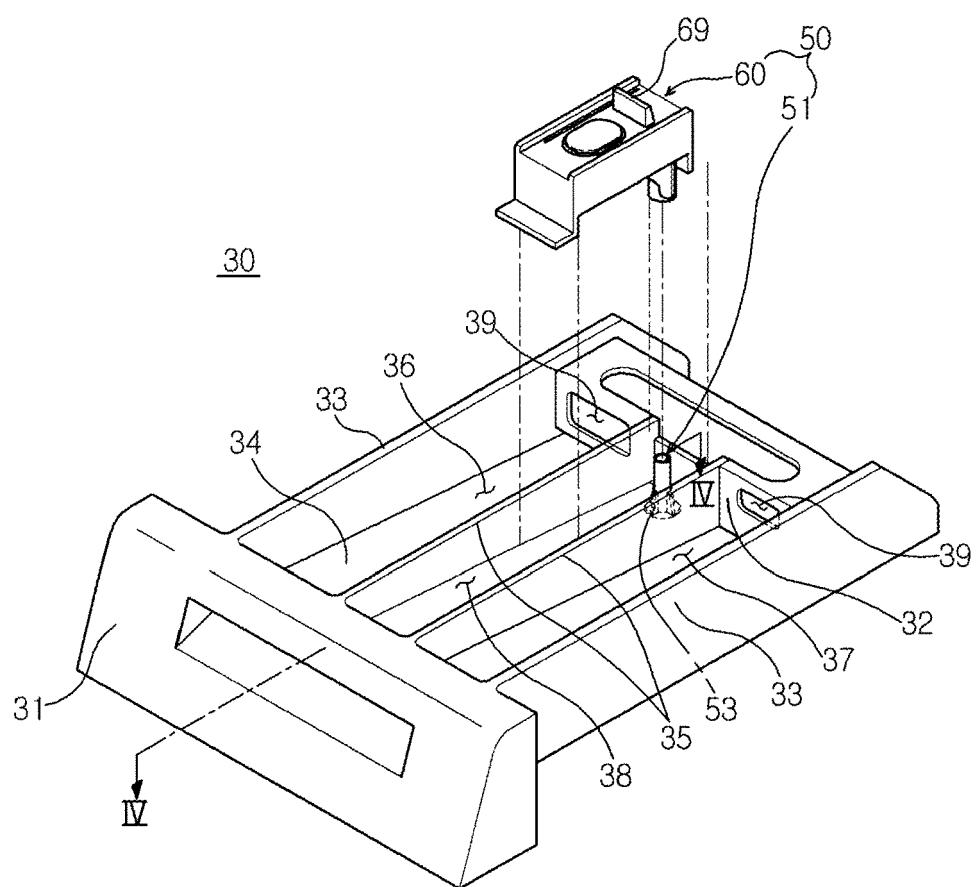


Fig.3

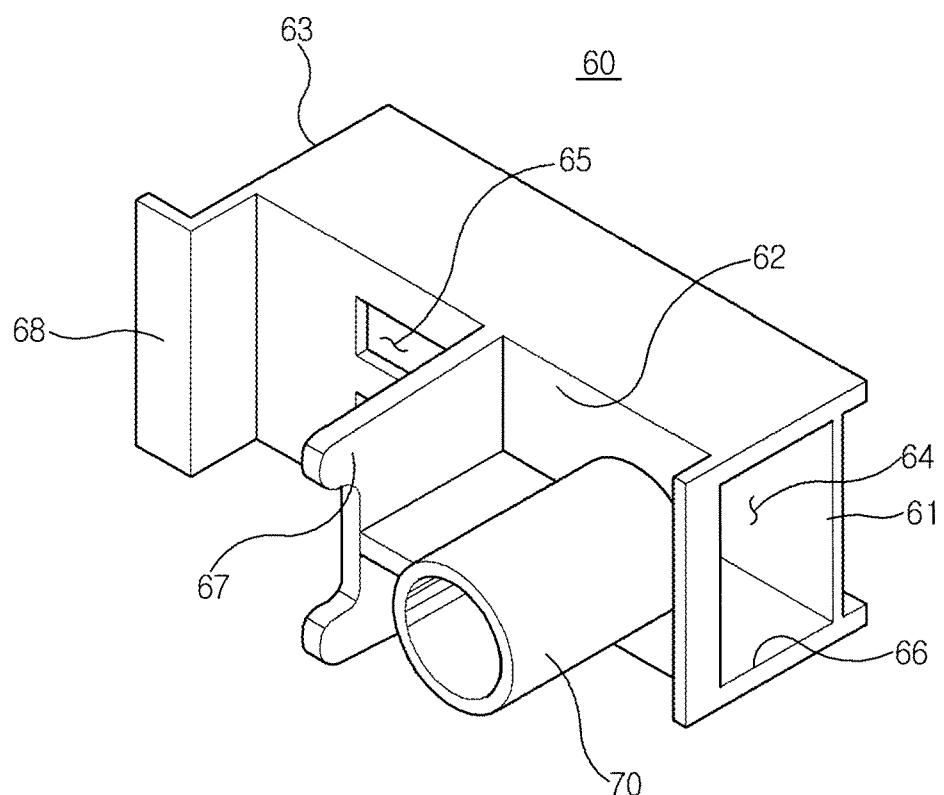
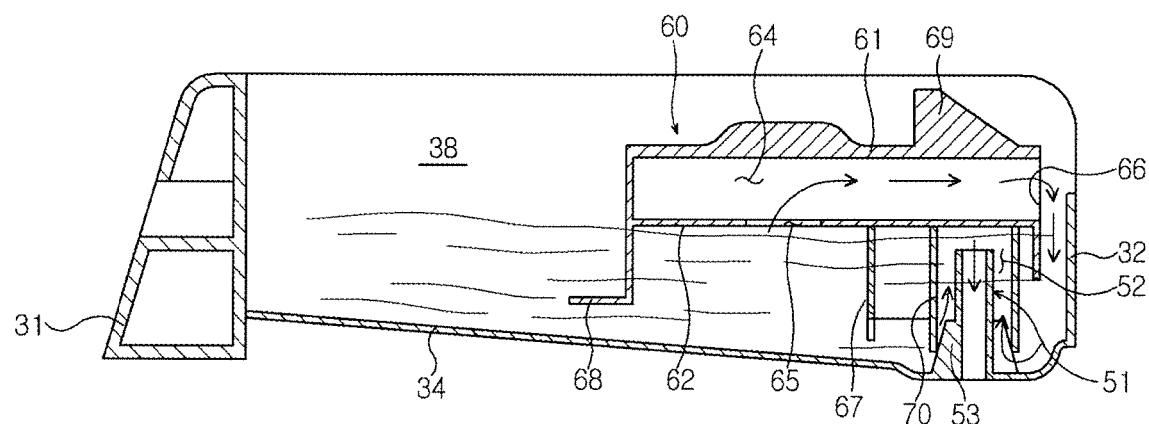


Fig.4





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	US 2005/235704 A1 (CHO HAN K [KR] ET AL) 27 October 2005 (2005-10-27) page 1, paragraphs 18,19; page 2, paragraphs 34-46; page 3, paragraphs 48,58,59; abstract; claims; figures 3-6 -----	1-12	INV. D06F39/02
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			TECHNICAL FIELDS SEARCHED (IPC)
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2 The present search report has been drawn up for all claims			
2	Place of search	Date of completion of the search	Examiner
	Munich	6 March 2007	Clivio, Eugenio
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**REFERENCES CITED IN THE DESCRIPTION**

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