



US 20040163185A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2004/0163185 A1****Kim et al.**(43) **Pub. Date: Aug. 26, 2004**(54) **WASHING MACHINE AND CONTROL METHOD THEREOF****Publication Classification**(76) Inventors: **Geon Kim**, Jinhae-si (KR); **Yu Beom Kang**, Changwon-si (KR); **Sang Man Je**, Koje-si (KR)(51) **Int. Cl.⁷** **D06F 37/42**(52) **U.S. Cl.** **8/158; 68/12.02; 68/12.19; 68/13 R**Correspondence Address:
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CHANTILLY, VA 20153 (US)(57) **ABSTRACT**

An apparatus and method for detecting water leakage in a washing machine, and for controlling a main inlet valve accordingly, are provided. The apparatus includes a leakage container for accumulating leaking water; and a leakage detector for detecting an accumulation of leaking water in the leakage container. The method includes steps of supplying water to a tub; determining whether a water leakage condition exists; and shutting off the supply of water to the tub, if it is determined that a water leakage condition exists.

(21) Appl. No.: **10/730,285**(22) Filed: **Dec. 9, 2003**(30) **Foreign Application Priority Data**

Dec. 10, 2002 (KR) P2002-0078336

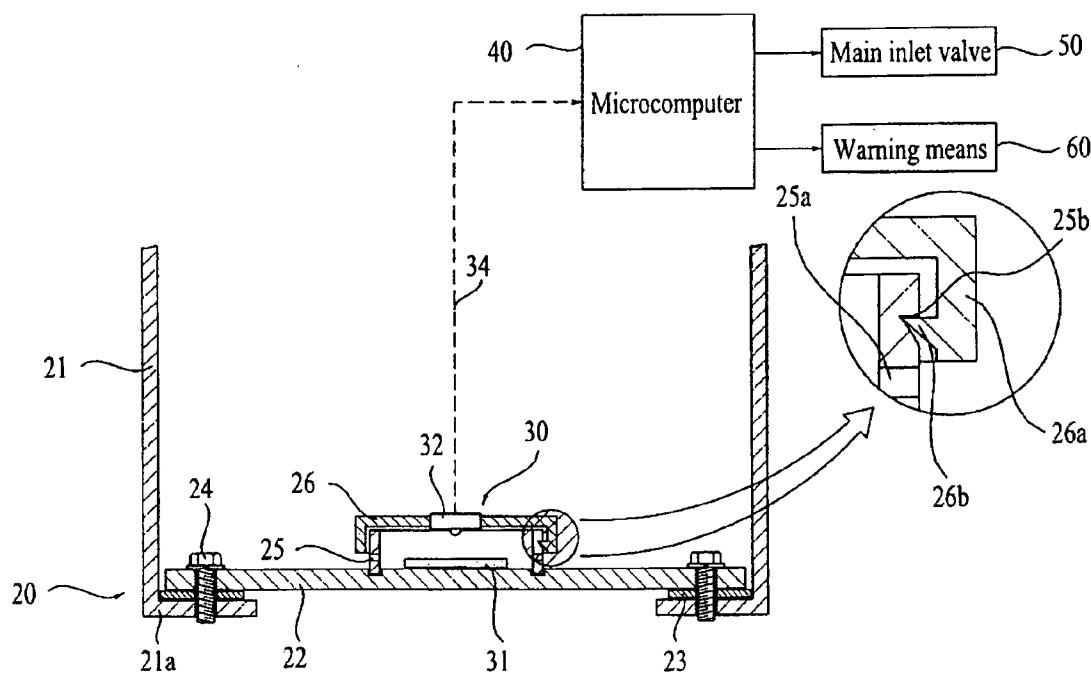


FIG. 1
Contemporary Art

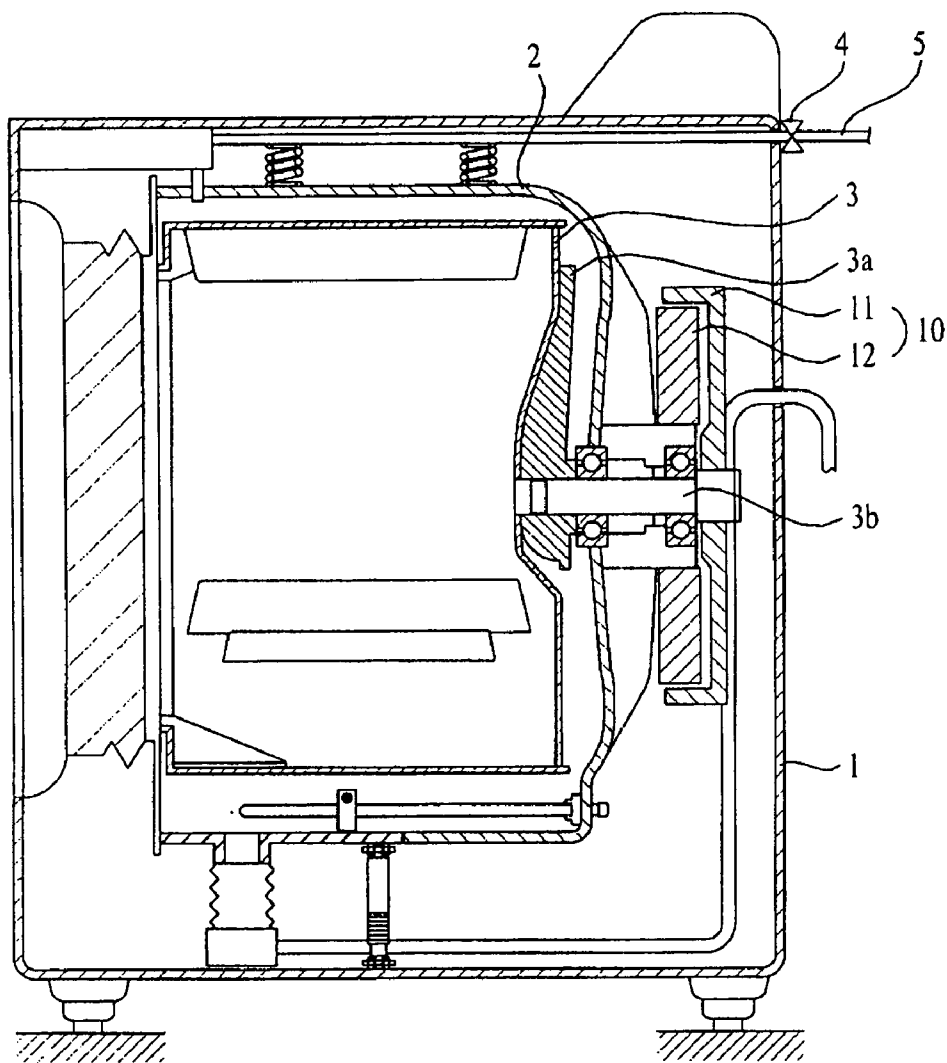


FIG. 2

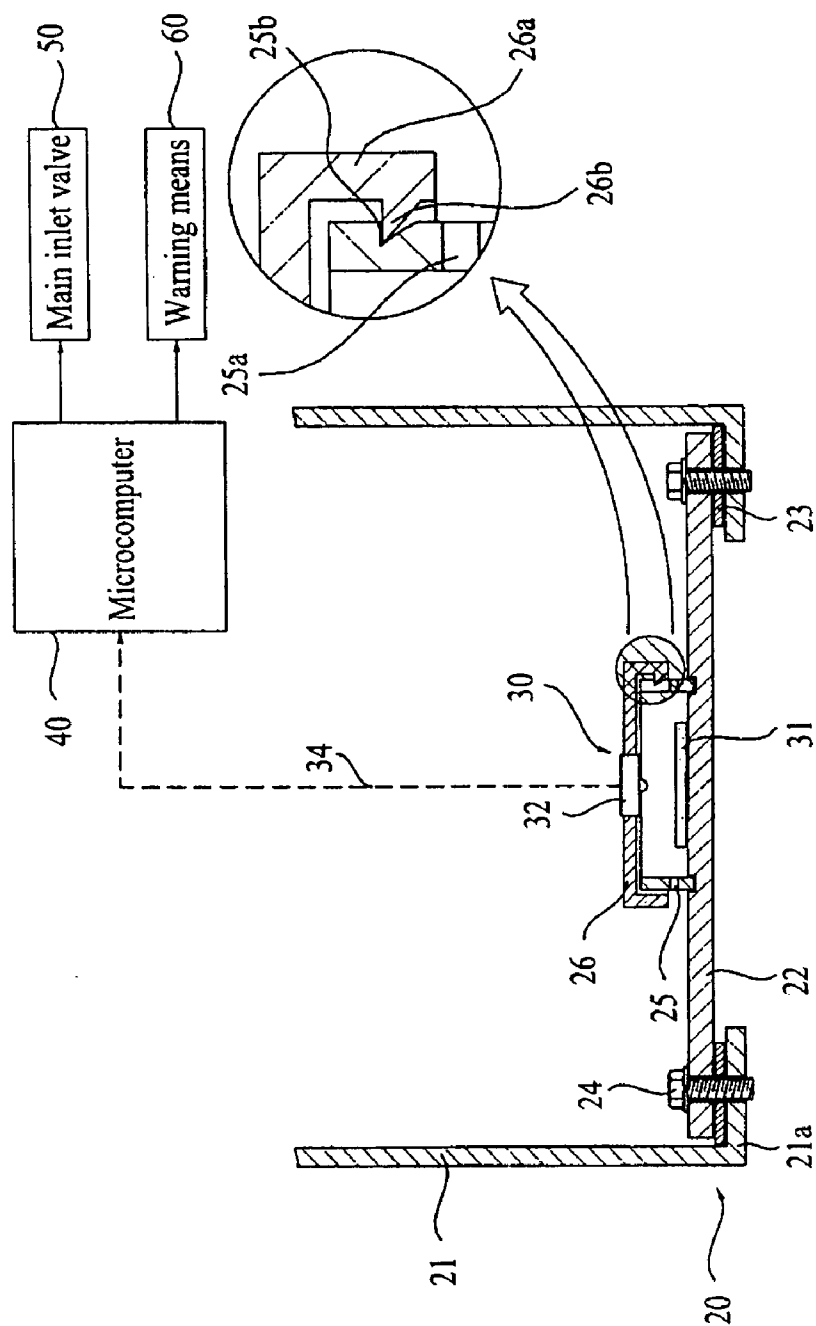
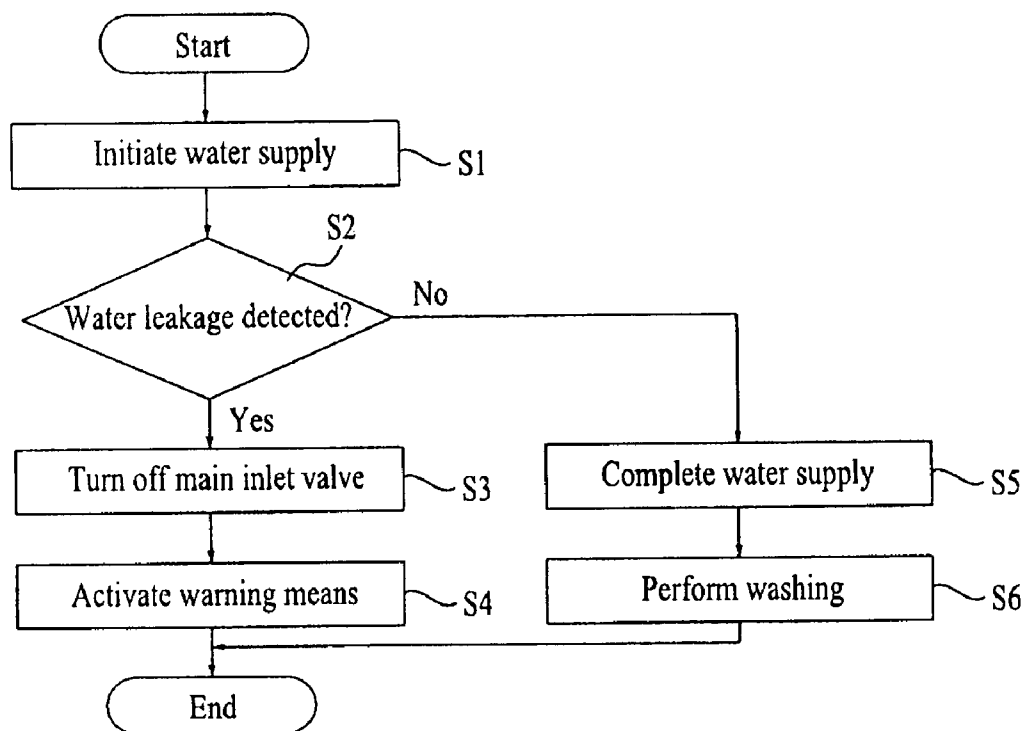


FIG. 4



WASHING MACHINE AND CONTROL METHOD THEREOF

[0001] This application claims the benefit of Korean Application No. 10-2002-0078336 filed on Dec. 10, 2002, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a washing machine and control method thereof, and more particularly to an apparatus for sensing water leakage in a washing machine, by which operation is stopped when water leakage is sensed.

[0004] 2. Discussion of the Related Art

[0005] To perform a washing step, a contemporary washing machine is typically provided with a tub to be filled with water from a commercial source. More specifically, upon receiving a wash execution command from a user, the tub is filled with water supplied through a variety of hoses and valves. A contemporary washing machine is shown in FIG. 1.

[0006] Referring to FIG. 1, a drum-type washing machine comprises a cylindrical tub 2 installed within a cabinet 1 forming an enclosure of the interior of the washing machine. A drum 3 is rotatably installed inside the tub, and a spider 3a is employed to fix a drive shaft 3b to the rear side of the drum. The drive shaft 3b penetrates the center of the rear side of the tub 2, to be connected to a rotor 11 of a motor unit 10, which includes a stator 12.

[0007] Meanwhile, an inlet hose 5, disposed above the tub 2 and routed through the cabinet 1 from an upper point of the rear side of the cabinet, communicates with the tub via a main inlet valve 4. When the main inlet valve 4 is turned on, water is supplied to the tub 2 via the inlet hose 5 until a predetermined water level is reached.

[0008] There may be instances, however, where the water supplied as above leaks from the tub 2, or elsewhere, into the interior of the cabinet 1 and may accumulate. In such an event, the leaking water, and particularly the accumulated water, corrodes internal components of the washing machine, especially those installed in the lower regions of the cabinet 1, and contaminates the installation area of the washing machine by leaking through the bottom of the cabinet. Moreover, such leakage slows the filling of the tub to the predetermined level, thus prolonging the wash cycle and wasting water.

[0009] Accordingly, there is a need for some means for controllably shutting off the main inlet valve 4 while the water is filling the tub 2 to perform a washing step.

SUMMARY OF THE INVENTION

[0010] Accordingly, the present invention is directed to a washing machine and control method thereof that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0011] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a washing machine and control method thereof, which pre-

vents a corrosion of internal components of the washing machine and a contamination of an installation area of the washing machine.

[0012] It is another object of the present invention to provide a washing machine and control method thereof, which enables a main inlet valve to be controllably shut off while filling a tub with water to perform a washing step.

[0013] It is another object of the present invention to provide a washing machine and control method thereof, which prevents an excessive consumption of water.

[0014] It is another object of the present invention to provide a washing machine and control method thereof, which prevents a prolonged wash cycle in the event of a water leakage condition.

[0015] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

[0016] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided a washing machine comprising leakage containment means for accumulating leaking water; and leakage detection means for detecting an accumulation of leaking water in the leakage containment means. The leakage containment means comprises a cabinet having a plurality of sides and a bottom, and the leakage detection means comprises a switch activated by a predetermined level of accumulation of leaking water in the leakage containment means.

[0017] The leakage detection means of the present invention is facilitated by a switch support for supporting the switch at its upper end and a float member having a predetermined buoyancy. The switch support is connected at its lower end to an inner surface of the bottom of the cabinet. The support has an interior space of a predetermined height and at least one perforation allowing water flow from the leakage containment means to the interior space of the switch support. The float member is disposed in the interior space of the switch support such that the float member is brought into contact with the switch by floating, to thereby activate the switch, if the accumulation of leaking water in the leakage containment means reaches the predetermined level. Preferably, the switch is a tactile switch having a sensitivity allowing operation by the buoyancy of the float member.

[0018] In another aspect of the present invention, there is provided a washing machine control method comprising steps of supplying water to a tub via main inlet valve; determining whether a water leakage condition exists; and shutting off the supply of water to the tub by controlling the main inlet valve, if it is determined that a water leakage condition exists.

[0019] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0021] **FIG. 1** is a cross-sectional view of a contemporary washing machine;

[0022] **FIG. 2** is a cross-sectional view of a washing machine according to the present invention;

[0023] **FIG. 3** is a cross-sectional view of a washing machine according to the present invention, illustrating an operation of an apparatus for sensing water leakage; and

[0024] **FIG. 4** is a flowchart of a washing machine control method according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0025] Reference will now be made in detail to the preferred embodiment of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0026] Referring to **FIG. 2**, an apparatus for sensing water leakage in a washing machine according to the present invention includes a leakage containment means **20** for accumulating water leaking from a tub (not shown), or elsewhere within the interior of a cabinet (not shown) of the washing machine, and a leakage detection means **30** for detecting an accumulation of leaking water in the leakage containment means.

[0027] The leakage containment means **20** comprises a plurality of side panels **21** each having a bottom flange **21a**, formed as an inwardly bent bottom-edge surface of the respective side panels, and a bottom panel **22** for closing a bottom opening formed by the side panels. The perimeter of the bottom panel **22** rests atop the bottom flanges **21a** of the side panels **21** and is secured thereto, to form a seal with the side panels, by a sealing means comprised of compression means, i.e., a plurality of bolts **24** passing through the perimeter of the bottom panel and the bottom flanges, and a packing member **23** inserted between the bottom flanges and the bottom panel and compressed by the compression means. The side panel **21** forms the sides of the cabinet of the washing machine and may be formed as a contiguous piece or by connecting the side panels, and the bottom panel **22** forms the bottom of the cabinet of the washing machine.

[0028] The leakage detection means **30** comprises a tactile switch **32**, activated by a predetermined level of accumulation of leaking water in the leakage containment means **20**; a cylindrical switch support **25** of a predetermined height, having at least one perforation **25a** formed in its sidewall to allow water to flow from the leakage containment means **20** to an interior space of the switch support; and a float member **31** having a predetermined buoyancy, disposed in the interior space of the switch support, to be brought into contact with the tactile switch by floating, and thereby activate the tactile switch, if the accumulation of leaking water in the leakage containment means reaches the predetermined level.

The switch support **25** is centrally provided on the bottom panel **22**, with its lower end connected to the bottom panel and its upper end provided with a switch mount **26** for securely positioning the tactile switch **32** above the float member **31**. The switch mount **26** includes an annular flange **26a**, protruding downward from its perimeter, and a plurality of hooks **26b** formed at a lower end of the annular flange **26**, to be respectively inserted in a plurality of corresponding hook holes **25b** correspondingly formed in the outer surface of the switch support **25**, for coupling the switch mount to the switch support.

[0029] The leakage detection means **30** outputs a leakage detection signal to a microcomputer **40** via a lead wire **34** connected to the tactile switch **32**, which may be activated by closing or by opening. The microcomputer **40** generates respective control signals to a main inlet valve **50** for controlling the supply of water to the tub and to a warning means **60** such as a display panel or audio signal generator for informing the user of the status of the washing machine.

[0030] Referring to **FIG. 4**, illustrating a washing machine control method according to the present invention explained with respect to **FIG. 3**, a water supply operation is initiated in a step **S1**, whereby the tub of the washing machine is to be filled via the main inlet valve **50** to a predetermined level for performing a washing step. In the event that a water leakage condition exists, the leaking water accumulates in the bottom of the leakage containment means **20** and flows into the interior space of the switch support **25** through the perforation **25a**, thus raising the float member **31**. If the leakage is excessive, namely, of a sufficient rate or accumulation, the float member **31** is raised to a predetermined elevation determining the existence of a water leakage condition, whereby the tactile switch **32** is activated and a leakage detection signal is generated.

[0031] Accordingly, it is determined in a step **S2** whether the above-described water leakage condition exists. If so, a leakage detection signal is generated, to be output from the tactile switch **32** for input to the microcomputer **40** via the lead wire **34**, whereupon the microcomputer outputs in a step **S3** a first control signal to the main inlet valve **50**, shutting off the supply of water to the tub. Meanwhile, a second control signal is output in a step **S4** to the warning means **60**.

[0032] Otherwise, that is, when the float member **31** is not raised to the predetermined elevation and it is therefore determined that no water leakage condition exists, the supply of water proceeds to completion in a step **S5** so that washing can be performed in a step **S6**.

[0033] As described above, the washing machine and control method thereof according to the present invention controllably shuts off a main inlet valve in the event of a water leakage condition, thereby preventing a corrosion of internal components of the washing machine and a contamination of an installation area of the washing machine. In the event of a water leakage condition, the present invention also prevents an excessive consumption of water and a prolonged wash cycle.

[0034] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present inven-

tion cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A washing machine comprising:
 - leakage containment means for accumulating leaking water; and
 - leakage detection means for detecting an accumulation of leaking water in said leakage containment means.
2. The washing machine as claimed in claim 1, said leaking containment means comprising a cabinet having a plurality of sides and a bottom.
3. The washing machine as claimed in claim 2, wherein said cabinet is formed by a plurality of connected side panels forming a bottom opening and a bottom panel having a perimeter, connected to a bottom edge of each connected side panel, for closing the bottom opening formed by the side panels.
4. The washing machine as claimed in claim 3, wherein each of the plurality connected side panels comprises a bottom flange formed at the bottom edge of each side panel to be bent inward.
5. The washing machine as claimed in claim 4, wherein the perimeter of the bottom panel rests atop the bottom flanges of the side panels and is secured to the side panels.
6. The washing machine as claimed in claim 5, further comprising sealing means to seal the bottom panel to the side panels.
7. The washing machine as claimed in claim 6, said sealing means comprising:
 - compression means passing through the perimeter of the bottom panel and the bottom flanges; and
 - a packing member inserted between the bottom flanges and the bottom panel and compressed by said compression means.
8. The washing machine as claimed in claim 2, said leakage detection means comprising a switch activated by a predetermined level of accumulation of leaking water in said leakage containment means.
9. The washing machine as claimed in claim 8, said leakage detection means further comprising:
 - a switch support for supporting said switch at an upper end, connected at a lower end to an inner surface of the bottom of the cabinet, said support having an interior space of a predetermined height and having at least one perforation allowing water flow from said leakage containment means to the interior space of said switch support; and

- a float member having a predetermined buoyancy, disposed in the interior space of said switch support such that said float member is brought into contact with said switch by floating, to thereby activate said switch, if the accumulation of leaking water in said leakage containment means reaches the predetermined level.

10. The washing machine as claimed in claim 9, wherein said switch is a tactile switch having a sensitivity allowing operation by the buoyancy of said float member.

11. The washing machine as claimed in claim 9, said switch support comprising a switch mount for securely positioning said switch above said float member.

12. The washing machine as claimed in claim 1, said leakage detection means outputting a leakage detection signal if the accumulation of leaking water in said leakage containment means reaches a predetermined level.

13. The washing machine as claimed in claim 12, further comprising:

- a main inlet valve for supplying water to a tub;
- a microcomputer, receiving the leakage detection signal from said leakage detection means, for outputting at least one control signal to shut off said main inlet valve if the accumulation of leaking water in said leakage containment means reaches the predetermined level.
- 14. The washing machine as claimed in claim 13, further comprising warning means, receiving the at least one control signal from said microcomputer, for informing the user of the status of the washing machine including an indication of the accumulation of leaking water in said leakage containment means reaching the predetermined level.

15. A washing machine control method comprising steps of:

- supplying water to a tub;
- determining whether a water leakage condition exists; and
- shutting off the supply of water to the tub, if it is determined that a water leakage condition exists.
- 16. The method of claim 15, wherein the supply of water is controlled by a main inlet valve.
- 17. The method of claim 15, further comprising a step of generating a sensed water leakage signal, if it is determined that a water leakage condition exists.
- 18. The method of claim 15, further comprising a step of generating a warning signal, if it is determined that a water leakage condition exists.

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