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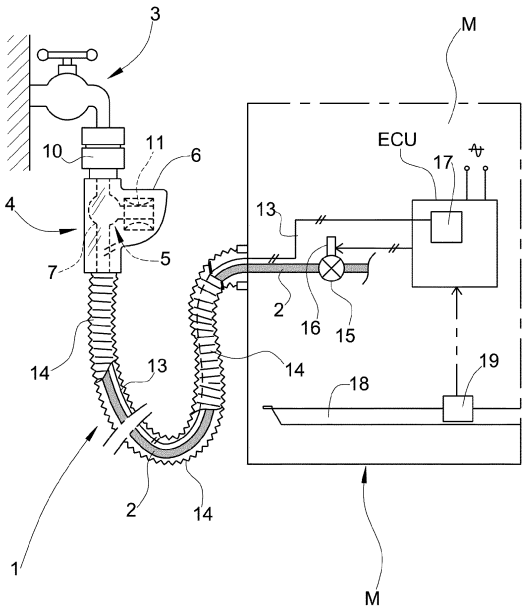
(54) A water supply system of the so-called "water stop" type, for a washing machine

(57) The water supply system comprises
a control unit (ECU) to be associated with a washing machine (M),
a supply hose (2) intended to be connected between a water source (3) and the machine (M), to convey a flow of water into the machine (M),
a solenoid shut-off valve (5), normally closed, positioned between the hose (2) and the water source (3) and provided with an operating winding or solenoid (11), and
a safety hose (14) which extends around the supply hose (2), between the solenoid valve (5) and the machine (M), and in which insulated electrical conductors (13) extend, for connecting the winding or solenoid (11) of the valve (5) to the control circuit means (ECU).

The winding or solenoid (11) of the solenoid shut-off valve (5) is made so as to be operable by an extra-low voltage, and the control unit (ECU; 17) is predisposed to cause the application of an extra-low voltage to this winding or solenoid (11).

FIG. 1



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Description

[0001] The present invention relates to a system for supplying water to a washing machine, such as a laundry washing machine or a dishwasher.

[0002] More specifically, the invention relates to a water supply system of the so-called "water stop" type, comprising

control circuit means to be associated with the washing machine,
a water supply hose intended to be connected between a water source and the machine, to convey a flow of water into the machine,
a solenoid shut-off valve, normally closed, positioned between said hose and the water source and provided with an operating solenoid or winding,
a safety hose which extends around the supply hose, between said solenoid valve and the machine, and in which insulated electrical conductors extend, for connecting the winding or solenoid of said solenoid valve to the aforesaid control circuit means;
the control circuit means being adapted to cause, in predetermined conditions of operation, the supply of an energizing current to the winding or solenoid of said solenoid valve.

[0003] In a water supply system of this type, if water leaks from the supply hose, the leaked water flows into the machine through the gap between the supply hose and the surrounding safety hose. Inside the machine, when the leaked water reaches a predetermined level, an electronic control unit of the machine causes the closure of the solenoid shut-off valve of the water-stop system, thus interrupting the supply of water to the machine.

[0004] These systems are reasonably effective in preventing flooding and consequent damage.

[0005] The solenoid shut-off valve in an existing water-stop system comprises an operating winding or solenoid which is energized by a current at ordinary mains voltage, typically 220 V AC.

[0006] In order to limit the risks of electric shock for the user, the winding or solenoid of the solenoid shut-off valve of a water-stop system of this type is enclosed in a casing of electrically insulating material, typically moulded plastic, into which an electrically insulating sealing resin is subsequently injected.

[0007] The necessity for these arrangements intended to limit the risks of electric shock leads to complications in terms of construction and design and an increase in the cost or overall dimensions.

[0008] One object of the present invention is to propose a water supply system of the so-called water stop type which can be used to eliminate, or at least limit, the drawbacks of the prior art solutions described above.

[0009] This and other objects are achieved according to the invention with a water supply system of the type defined above, characterized in that the winding or solenoid of the aforesaid solenoid shut-off valve is made in such a way that it can be operated with an extra-low voltage, and in that the aforesaid control circuit means are predisposed to cause the application, to said winding or solenoid, of an extra-low voltage.

[0010] In the present description and in the claims below, the term "extra-low voltage" denotes a voltage at a level such that there is no risk of electric shock.

[0011] According to the definition provided by the International Electrotechnical Commission (IEC), an extra-low voltage is a voltage which does not exceed 50 V AC r.m.s. or a peak value of 70 V AC, or is less than 120 V DC ripple-free. Further information on this point may be found in IEC standard 61140, or in CEI standard 64-8, Part 4 of the Comitato Elettrotecnico Italiano.

[0012] Because of the aforesaid characteristics, in a water-stop system according to the present invention there is no longer any need to enclose the operating winding or solenoid of the solenoid shut-off valve in an electrically insulating container filled with an electrically insulating sealing resin.

[0013] This reduces the number of components and set-up operations required, and consequently reduces the costs.

[0014] It is also possible to reduce the overall dimensions to an appreciable extent.

[0015] Further characteristics and advantages of the invention will be made clear by the following detailed description, provided purely by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1 is a schematic representation of a water supply system of the so-called water-stop type according to the present invention; and
Figure 2 is a partial view in axial section of the portion of the water-stop system according to the invention which includes the solenoid shut-off valve.

[0016] In Figure 1, the number 1 indicates the whole of a system of the so-called water-stop type for supplying water to a washing machine M.

[0017] The system 1 comprises a water supply hose, indicated by 2, intended to be connected between a water source 3 (Figure 1) and the machine M, to convey a flow of water into the machine.

[0018] The system 1 also comprises a solenoid shut-off unit, indicated as a whole by 4 in the drawings. With particular reference to Figure 2, this solenoid valve unit 4 comprises a solenoid valve 5, enclosed in a casing or envelope 6 of electrically insulating material.

[0019] In a known way, the solenoid valve 5 comprises a body 7, made of moulded plastic material for example, in which an inlet connector 8 and an outlet connector 9 are formed.

[0020] The inlet connector 8 is coupled in use to the water source 3, for example by means of a known connecting device of the nut type 10 (Figure 2).

[0021] The inlet end of the hose 2 is fitted tightly on

the outlet connector 9 of the solenoid valve 5.

[0022] The solenoid valve 5 is essentially of a known type, for example the type described in Italian utility model no. 215.099 in the name of the present applicant.

[0023] This solenoid valve comprises, in particular, an operating winding or solenoid indicated by 11 in Figure 2. This winding is formed from insulated electrical wire and is designed to be energized by an extra-low voltage current.

[0024] The winding or solenoid 11 extends inside the casing 6, which does not need to be filled with an electrically insulating sealing resin.

[0025] The winding or solenoid 11 has a pair of terminals, only one of which is visible in Figure 2, where it is indicated by 12. Corresponding insulated electrical conductors 13, only one of which is visible in Figure 2, are connected to these terminals.

[0026] The water-stop system 1 also comprises a safety hose 14, which extends around the water supply hose 2, between the solenoid valve 5 and the washing machine M.

[0027] The conductors 13 which are connected to the winding or solenoid 11 of the solenoid valve 5 extend through the space between the hose 2 and the safety hose 14, into the inside of the machine M, as shown in Figure 1.

[0028] In the illustrated exemplary embodiment, the water supply hose 2 is connected, inside the machine M, to the inlet of a further shut-off valve 15, which is normally closed and which is provided with an operating winding or solenoid 16.

[0029] In the illustrated embodiment (see Figure 1), the washing machine M is provided with an electronic control unit ECU, to which the connecting conductors 13 of the solenoid shut-off valve 5 are connected. This unit is also connected to the operating winding or solenoid 16 of the further solenoid valve 15.

[0030] The unit ECU comprises, in particular, a control module 17 for the solenoid valve 5, to which it is connected by conductors 13. This module 17 is predisposed to control the operation of the solenoid valve 5, by applying an extra-low DC or AC voltage to its winding or solenoid 11.

[0031] The winding or solenoid 16 of the further solenoid valve 15 may or may not also be made for extra-low voltage operation.

[0032] In normal operation, the unit ECU causes both of the solenoid shut-off valves 5 and 15 to open in order to supply a flow of water to the washing chamber of the washing machine M. A flow of water can then pass from the water source 3 into the inside of the machine M, through the hose 2.

[0033] If there is a leak of water due to a tear in the hose 2, the leaked water flows into the machine M, through the space formed between this hose 2 and the surrounding safety hose 14. Inside the machine, the leaked water can be collected in a vessel 18 associated with a level sensor 19 connected to the unit ECU.

[0034] As soon as the leaked water level in the container 18 rises above a predetermined level, the unit ECU causes the solenoid valve 5 to close, thus shutting off the flow of water. The leak is thus halted without risk of flooding.

[0035] The module 17 can comprise, for example, a step-down transformer, followed if required by a rectifier circuit of a known type.

[0036] Naturally, the principle of the invention remaining the same, the forms of embodiment and the details of construction may be varied widely with respect to those described and illustrated, which have been given purely by way of non-limiting example, without thereby departing from the scope of the invention as defined by the attached claims.

Claims

1. Water supply system of the so-called "water stop" type, for a washing machine (M), comprising
control circuit means (ECU) to be associated with the machine (M),
a water supply hose (2) intended to be connected between a water source (3) and the machine (M), to convey a flow of water inside the machine (M),
a solenoid shut-off valve (5), normally closed, disposed between said hose (2) and the water source (3) and provided with a control solenoid or winding (11),
a safety hose (14) which extends around the supply hose (2), between said solenoid valve (5) and the machine (M), and in which insulated electrical conductors (13) extend, for connecting the winding or solenoid (11) of said valve (5) to said control circuit means (ECU);
the control circuit means (ECU) being predisposed to cause, in predetermined conditions of operation, the supply of an energizing current to the winding or solenoid (11) of said valve (5);
the water supply system (1) being **characterized in that** the winding or solenoid (11) of said solenoid shut-off valve (5) is adapted to be controlled with an extra-low voltage, and **in that** said control circuit means (ECU; 17) are predisposed to cause the application, to said winding or solenoid (11) of the valve (5), of an extra-low voltage.

2. Water supply system according to Claim 1, wherein said control means (ECU; 17) comprise a voltage-lowering transformer, and possibly a rectifier circuit.

3. Water supply system according to either of the preceding claims, comprising a further solenoid shut-off valve (15), normally closed, intended to be placed inside the machine (M) and connected to said water supply hose (2); said further solenoid shut-off valve (15) being provided with a control solenoid or winding

(16) made such as to be controllable by means of an extra-low voltage.

4. Water supply system according to any of the preceding claims, wherein said solenoid shut-off valve (5) is encapsulated in a housing or envelope (6) without any interposed electrically insulating, sealing material poured or cast thereinto.

FIG. 1

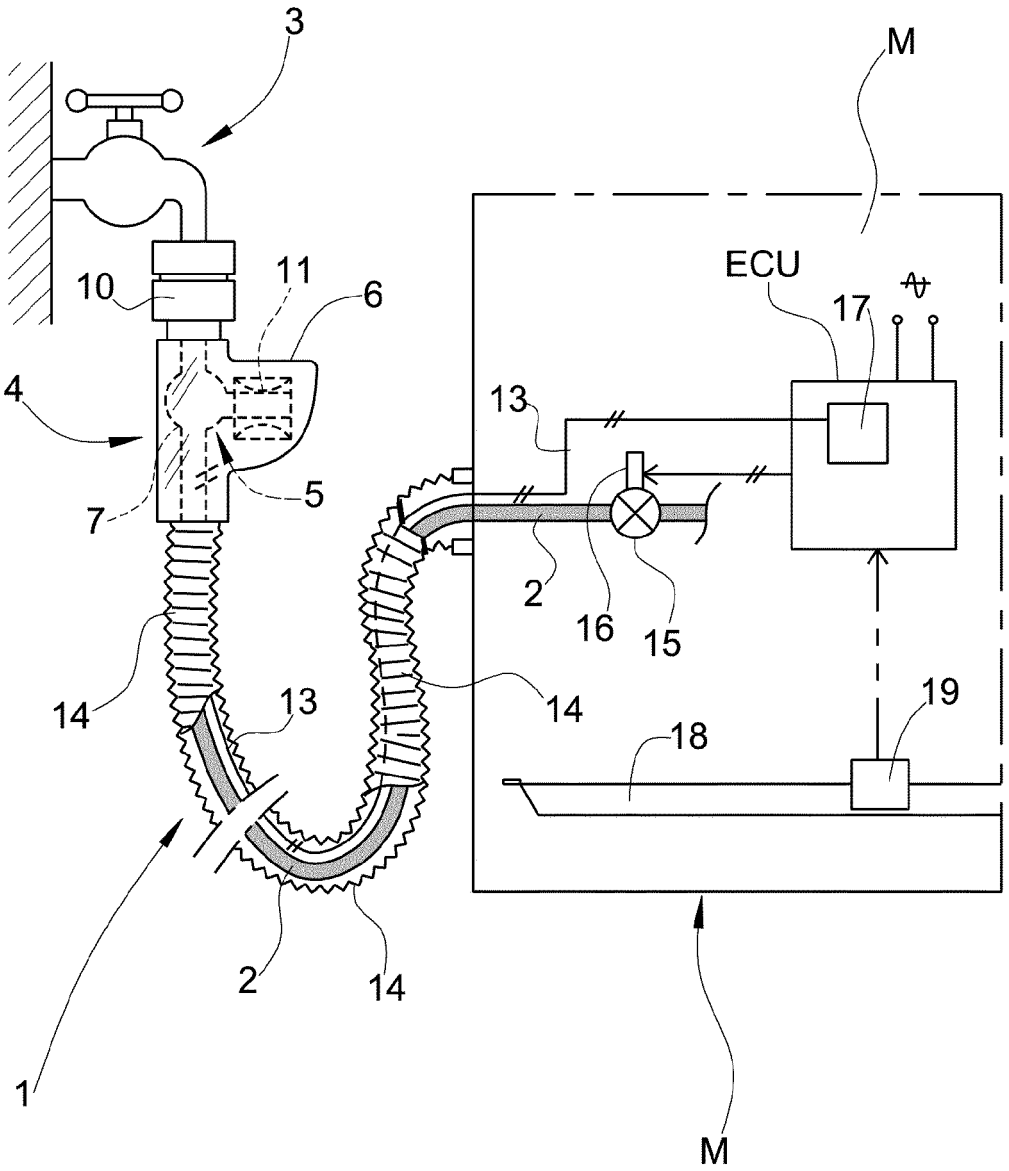
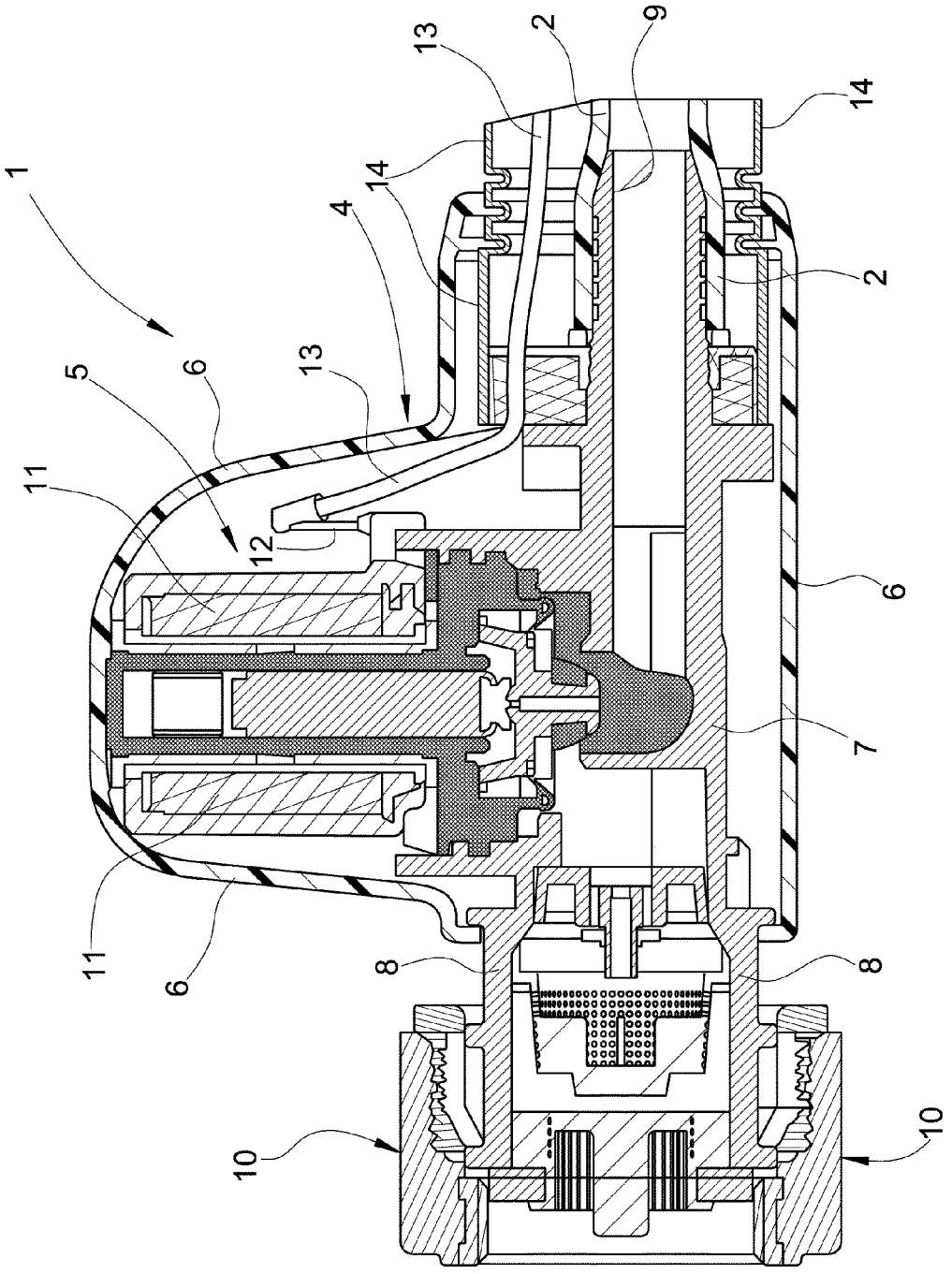


FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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