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**(54) Safety circuit for domestic appliances using water**

(57) The invention relates to a safety circuit for domestic appliances using water, particularly washing machines and dishwashers, with a program selector, a level switch in the washing or rinsing container and a leak detector in a water collecting trough. Safety can be increased and damage caused by fault occurring even when the domestic appliance is switched off can be prevented by the provision of an additional logic circuit continuously fed with mains alternating current which can be controlled by the program selector, the level switch and the leak detecting device, by the logic circuit switching on the process control to the power supply on the occurrence of predetermined trigger conditions and by the process control effecting predetermined switching processes, as a function of the prevailing trigger conditions, through components (e.g. pump) of the domestic appliance.

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## Description

[0001] The invention relates to a safety circuit for domestic appliances using water, in particular washing machines and dishwashers, with a program selector, a level switch connected with washing or rinsing containers and a leak detecting device in a water collecting trough.

[0002] Safety circuits for domestic appliances using water, of this type, are known by which controllable valves are inserted in the water supply, which are controllable by the leak-detecting device, as shown in DE 34 25 588 C2 and DE 34 40 695 A1. With these safety circuits the only assurance is that when a leak occurs the water supply to the domestic appliance is cut off.

[0003] It is the object of the invention to improve a safety circuit of the type mentioned in the preamble so that fault conditions leading to damage are recognised both when the domestic appliance is switched off as well as when it is switched on and corrective measures can be introduced.

[0004] In accordance with the invention, this object is achieved by the provision of an additional logic circuit continuously fed by the mains alternating voltage which can be triggered by the program selector, the level switch and the leak detection device, by the logic circuit under the predetermined trigger conditions switching on the process control to the power supply and by the process control, as a function of the existing control conditions, effecting predetermined switching processes through components (e.g. pump) of the domestic appliance.

[0005] With this additional logic circuit, switching processes can be effected through the process control even when the domestic appliance is switched off, which leads not only to an indication of the fault but can also be adapted to remove the undesired effects of the fault. Thus, even with domestic appliances which are switched off, an alarm signal can be given if water from a leak appears in the water collecting trough or inside the appliance.

[0006] According to one simple embodiment it is intended that the logic circuit is designed as an OR circuit, that associated control signals to the control input of the OR circuit are sent by the program selector with any selected program, the level switch on exceeding a predetermined fill level in the washing or rinsing container and the leak detection device on the appearance of water from a leak in the water-collecting trough and the OR circuit when triggered switches on the power supply to the process control through at least one control input through an electronically triggerable switching device.

[0007] The triggering conditions for the logic circuit can be derived by designing the program selector as a rotary switch with a number of switch positions corresponding with the programs each of which is associated with a control input of the logic circuit or by forming the

program selector with a number of on/off switches corresponding to the number of programs each of which is associated with a control input of the logic circuit.

[0008] The monitoring of the fill level in the washing or rinsing container by means of the level switch is designed in such a way that the switching level in respect of washing or rinsing container is lower than the lower edge of the door opening of the domestic appliance.

[0009] In one embodiment, an acoustic and optical alarm is given when the appliance is switched off and the logic circuit is actuated. To remove faults the switching processes are effected, preferably after a delay, through the process control. The coordination switching processes for the remedial action to be taken is provided by the triggering conditions for the logic circuit and the process control.

[0010] The invention will be more particularly defined by means of an exemplary embodiment shown as a block circuit diagram in the drawing.

[0011] In the block circuit diagram the operating circuit of the intended programs of the domestic appliance will not be considered in more detail. These circuits are formed in known ways and are operated in accordance with the predetermined program.

[0012] In order to carry out remedial action in the event of a fault a so-called stand-by operation comes into play. For this, an additional logic circuit LS is permanently connected to a power supply, i.e. it can be operated even when the domestic appliance is switched off.

[0013] The program selector PW of the domestic appliance controls the process control PS of the domestic appliance not only when it is running but also the logic circuit LS with the program leads P1 to Pn. A separate control lead sn+1 for the logic circuit LS is provided for the leak detector device LA in the water-collecting trough underneath the domestic appliance. The leak detecting device LA puts a control signal to the logic circuit LS on this control lead sn+1 if it detects water from a leakage in the water-collecting trough.

[0014] A level switch WÜS, the switching level of which is below the door opening is connected with the washing or rinsing container of the domestic appliance. In this way, if the domestic appliance is switched off and the door is open, escape of water from the appliance is prevented if the supply valve is jammed and water enters the washing or rinsing container even when the appliance is not operating. When actuated, this level switch WÜS gives a control signal to the control input on the logic circuit LS and the control input wüs of the process control PS.

[0015] If the logic circuit LS is designed as an OR circuit, then it responds to any desired trigger on the control inputs s1 to sm and switches on the electronic switching circuit ES. For this, the process control PS is switched on to the power supply SPV, regardless of the operating circuits (not shown) and can actuate other switching processes, associated with the various trig-

gering conditions, because of the existing switching conditions. Thus, these switching processes include an acoustic and optical alarm. The components GA of the domestic appliance, for example, the discharge pump, can advantageously be set in motion after a certain delay as remedial measures on the occurrence of a certain trigger for pumping out water. The remedial measure to be effected can be selected as a function of the operating conditions on the control units s1 to sm of the logic circuit LS and the control inputs p1 to pn as well as 1a and wüs of the process control PS, as a result of which the components GA of the domestic appliance to be activated are switched on and off through the power control NST. The choice of the remedial measures to be taken in this case will also depend on the nature of the domestic appliance.

**[0016]** The leak detecting device LA may advantageously be formed as a conductivity sensor. For this, two metal plates may form the conductivity sensor which is introduced into the water collecting trough.

### Claims

1. Safety circuit for domestic appliances using water, particularly washing machines and dishwashers, with a program selector, a level switch in the washing or rinsing container and a leak detector in a water collecting trough, characterised in that

an additional logic circuit (LS) continuously fed by mains alternating current is provided which is controllable by the program selector (PW), the level switch (WÜS) and the leak detector device (LA), the logic circuit (LS) switches on the process control (PS) to the power supply (SPV) and that the process control (PS) effects predetermined switching processes, as a function of the prevailing trigger conditions, through components (GA) (e.g. pump) of the domestic appliance.

2. Safety circuit in accordance with Claim 1, characterised in that

the logic circuit (LS) is designed as an OR circuit, the appropriate trigger signals are supplied to the control inputs (s1...sm) of the OR circuit by the program selector (PW) on any selected program (P1 ... Pk), by the level switch (WÜS) on exceeding a predetermined fill in the washing or rinsing container and by the leak detector (LA) on the appearance of leaked water in the water collecting trough and the OR circuit switches on the power supply (SPV) to the process control (PS) by way of an electronically triggerable switching device

when triggered by at least one control input (s1...sm).

3. Safety circuit in accordance with Claim 1 or 2 characterised in that

the program selector (PW) is designed as a rotary switch with a number (k) of switching positions corresponding to the programmes (P1...Pk), to which the control inputs (s1...sn) of the logic circuit (LS) are assigned by way of coding n.

4. Safety circuit in accordance with Claim 1 or 2 characterised in that

the program selector (PW) is formed with a number (k) of on/off switches corresponding to the programmes (P1...Pk), as a rotary switch with a number (k) of switching positions corresponding to the programmes (P1...Pk), to which the control inputs (s1...sn) of the logic circuit (LS) are assigned by way of coding n.

5. Safety circuit in accordance with one of the claims 1 to 4, characterised in that

the level switch (WÜS) is connected with washing or rinsing containers in such a way that its switching level is below the lower edge of the door opening of the domestic appliance.

6. Safety circuit in accordance with one of the claims 1 to 5, characterised in that

with a response from the logic circuit (LS) an acoustic and optical alarm can be given when the process control (PS) is switched off.

7. Safety circuit in accordance with one of the claims 1 to 6, characterised in that

the switching processes through components (GA) of the domestic appliance can be delayed with respect to the provision of the alarm.

8. Safety circuit in accordance with one of the claims 1 to 7, characterised in that

the leak detector device (LA) takes the form of a conductivity sensor.

9. Safety circuit in accordance with Claim 8, characterised in that

the conductivity sensor consists of two metal plates introduced into the water collecting trough.

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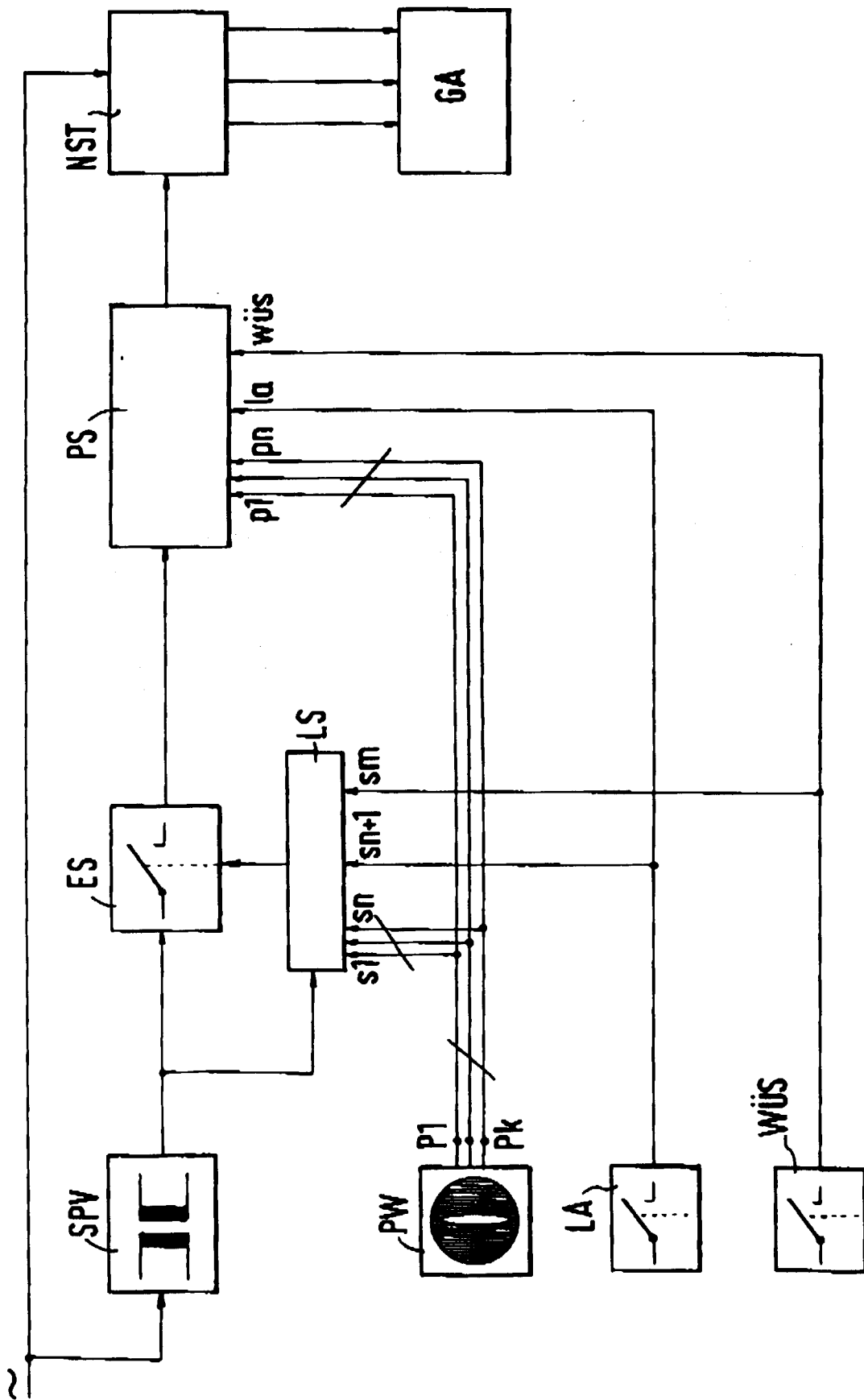
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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 10 3642

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| Place of search<br><b>MUNICH</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                          | Date of completion of the search<br><b>18 June 1999</b> | Examiner<br><b>Laue, F</b>                   |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                          |                                                         |                                              |

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 99 10 3642

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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