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(54) **Machine for washing**

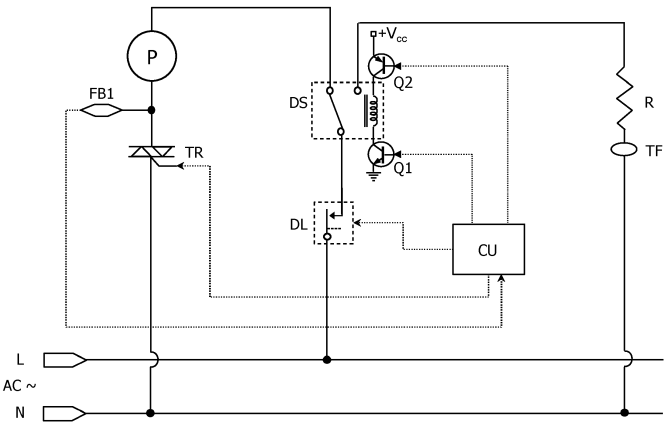
(57) A machine for washing comprises:
- a supply line (AC), which includes a first conductor (N) and a second conductor (L);
- a plurality of electrical loads, which include a heating element (R) and a motor (P) of a pump; and
- a control circuit, which includes:
- a control unit (CU);
- first switching means (DS'), which can be driven by the control unit (CU) for supplying the heating element (R) by connecting it between the first and second conductors (L, N); and
- second switching means (TR), which can be driven by the control unit (CU) for supplying the motor (P) by connecting it between the first and second conductors (L, N).

The control unit (CU) is configured for driving the first switching means (DS') and the second switching means (TR) for supplying the heating element (R) during periods of operation of the machine different from those in which the motor (P) is supplied.

The first switching means are constituted by a monostable switch (DS') that can be switched between:
- a first position, in which the motor (P) is connected between the first and second conductors (L, N) through the monostable switch (DS') in said first position and said second switching means (TR); and
- a second position, in which the heating element (R) is connected between the first and second conductors (L, N) through the monostable switch (DS') in said second position.

The stable position of the monostable switch (DS') is said first position.

Fig. 2

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## Description

Field of the invention

**[0001]** The present invention relates to electrical household appliances comprising a plurality of electrical loads, amongst which two alternately operating electrical loads.

Background of the invention

**[0002]** Examples of electrical household appliances of the type referred to above are laundry-washing machines and dishwashers, normally supplied with alternating current, which typically have electrical loads that must not be activated simultaneously, i.e., loads that are activated at different moments of one and the same treatment program performed by the machine. Typical loads of this type are a heating resistance and a drain pump: the resistance is activated for heating the washing liquid in order to carry out a treatment step, while the drain pump is inactive; at the end of the treatment step considered, the liquid is then drained, by operating the pump while the heating resistance is no longer active.

**[0003]** The drain pump typically comprises a synchronous or asynchronous electric motor, controlled by means of at least one triac, which is driven by a control unit for supplying appropriately the windings and carrying out switching in alternating current. If, for any reason, the motor is supplied with direct current, its windings overheat rapidly, with the risk of fire: this occurs, for example, when the triac goes into the failure condition referred to as "diode mode", a mode in which it behaves like a diode and acts like a rectifier.

**[0004]** Control of the heating resistance is typically managed by an electromechanical relay, which is also driven by the control unit of the machine. Usually connected in series to the resistance is a thermal fuse, which goes into action in the case where the resistance itself overheats. This may happen, for example, when - owing to any malfunctioning of the machine - the resistance is activated in the absence of washing liquid in the treatment tank.

**[0005]** According to the current state of the art, in machines of the type referred to a "dual safety" is provided, also for normative reasons, aimed at facing the possibility of a simultaneous failure of two components that may generate a condition of risk, for example associated to operation of the motor or of the resistance. A typical example of how this function is currently implemented is illustrated in the attached Figure 1. It is to be noted that said figure is extremely schematic in so far as it is aimed merely at illustrating general operation of the circuit. For this reason, representation of further circuit components normally envisaged is omitted (such as a resistance in series to the base of the transistor designated by Q1 or a diode in parallel to the coil of the deviator relay designated by DS, as well as similar resistances, transistors, and diodes for driving the relays designated by RR and DL).

**[0006]** In said figure, designated by L and N are the two conductors of an electrical supply line, which are here assumed as being the live and neutral lines of an a.c. supply network AC. Designated by P is the motor of the drain pump, whilst R designates the heating resistance, connected in series to which is a thermal fuse TF. The circuit includes first and second switching means that control supply of the resistance R and of the motor P, respectively, and that are driven by the control unit of the machine, designated by CU. The first switching means are constituted by a relay RR of a normally open type, whilst the second switching means are constituted by a triac TR. Designated by DS is an electrical deviator, constituted by a deviator relay, which is also driven by the control unit CU by means of an npn transistor Q1, in series to the coil of the relay DS. The deviator relay DS is of a monostable type and has a stable resting position - i.e., the position that it assumes when it is not energized by the switching command - which is that of closing of the circuit branch of the resistance R. In other words, then, the deviator relay DS can be switched from the normal condition of closing of the circuit branch of the resistance R to the condition of closing of the circuit branch of the motor P.

**[0007]** Designated by DL is a further switch that can be controlled by the unit CU, which belongs to a door-lock device of the machine and is connected in series to the deviator relay DS. Designated by FB1 and FB2 are two feedback circuits, designed to supply to the control unit CU diagnostic information regarding the state of operation of the triac TR and of the relay RR, respectively.

**[0008]** In conditions of normal operation, after start of a machine cycle, the switch DL is closed. The relay DS is in its stable resting condition, i.e., in the condition for closing the circuit branch of the resistance R; at the appropriate moment of a washing cycle the control unit CU governs closing of the relay RR so as to supply the resistance R. At the end of the heating step, the control unit CU governs opening of the relay RR. In the event of failure in closing of the relay RR (where by "failure in closing" is meant the fact that the relay remains in the closing condition irrespective of the command received), which can be detected via the feedback circuit FB2, the control unit CU sends the transistor Q1 into the conduction state so as to govern switching of the relay DS and thus interrupt supply to the resistance R. Said possibility is allowed by the fact that - as has been said - the two loads R and P are operate in alternation: this means that, in the case described, even though the relay DS is governed for closing the supply branch of the motor P, the motor itself is not supplied, given the condition of non-conduction of the triac TR. In the case where, on account of a further failure, the deviator relay DS remains in its condition and does not carry out switching, safety is guaranteed by entry into action of the thermal fuse TF connected to the resistance. When, instead, the motor P is

to be supplied, once again in conditions of proper operation of the machine, the control unit CU governs the relay DS, via the transistor Q1, at the appropriate moment of a washing cycle, so that the relay itself goes into the condition opposite to the one illustrated, i.e., the condition for closing the circuit branch of the motor P. The control unit CU moreover drives the triac TR.

**[0009]** As has been said, a possible critical condition of failure of the triac TR is the one referred to as "diode mode". As explained previously, when such a failure occurs, the triac TR allows only passage of the positive or negative half-waves of the mains voltage. In effect, then, the motor P is supplied in direct current. The windings of the motor P are not, however, able to withstand this type of supply, thus overheating rapidly, even with the risk of fire.

**[0010]** The possible condition of failure of the triac TR in diode mode can be detected by the control unit CU by means of the feedback circuit FB1. The unit CU thus governs opening of the switch DL and at the same time switching of the relay DS so as to interrupt supply to the motor P. The cases of failure envisage that at the most one between the switch DL and the relay DS can fail, and consequently absence of supply of the motor P is guaranteed, and hence safety also of the machine. Switching of the deviator relay DS on the branch of the resistance R, i.e., in its normal condition illustrated in the figure, is rendered possible by the fact that the resistance R is not in any case supplied, given the condition of normal opening of the relay RR.

## Summary and object of the invention

**[0011]** The circuit arrangement of Figure 1, albeit efficient and able to guarantee the requirements of "dual safety", is relatively complicated and costly.

**[0012]** The aim of the present invention is basically to provide an improved circuitry for controlling two loads with alternating operation like the ones previously exemplified, and in particular provide a circuit arrangement that is simple and inexpensive, but at the same time able to ensure the necessary dual degree of safety required by the standards. The above and other aims still, which will emerge more clearly hereinafter, are achieved according to the present invention by a machine for washing having the characteristics referred to in Claim 1. Preferred characteristics of the invention are referred to in the dependent claims. The claims form an integral part of the technical teaching provided in relation to the invention.

## Brief description of the drawings

**[0013]** The aims, characteristics, and advantages of the present invention will emerge clearly from the ensuing description, with reference to the annexed drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a schematic illustration of a part of a control circuit of a machine for washing according to the prior art, in relation to two alternately operating electrical loads;
- Figure 2 is a schematic illustration of a part of a control circuit of a machine for washing in accordance with an embodiment of the invention, in relation to two alternately operating electrical loads.

## Description of preferred embodiments of the invention

**[0014]** Reference to *"an embodiment"* or *"one embodiment"* in the framework of the present description indicates that a particular configuration, structure, or characteristic described in relation to the embodiment is comprised in at least one embodiment. Hence, phrases such as *"in an embodiment"* or *"in one embodiment"* and the like that may be present in various points of the present description do not necessarily all refer to one and the same embodiment. Moreover, the particular configurations, structures, or characteristics can be combined in any adequate way in one or more embodiments. The references used herein are merely provided for convenience and do not define the field of protection or the scope of the embodiments.

**[0015]** Where not otherwise specified, in the framework of this description and of the attached claims, the term *"effective",* when it refers to the operation of an electrical load of the electrical household appliance, indicates that said load operates fully for the purposes of execution of the function assigned thereto. In said perspective, for example with reference to a machine for washing, the effective operation of a heating element implies that said element is supplied electrically so as to produce a given thermal energy, designed to cause heating of a washing liquid as envisaged by a program of operation of the machine in order to perform its function for the washing treatment. Likewise, in the case of the motor of a drain pump, effective operation implies that said motor is supplied electrically in such a way that the pump causes a programmed evacuation of the washing liquid from a treatment tank of the machine.

**[0016]** Figure 2 represents the circuit diagram for control of a machine for washing according to the invention, limitedly to the part of interest for an understanding of the present invention. Also the diagram of Figure 2 is simplified, as has been said in relation to the circuit of Figure 1.

**[0017]** In the example, the machine for washing is a laundry-washing machine. In Figure 2 reference numbers in part similar to those of Figure 1 are used to indicate elements that are technically equivalent to the ones already described above. In effect, as will emerge hereinafter, the circuit of Figure 2 is to a large extent similar to that of Figure 1.

**[0018]** In Figure 2, L and N designate two conductors of an electrical supply line AC, which are assumed to be the live conductor and the neutral conductor of an alter-

nating-current mains supply, via which the circuit is supplied. As per the known art, the machine comprises a plurality of electrical loads, operation of which is controlled by means of the control unit designated by CU, in particular of an electronic-microcontroller type, which drives corresponding controllable switching means in accordance with a program of operation of the machine.

**[0019]** The aforesaid electrical loads comprise a first electrical load and a second electrical load, that operate in alternation, i.e., two loads that, in proper conditions of operation of the machine, are rendered effective during different periods, on the basis of the operating program. With reference to the preferred example of embodiment provided herein, the first load is constituted by an element for heating the washing liquid, such as the electrical resistance designated by R, whereas the second electrical load is constituted by the synchronous motor designated by P, in particular the motor of a pump for draining the washing liquid. The resistance R and the motor P are of a type commonly used in the sector. Designated by TF is a known thermal fuse for protection, set in series to the resistance R.

**[0020]** The circuit comprises a monostable switch, that can be switched by the control unit CU from a normal condition of closing of the circuit branch of the pump P to a condition of closing of the circuit branch of the resistance R. In the example, the switch comprises a deviator relay DS' of a monostable type, the stable resting position of which is - as has been said - that of closing of the circuit branch of the pump P. Preferably, the circuit governing the deviator relay DS' is a dual-driving circuit; i.e., activation of the relay is by means of a pair of mutually independent driving circuits or means. In the preferred example of embodiment illustrated, the control unit CU generates a pair of mutually independent output signals, which, via a respective transistor Q1, Q2, supply the command signal to the coil of the relay.

**[0021]** The circuit comprises switching means, driven by the control unit CU for governing electrical supply to the motor P so as to render operation thereof effective, when this is envisaged by a treatment program of the machine, i.e., at different times with respect to the resistance R. In the example of embodiment illustrated, the aforesaid switching means comprise a triac TR, driven by the control unit CU.

**[0022]** As explained previously, the two loads represented by the resistance R and by the motor P present alternating operation. Consequently, the control unit CU is provided for driving the deviator relay DS', on one side, and the triac TR on the other, in such a way that operation of the resistance R is rendered effective during periods of operation of the machine different from the periods in which operation of the motor P is rendered effective.

**[0023]** Designated by DL are further switching means, which are also driven by the control unit, connected in series to the deviator relay DS'. In the example, said further switching means DL are constituted by a controllable switch belonging to a door-lock device of the washing machine.

**[0024]** In the example of embodiment, the control circuit then comprises a feedback circuit FB1, configured - in a way in itself clear to a person skilled in the art - for supplying to the control unit CU diagnostic information regarding both the state of operation of the triac TR and the state of operation of the deviator relay DS.

**[0025]** As may be appreciated, the circuit of Figure 2 in accordance with the invention basically differs from the known one of Figure 1 by:

- the absence of the relay RR dedicated to control of supply of the resistance R;
- the stable resting position of the deviator relay DS', which in this case is the position of closing of the circuit branch of the motor P; and
- the dual driving of the deviator relay DS.

**[0026]** In this way, in the solution according to the invention, the deviator relay DS' comes to constitute the actuator of the resistance R, i.e., the switching means for controlling its supply. In the prior art represented in Figure 1, instead, the deviator relay DS is only used for enabling or not supply of the resistance R, the effective control of which is instead entrusted to the relay RR.

**[0027]** The preferred embodiment of the circuit of Figure 1 moreover enables elimination of the feedback circuit FB2 provided according to the prior art, given that the state of the deviator relay DS' can be monitored by means of the feedback circuit FB1. On the other hand, in principle, a further feedback circuit could be dedicated to monitoring of the deviator relay DS'.

**[0028]** To sum up, in the example represented, the resistance R may be connected to the conductor L through the switch DL and the deviator relay DS', with the thermal fuse TF downstream of the resistance R and connected at the other end to the conductor N. On the other side, also the motor P can be connected to the conductor L through the switch DL and the deviator relay DS', with the triac TR downstream of the motor P, connected at the other end to the conductor N. The switch DL and the switch represented by the relay DS' are set in series to one another, upstream of resistance R and the motor P.

**[0029]** As has been said, operation of the motor P and of the resistance R can be rendered effective only at different moments, with the switch represented by the deviator relay DS' that now constitutes a switching means for controlling supply of the resistance R, without any need for the traditional dedicated relay RR of Figure 1.

**[0030]** In normal operation of the machine, with the switch DL closed, the unit CU governs switching of the deviator relay DS' from its stable resting position (on the left, on the branch of the motor P) to that of supply of the resistance R (on the right, on the branch of the resistance R) when, at a given moment of the program of operation of the machine, it is necessary to start heating of the washing liquid. Switching of the deviator relay DS' is provided by the control unit CU by governing the driving

means represented by the transistors Q1 and Q2.

**[0031]** At the end of the heating step, the control unit CU governs the relay DS' so as to bring it back into its stable resting condition, of closing of the branch of the motor P and of opening of the branch of the resistance R. The possible condition of failure of the relay DS' in closing on the branch of the resistance R can be detected by the unit CU on account of the absence of the signal of the feedback circuit FB1 that indicates failure of the relay DS' to close on the branch of the pump P. Protection of the resistance R is guaranteed by the presence of the thermal fuse TF, which, by overheating beyond its limit of normal operation, opens and disconnects the resistance itself from the supply. The possible cases of failure contemplated do not envisage in fact considering the effects of a mechanical failure of the thermal fuse TF, given that the mechanical failure of the relay DS' has already been hypothesized and the possibility of two concomitant mechanical failures is not contemplated.

**[0032]** When, instead, the pump has to be activated, the deviator relay DS' is in its stable resting condition, as represented in Figure 2, and the control unit CU drives the triac TR so as to activate the motor M. The possible failure of the triac TR, for example in diode mode, is detected by the unit CU by means of the feedback circuit FB1. The unit CU can then govern opening of the switch DL. In the event of a second failure that prevents said opening, which can be detected once again by means of the feedback circuit FB1, the unit CU can govern switching of the deviator relay DS' on the circuit branch of the resistance R so as to cut off supply to the motor P of the pump. The consequent turning-on of the resistance R occurs in any case in conditions of safety, thanks to the presence of the protection thermal fuse TF.

**[0033]** It should be noted that activation of the resistance R as part of the safety procedure occurs in any case only following upon a dual failure on the other components that ensure safety, i.e., the triac TR and the switch DL or the corresponding driving circuitry.

**[0034]** The use of a circuit for control of the switch DS' with dual driving guarantees that, for there to be an undesired turning-on of the resistance, there must occur simultaneous failure of at least two electronic components inserted in one and the same control circuit.

**[0035]** In the preferred embodiment of the invention, the dual driving circuitry of the deviator relay DS' is aimed at enabling that, even in the presence of just one electronic failure to the circuitry itself, the deviator relay DS' will be controllable by the control unit CU. The circuit is consequently immune to single electronic failure.

**[0036]** The above circuitry can be obtained with modalities that are clear to a person skilled in the art, for example by providing a pair of switching devices, in particular semiconductor switching devices, with independent driving in series to the driving coil of the relay DS'. Failure of just one of said switching devices of the driving circuit cannot produce switching of the relay and consequent supply of the resistance R.

**[0037]** In the example represented, the two transistors Q1 and Q2, of an npn type and pnp type respectively, are provided for the above purpose. In order to bring about switching of the relay DS' into the position of supply of the resistance R, both of the transistors Q1 and Q2 have to be brought from the state of inhibition to the state of conduction. If, for any reason, one of the two transistors, Q1 or Q2, were to present a failure into the state of conduction, the other transistor would in any case remain usable for driving the relay DS'.

**[0038]** Instead, an undesirable supply of the resistance R (i.e., an undesirable switching of the deviator DS' on the circuit branch of the resistance) could be caused by the simultaneous dual electronic failure of the driving circuit, for example of the transistors Q1 and Q2. For such an extremely unfavourable case, there is in any case present the thermal fuse TF, which would go into action, disconnecting the resistance R and sending the machine into a condition of safety. Instead, failure of one or both of the transistors Q1 and Q2 in the state of inhibition will not produce any risk of undesirable supply of the resistance R.

**[0039]** As may be seen, as compared to the known art illustrated in Figure 1, the arrangement of Figure 2 enables elimination of the relay RR of the circuit of Figure 1, with the simple addition - if so desired - of a less expensive transistor Q2, with a consequent saving in costs.

**[0040]** Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to what has been described and illustrated herein purely by way of example, without thereby departing from the scope of the present invention as defined in the annexed claims.

**[0041]** The invention has been described with particular reference to a laundry-washing machine, but the same concepts may be applied also to a washer-dryer or also to a dishwasher, which typically comprise a resistance for heating the washing liquid and a drain pump, i.e., two loads that - in conditions of proper operation of the machine - are rendered active at different moments.

## Claims

**1.** A machine for washing comprising:

- an electrical supply line (AC), which comprises a first conductor (N) and a second conductor (L);
- a plurality of electrical loads, which include a heating element (R) and a motor (P) of a pump; and
- a control circuit, which includes:

  - a control unit (CU);
  - first switching means (DS'), drivable by the control unit (CU) for supplying the heating element (R) by connecting it between the first conductor (N) and the second conduc-

tor (L); and
- second switching means (TR), drivable by the control unit (CU) for supplying the motor (P) by connecting it between the first conductor (N) and the second conductors (L);

wherein the control unit (CU) is configured for driving the first switching means (DS') and the second switching means (TR) for supplying the heating element (R) during periods of operation of the machine different from those in which the motor (P) is supplied;
wherein the first switching means comprise a monostable switch (DS') switchable between:

- a first position, in which the motor (P) is connected between the first and second conductors (L, N) through the monostable switch (DS') in said first position and said second switching means (TR); and
- a second position, in which the heating element (R) is connected between the first and second conductors (L, N) through the monostable switch (DS') in said second position;

and wherein the stable position of the monostable switch (DS') is said first position.

**2.** The machine according to Claim 1, wherein the control circuit comprises first driving means (Q1) and second driving means (Q2), which can be controlled by the control unit (CU) for driving in an independent way the monostable switch (DS').

**3.** The machine according to Claim 1 or Claim 2, wherein the monostable switch is a monostable deviator relay (DS').

**4.** The machine according to Claim 2 or Claim 3, wherein the driving means comprise a first switching device (Q1) and a second switching device (Q2), in particular a semiconductor switching device, connected in series at the two ends of a coil of the deviator relay (DS').

**5.** The machine according to Claim 4, wherein the first and second switching devices comprise a first transistor (Q1) and a second transistor (Q2), in particular an npn transistor and pnp transistor, respectively.

**6.** The machine according to any one of the preceding claims, wherein the second switching means comprise a triac (TR).

**7.** The machine according to any one of the preceding claims, wherein the control circuit further comprises third switching means (DL), switchable by the control unit (CU) between a closed position and an open position, in which the monostable switch (DS') is connected or else not connected, respectively, between the first and second conductors (L, N) of the supply line (AC).

**8.** The machine according to Claim 7, wherein the third switching means (DL) are part of a door-lock device of the machine.

**9.** The machine according to any one of the preceding claims, wherein the control circuit further comprises a feedback circuit (FB1) designed to detect a state of failure of the second switching means (TR).

**10.** The machine according to any one of the preceding claims, wherein the control circuit further comprises a protection thermal fuse (TF) connected in series to the heating element (R).

**11.** The machine according to any one of the preceding claims, **characterized in that** it is a laundry-washing machine, a laundry washer-dryer or a dishwasher, **in that** the heating element is a resistance (R; R1) for heating a washing liquid, and **in that** the pump is a pump (P) for draining the washing liquid.

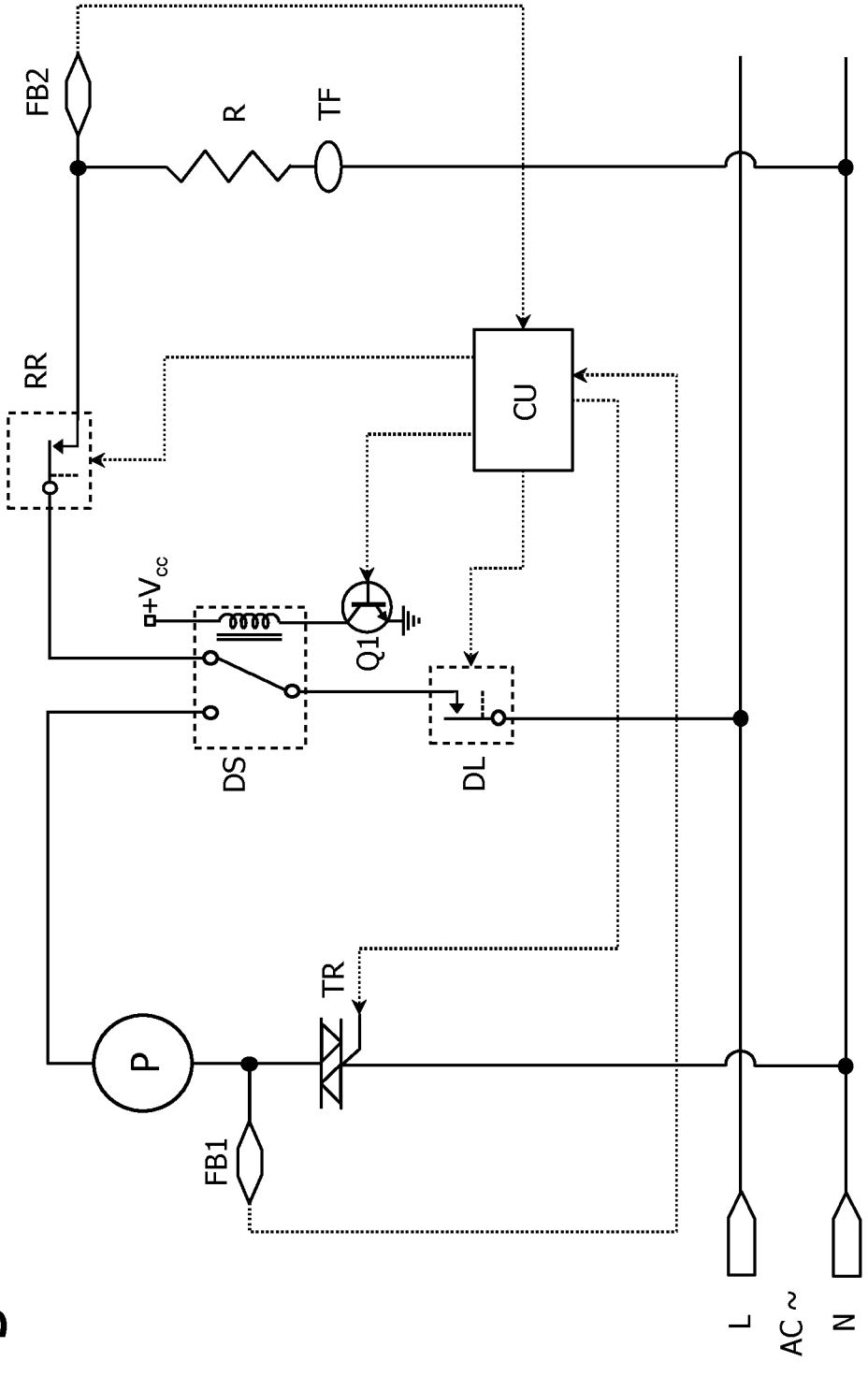
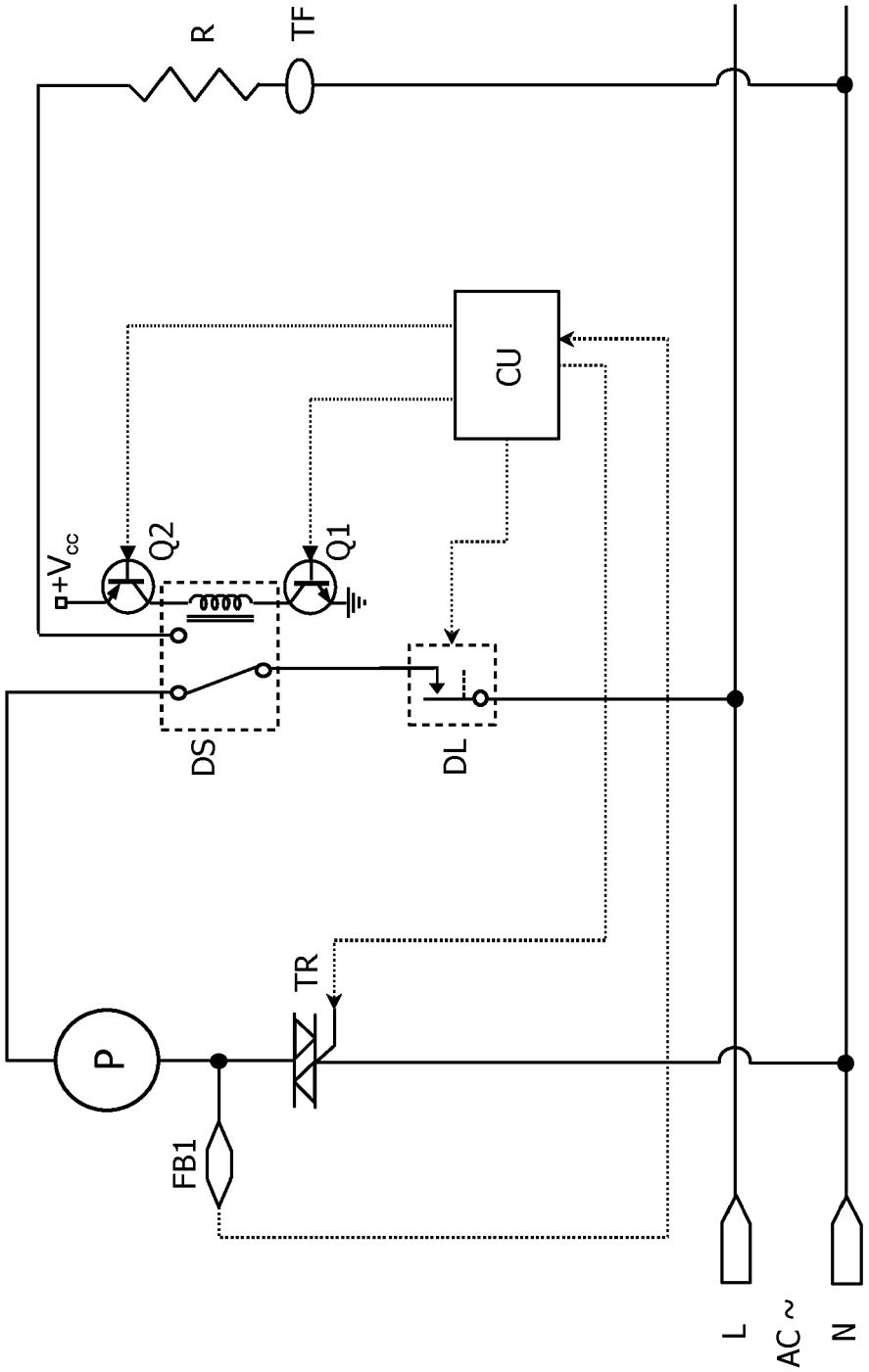



Fig. 1

Fig. 2



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# EUROPEAN SEARCH REPORT

Application Number
EP 13 15 1353

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A | EP 1 867 775 A1 (ELECTROLUX HOME PROD CORP [BE]) 19 December 2007 (2007-12-19)<br>* the whole document *<br>----- | 1-11 | INV.<br>A47L15/42<br>D06F33/02<br>D06F37/42<br>D06F39/04<br>A47L15/00 |
| A | EP 2 386 806 A1 (ELECTROLUX HOME PROD CORP [BE]) 16 November 2011 (2011-11-16)<br>* the whole document *<br>----- | 1-11 | |
| A | EP 2 085 836 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE])<br>5 August 2009 (2009-08-05)<br>* the whole document *<br>----- | 1-11 | |
| A | EP 0 740 008 A2 (WHIRLPOOL EUROP [NL])<br>30 October 1996 (1996-10-30)<br>* the whole document *<br>----- | 1-11 | |

TECHNICAL FIELDS SEARCHED (IPC)

A47L
D06F

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 20 February 2013 | Jezierski, Krzysztof |

CATEGORY OF CITED DOCUMENTS

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1 EPO FORM 1503 03.82 (P04C01)

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20-02-2013

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| EP 1867775 A1 | 19-12-2007 | AT 503882 T | 15-04-2011 |
| | | EP 1867775 A1 | 19-12-2007 |
| | | ES 2364278 T3 | 30-08-2011 |
| EP 2386806 A1 | 16-11-2011 | AU 2011251956 A1 | 29-11-2012 |
| | | CN 102906511 A | 30-01-2013 |
| | | EP 2386806 A1 | 16-11-2011 |
| | | WO 2011141536 A1 | 17-11-2011 |
| EP 2085836 A1 | 05-08-2009 | DE 102008006512 A1 | 30-07-2009 |
| | | EP 2085836 A1 | 05-08-2009 |
| EP 0740008 A2 | 30-10-1996 | EP 0740008 A2 | 30-10-1996 |
| | | ES 2181820 T3 | 01-03-2003 |

EPO FORM P0459

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