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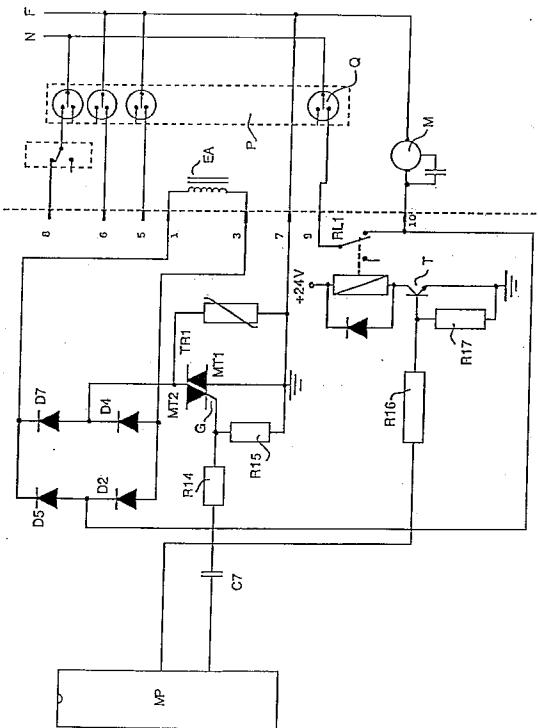
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54 Control device for an actuating element in washing machines, particularly a dishwasher, supplied starting from an alternate voltage.

(57) The present invention refers to a control device of an actuating element in washing machine, particularly a dishwasher, of the type comprising an electronic control circuit and means for supplying a control signal to the actuating element, characterised in that a supply of alternate current is supplied through an electronic switch (TR1) driven by the electronic control circuit, (MP), to rectifying means (D2, D4, D5, D7) which produces the control signal for the actuating element (EA).



EP 0 602 423 A1

The present invention refers to a control device of an actuating element in washing machines, particularly a dishwasher, of the type comprising an electronic control circuit and means for supplying a control signal to the actuating element.

In domestic washing machines, such as laundry washers and dishwashers, various actuating elements are present. Such actuating elements are used for activating other components being part of the washing machine and which carry out well defined functions.

For instance said functional elements can be electrovalves which have to be controlled in a suitable way for providing the water supply to the washing machines; or they can be used for energizing an electromagnet which allows the release of the small lid of a washing agent dispenser, so as to cause the delivery of said agents (detergents) in the inside of a washing chamber of a washing machine.

Actuating elements are also used for allowing the execution of other internal functions of said washing machines.

When said actuating elements require for their operation of a non alternate or unidirectional supply, this latter must be obtained in a certain way starting from the alternate supply which supplies the whole machine.

In particular, when in the inside of the machine electronic modules are provided, which themselves require a supply voltage in direct current, one of the simplest ways for obtaining the supply voltage for said actuators is that of taking the supply from the circuit which already produces the direct current for the other electronic components, instead of specifically providing a transformer, a rectifier circuit and a filtering and stabilizing circuit of the rectified current.

Such a solution has however the drawback of determining an increase in the manufacturing costs of the washing machine, inasmuch as it obliges to oversize the supply circuit of direct current; furthermore, this causes a reduction of the useful space in the inside of the washing machine, and it also makes more difficult the mounting of the components on the electronic module.

Aim of the present invention is that of obtaining a device which does not suffer the above described drawbacks and which, in the meanwhile, results in being reliable, efficient and of low cost.

Consequently, for attaining said aims, the present invention has for subject a control device of an actuating element in washing machine, particularly a dishwasher, of the type comprising an electronic control circuit and means for supplying a control signal to the actuating element, characterised in that a supply of alternate current is supplied through an electronic switch driven by the electronic control circuit, to rectifying means which produces the control signal for the actuating element.

Further aims and advantages of the present invention will result in being clear from the description which follows, supplied as an explanatory and not limiting example, and from the annexed drawing, wherein in a circuit implementation of the device according to the invention is represented.

As an applicative, but not limiting, example, with reference to the essential part of the drawing a control device for an automatic detergent dispenser in a dishwashing machine is described.

In the figure, with M an electric motor is indicated, for the driving, by means of a pump, of the sprinklers in the inside of the washing chamber of a dishwashing machine.

15 Said motor is generally constituted by a stator element and a rotor element, in addition to a ferromagnetic core.

With RL1 a control relay of the motor M is indicated, while with P a programmer, or timer, of the dishwashing machine is indicated.

20 With reference letter T a driver transistor is indicated, the output of which (collector) is connected to relays RL1; the emitter is connected to ground and its base receives, through a resistor R16, a driving signal from a pin of a integrated electronic circuit of control (micro controller), indicated with MP.

25 Between the base and the emitter of said transistor T a biasing resistor is connected, indicated with R17.

30 At one of the ends of said motor M, by means of a terminal indicated with 10, the anode of a diode indicated with D5 and the cathode of a second diode indicated with D2 are connected.

35 To the anode of diode D2 the anode of a third diode indicated with D4 is connected. To the cathode of this last diode D4 the anode of a fourth diode D7 is connected, having its cathode connected to the cathode of said diode D5.

40 Said four diodes D2, D5, D4 and D7 are connected in a diode bridge configuration. At the common point between the cathode of diode D4 and the anode of diode D7 a terminal MT2 of an electronic switch (triac) indicated with TR1 is connected.

45 A second terminal of said triac, indicated with MT1, is connected to ground, while gate G of said triac TR1 is connected, through a resistor R14 and a capacitor C7, to one of the pins of said microcontroller MP.

50 The cathodes of said diodes D5 and D7 are connected, by means of a terminal indicated with 1, to an end of a coil indicated with EA.

The second end of said coil EA is connected, by means of a terminal 3, to the anodes of diodes D2 and D4. Said coil EA realizes the actuating element of the detergent dispenser of the dishwashing machine.

55 Finally, two conductors indicated with N and F refer to the electric mains supply and identify respectively phase and neutral pole of the electric supply

signal.

The circuit operates in the following way.

During the washing phase, relay RL1, appropriately energized by the microcontroller MP, allows that the electric supply coming from the two conductors N or F reaches the ends of the motor M.

During the washing, in a predetermined period of time, microcontroller MP produces the stop of motor M, by disconnecting it from at least one of the two conductors N or F which carry the supply voltage; in this case from conductor N.

Just during this stop the delivery of the washing agents in the inside of the washing chamber is carried out.

For obtaining this, the triac TR1 is driven by microcontroller MP so as to be made conductive.

The conduction of triac TR1 delivers therefore a signal of alternate supply to the gates of diodes D2, D4, D5, D7.

In particular the triac TR1 is driven by microcontroller MP on gate G, through resistor R14 and condenser C7.

Diodes D2, D4, D5 and D7 deliver to the ends of coil EA a unidirectional supply having the higher potential on terminal 1. The flow of current in coil EA allows, for instance, the release of the washing agents, so that the latters fall in the inside of the washing chamber of the dishwashing machine.

The inductance constituted by windings of motor M, connected to the common point of diodes D2 and D5, and therefore in series to the triac, has the purpose of reducing the speed with which the current in the triac decreases, so as to overcoming the difficulty of the triac in sustaining this kind of commutation, wherein the use of the triac for controlling a load by means of a rectifying bridge is particularly hard.

The inductance value of the windings of motor M must be substantially lower than that of the windings of coil EA. This has the purpose of avoiding that a too higher value of the inductance presented by the windings of motor M prevents the normal flow towards the rectifying circuit of the electric supply signal coming from conductor F.

The present implementation of the device is made possible by the acknowledgement of the fact that, during the phase of release of the washing agents in the inside of the washing chamber of a washing machine, the washing motor is deactivated.

In this way it is therefore possible to take advantage of the windings of the motor M of the washing machine, using them as inductance of the triac driving circuit, without requiring the use of a dedicated inductance.

The characteristics of the control device of an actuating element in washing machine subject of the present invention result in being clear from the given description; from the given description are also clear its advantages.

Particularly they are represented by the fact that an economic saving is obtained in the embodiment of the device, inasmuch as the use of transformers or other devices is not required, for obtaining a direct current supply having high value for driving the actuating device; as inductance to be connected in series to the electronic switch (triac TR1) and to the rectifying means of direct current, an inductance already being present in the washing machine is used, normally employed for different purposes.

In addition the simplicity of the realization of the devices and its efficiency in operation are highlighted.

It is however clear that numerous changes can be made to the control device of an actuating element in washing machine subject of the present invention (for instance applying such a device for the control of an electrovalve of a washing machine, or using another inductance presented by windings provided in the machine, such as those of a drain pump of a washing machine) without departing from the novelty principles inherent the invention; it is also clear that in the practical embodiment the used components could be realized by technical equivalents.

## Claims

1. Control device of an actuating element in washing machine, particularly a dishwasher, of the type comprising an electronic control circuit and means for supplying a command signal to the actuating element, characterised in that a supply of alternate current is supplied through an electronic switch (TR1) driven by the electronic control circuit (MP), to rectifying means (D2, D4, D5, D7) which produces the control signal for the actuating element (EA).
2. Control device of an actuating element according to claim 1, characterized in that the electronic switch is constituted by a triac (TR1).
3. Control device of an actuating element according to claim 2, characterized in that the electronic switch (TR1) is supplied through an inductance connected in series obtained by a winding already present in said washing machine.
4. Control device of an actuating element according to claim 3, characterized in that said inductance in series to said electronic switch (TR1) has an impedance value substantially lower than that of the actuating element (EA).
5. Control device of an actuating element according to claim 1, characterized in that it is used in washing machines for the detergent automatic distrib-

ution.

6. Control device of an actuating element according to claim 1, characterized in that it is used in washing machines for the control of an electrovalve. 5
7. Control device of an actuating element according to claim 3, characterized in that said inductance in series to said electronic switch (TR1) is that of the windings of a washing motor (M). 10
8. Control device of an actuating element according to claim 3, characterized in that said inductance in series to said electronic switch (TR1) is that presented by a drain pump at its ends. 15
9. Control device of an actuating element according to claim 1, characterized in that said electronic control circuit is constituted by a microcontroller circuit (MP). 20
10. Control device of an actuating element according to claim 1, characterized in that the current which is supplied to the winding of said actuating element (EA) is unidirectional. 25
11. Control device of an actuating element according to claim 1, characterized in that said rectifying means which supplies the control signal to the actuating element are constituted by a diodes bridge (D2, D4, D5, D7). 30

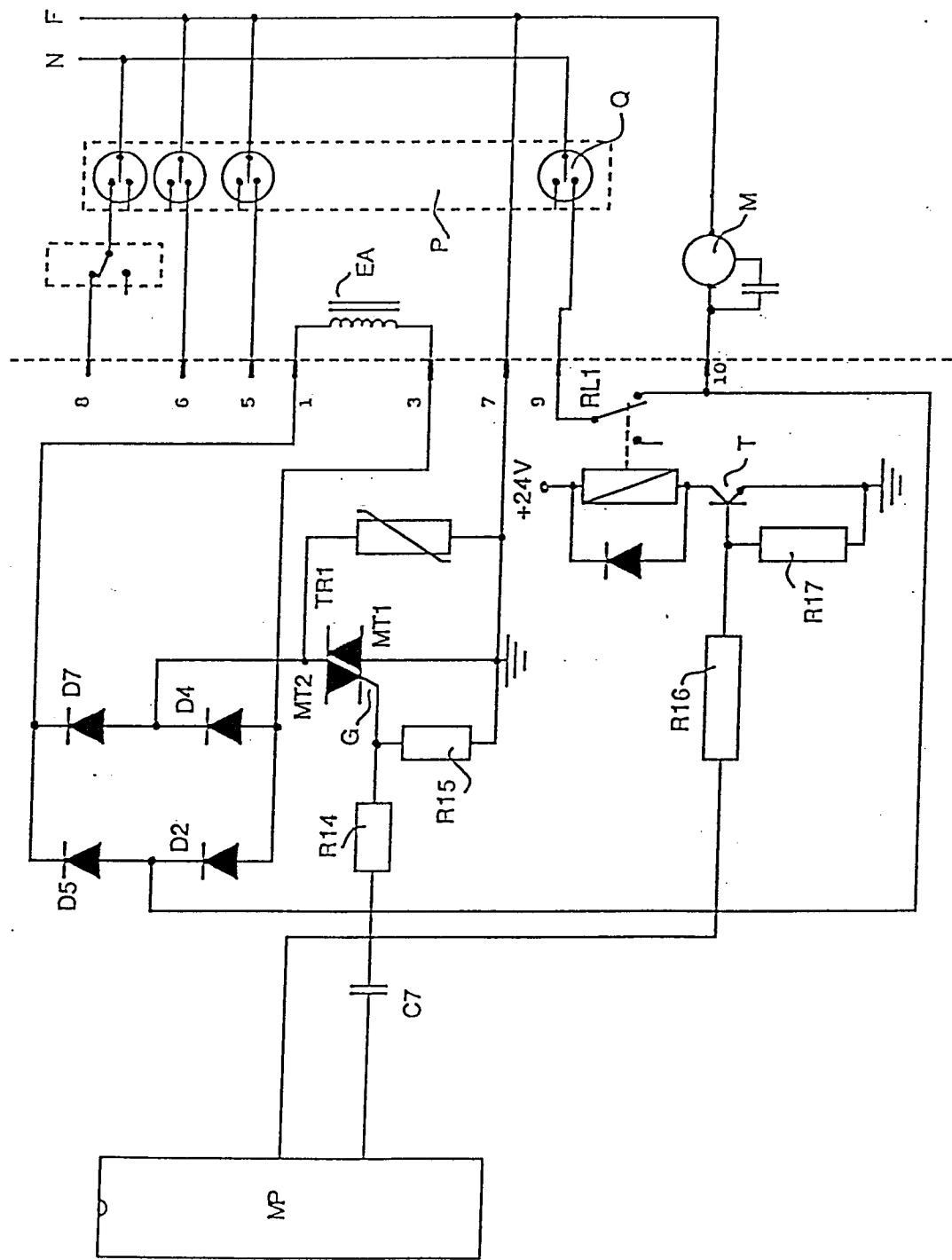
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## EUROPEAN SEARCH REPORT

Application Number

EP 93 11 8945

DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)						
A	US-A-4 410 329 (GENERAL ELECTRIC COMPANY) * column 7, line 67 - column 8, line 7; figure 3 *	1, 6, 9, 10	D06F33/02 A47L15/46						
A	US-A-4 195 500 (HITACHI LTD.) * column 4, line 61 - column 5, line 2; figure 6 *	1, 2, 6, 9							
A	FR-A-2 519 660 (CROUZET SA.) * claims; figure *	1, 10, 11							
A	US-A-3 638 090 (U.S. PHILIPS CORPORATION) * figure 5 *	1, 10, 11							
A	FR-A-2 253 121 (DOUBLEFELL LIMITED)  * page 7, line 26 - page 8, line 15; figures 7,8 *	1-4, 10, 11							
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)						
			D06F A47L						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of compilation of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>29 March 1994</td> <td>Courrier, G</td> </tr> </table>				Place of search	Date of compilation of the search	Examiner	THE HAGUE	29 March 1994	Courrier, G
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THE HAGUE	29 March 1994	Courrier, G							
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document							