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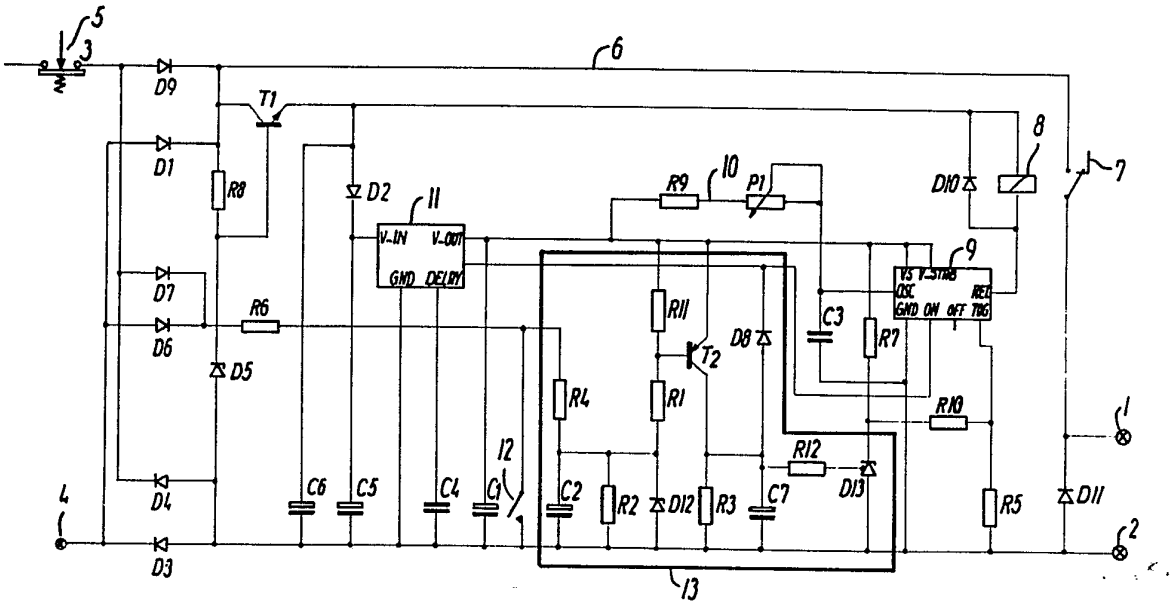

(57) Abstract

A control circuit for connecting an electrical consumer appliance to a supply mains during an adjustable pre-determined time interval comprises a relay switch (7) coupled into the supply line (6) to the consumer appliance, the relay coil of which is activated and deactivated by means of a drive circuit (9) with a timer function. The relay activating signal is provided at the output of the drive circuit and is generated in response to a change of the voltage level of a toggle signal supplied to the drive circuit (9) and generated by a pulse-shaping circuit (13) connected to the supply mains in response to a brief interruption of the supply voltage. Means (C) are associated with an adjusting unit (11) for supplying operating voltage to the drive circuit for maintaining the operating voltage during such a brief interruption.

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A control circuit with timer function for an electrical consumer appliance.

The invention relates to a control circuit for connecting an electrical consumer appliance to a supply mains during an adjustable pre-determined time interval, comprising a relay switch, coupled into the supply line to the consumer appliance, the relay coil of which is activated and deactivated by means of a drive circuit with a timer function.

In connection with electrically operated fans or other, e.g. heat generating electrical consumer appliances having a built-in control circuit with adjustable timer function it is often desirable to be able to switch the power on and off either by means of a an operator switch on the appliance itself or by remote control by means of a switch positioned at a distance from the appliance.

Such wishes are mainly based on energy saving, safety reasons and operation simplifying considerations.

The object of the present invention is to provide a design of such a control circuit, which in a simple way provides the possibility of such a remote control without additional control wires between the remote control switch and the control circuit itself.

With a view hereto the control circuit according to the invention is characterized in the relay activating signal provided at the output of the drive circuit is generated in response to a change of the voltage level of a toggle signal supplied to the drive circuit and generated by a pulse-shaping circuit connected to the supply mains in response to a brief interruption of the supply voltage, whereas means are associated with an adjusting unit for supplying oper-

ating voltage to the drive circuit for maintaining the operating voltage during such a brief interruption.

By letting the generation of the relay activating signal depend on a brief interruption of the supply voltage one or more remote control switches such as, e.g. spring loaded pressure couplers, can be placed in random positions along the supply line to the consuming appliance.

In the following the invention is further explained with reference to the drawing which shows a diagram of an embodiment of a control circuit according to the invention.

In the diagram, 1 and 2 designate connection terminals for the consuming appliance, e.g. an electrical drive motor for a fan, whereas 3 and 4 designate connection terminals for the supply voltage, and 5 is a pressure coupler, by means of which the supply voltage can be disconnected during a brief time interval.

A relay switch 7 is coupled into the supply line 6, the activating coil 8 of which is connected to an output REL from a drive circuit 9. The drive circuit 9 is of the type having a built-in timer function, which is made adjustable by means of an RC circuit 10 connected to an input OSC, and having a capacitor C_3, a fixed resistance R_9 and a potentiometer P_1. The drive circuit 9 is activated by means of a toggle signal supplied to an input TOG, for example so that the signal at the output REL changes level each time the toggle signal on the input TOG drops below a certain level, whereby the timer function is reset at zero. When the signal on the output REL assumes one of its two levels, e.g. low level, the relay 8 is activated, the switch 7 of which is maintained connected during the connection time determined by the RC circuit 10.

The supply voltage supplied to the terminals 3 and 4 is double rectified by means of the diode circuits D1, D3, D4 and D9 and is reduced to a voltage level of, e.g. 24 V by means of the circuit R8 D5, T1 supplying the relay coil 8.

The reduced 24 V voltage which is decoupled by a capacitor C6 is peak rectified in the circuit D2 C5 and series regulated by means of a regulator circuit 11 to a level of, e.g. 5 V. A capacitor C5 of, e.g. 1000 µF serves to maintain the input voltage to the regulator circuit 10 at interruption of the supply voltage during a brief time interval, e.g. up to 5 seconds. The operating voltage for the drive circuit 9 is taken from the output of the regulator circuit 11.

The regulator circuit is further arranged so that when the supply voltage is reestablished after an interruption of a longer duration, it produces a RESET signal at the output. This signal, the pulse width of which is determined by a capacitor C4, is supplied to a separate input ON on the drive circuit 9 and ensures that it always activates the relay 8, when the operating voltage has been interrupted (cold start).

In the embodiment shown the toggle signal to the input TOG of the drive circuit 9 is generated either by a brief activation of the pressure coupler 5 in the supply line or by activating a separate switch 12. In both cases a pulse-shaping circuit 13 connected to the supply main is affected.

When the coupler 5 is closed and the switch 12 is off the input voltage will, through the double rectifier diodes D6 and D7 and the resistances R6 and R4, generate a direct current of, e.g. 6.2 V over the diode D12. If the coupler 5 is opened, whereby the supply voltage is interrupted, or the switch 12 is connected, the voltage over the diode D12 will de-

crease, whereby the transistor T2 will conduct and charge the capacitor C7 to a voltage level of, e.g. 5 V. As soon as the voltage over the capacitor C7 has risen above a certain lower level, e.g. 2.5 V, the diode D13 will conduct, and thereby the toggle signal on the input TOG will be dragged below the change-over level, e.g. 1.6 V.

As the toggle input TOG in commercial embodiments of the drive circuit 11, e.g. like the circuit U 6047 B marketed by Telefunken Elektronic, is bounce protected so as to only react to pulses with a larger width than approx 1/12000 of the actual timer setting, which for example may be up to 60 minutes, the structure of the pulse-shaping circuit is arranged so that such a pulse width is ensured by a built-in time constant of, e.g. 0.5 seconds for the trailing edge of the voltage over the diode D13. If the switch 12 is activated during a time interval shorter than, e.g. 0.2 seconds, the transistor T2 will block, as soon as the voltage over the diode D12 reaches a level of, e.g. 4 V. The time delay occurs because the voltage over the capacitor C7 is discharged slowly through the resistance R3, and only when it reaches the aforementioned level of, e.g. 2.5 V, the diode D13 will block and the level of the toggle signal on the input TOG will assume its high level.

The resistance R4 serves to protect the switch 12 against the peak voltage when the capacitor C2 is discharged. If the adjusted 5 V voltage from the circuit 11 has been disconnected the capacitor C7 is discharged through the diode D8 which ensures that the toggle function is activated immediately at reestablishment of the supply voltage at cold start. The diodes D10 and D11 protect the circuit against voltage transients from the motor and the relay coil.

PATENT CLAIMS

1. A control circuit for connecting an electrical consumer appliance to a supply mains during an adjustable pre-determined time interval, comprising a relay switch (7) coupled into the supply line (6) to the consumer appliance, the relay coil of which is activated and deactivated by means of a drive circuit (9) with a timer function, characterized in that the relay activating signal provided at the output of the drive circuit is generated in response to a change of the voltage level of a toggle signal supplied to the drive circuit (9) and generated by a pulse-shaping circuit (13) connected to the supply mains in response to a brief interruption of the supply voltage, whereas means (C) are associated with an adjusting unit (11) for supplying operating voltage to the drive circuit for maintaining the operating voltage during such a brief interruption.

2. A control circuit as claimed in claim 1, characterized in that the pulse-shaping circuit (13) is further arranged so as to produce a toggle signal in response to activation of a separate switch (12) not affecting the supply voltage.

3. A control circuit as claimed in claim 1 or 2, characterized in that the drive circuit (9) is arranged so as to generate the relay activating signal in response to a reset signal generated by the adjusting unit (11), when the supply is reestablished after interruption beyond said brief time interval.

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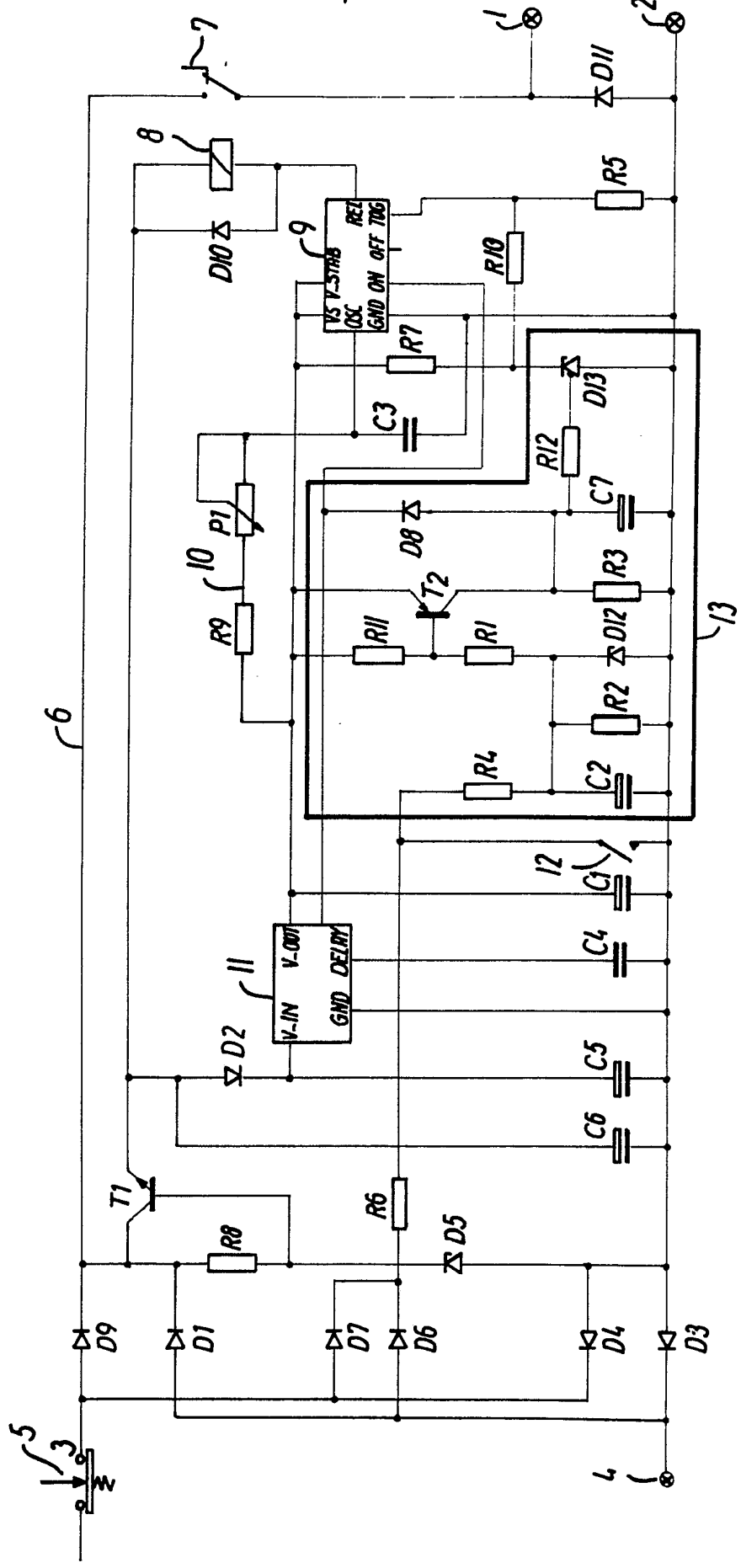
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INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 92/00140

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: H 01 H 47/00, H 02 J 13/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	H 01 H, H 02 J, H 05 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	US, A, 4204149 (J.J. CLEARY ET AL) 20 May 1980, see column 1, line 41 - column 2, line 2; column 7, line 33 - line 53; column 8, line 3 - line 7; column 8, line 61 - line 68 --	1-3
A	US, A, 4449161 (L.K. KLING) 15 May 1984, see abstract --	1
A	US, A, 4322632 (E.F. HART ET AL) 30 March 1982, see column 4, line 48 - column 6, line 21; figure 3 --	1
A	US, A, 4292546 (W.P. CLARK) 29 September 1981, see column 2, line 22 - column 3, line 14; figure 1 --	1

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* Special categories of cited documents:[10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
27th July 1992	1992 -08- 06
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Bertil Nordenberg

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/DK 92/00140

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 01/07/92
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A- 4204149	80-05-20	NONE		
US-A- 4449161	84-05-15	CA-A-	1196687	85-11-12
		DE-A-	3326012	84-01-19
		GB-A-	2123625	84-02-01
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		EP-A-	0036666	81-09-30
		JP-A-	56150936	81-11-21
US-A- 4292546	81-09-29	NONE		