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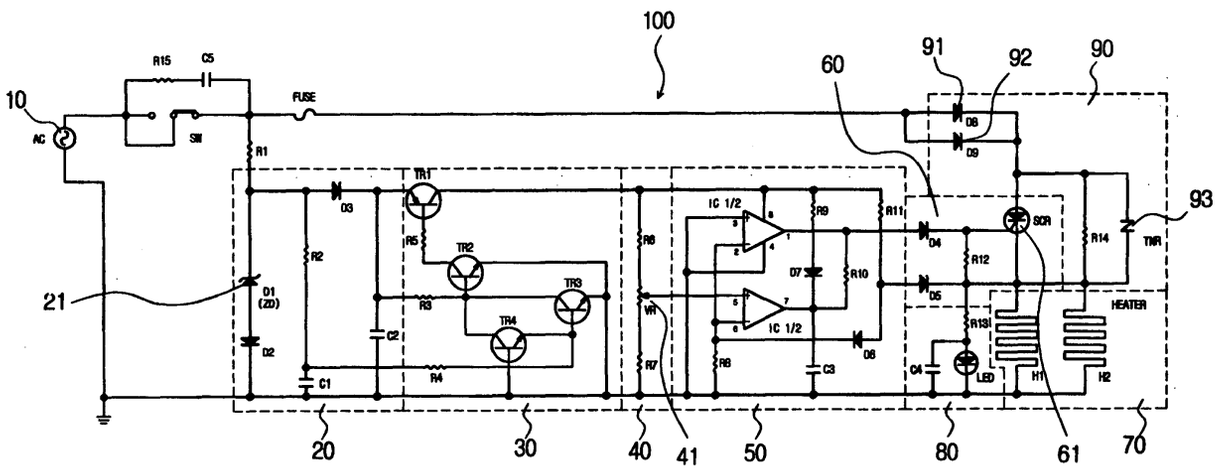
(54) Circuit for controlling the temperature of a hair iron

(57) A temperature control circuit (100) for a hair iron in which an alternating current is applied to the hair iron and the temperature of the hair iron is uniformly maintained, is disclosed. The temperature control circuit comprises a constant voltage portion (20) for rectifying the alternating current and converting the rectified current to a constant voltage; a pulse generating portion (30) for receiving an output from the constant voltage portion (20) and generating a pulse signal for applying zero pulse frequency so as to reduce frequency noise; a temperature control portion (40) for receiving a signal from the pulse generating portion (30) and controlling the temperature of a setting heater; a comparator portion (50) for comparing the output of the constant voltage portion with the resistance of the mat of the setting heater and generating an output during a given time; a heater control portion (60) such as a silicon control rectifier (61) for receiving an output signal from the comparator portion (50) to maintain and preheat the temperature of the mat uniformly; a heating portion (70) for receiving an output signal from the heater control portion (60) to heat up the mat of the setting heater; a heater control display portion (80) for displaying a preheat condition of the mat of the setting heater; and a backward voltage prevention portion (90) for preventing breakdown of devices due to surge or backward voltage of the heater control portion.



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Description

[0001] The present invention relates to a circuit for controlling the temperature of a hair iron, and more particularly, to a temperature control circuit for a hair iron, which is capable of intercepting surge or backward voltage to prevent breakdown of various devices such as integrated circuits (IC) or silicon control rectifiers (SCR), susceptible to high voltage, and is capable of preventing burns or electric shock accidents due to overcurrent, and thus be more safe to use.

[0002] In general, a temperature control circuit for a hair iron used for straightening curly hair, is operated by applying electric current to a heater, whereby the heater is heated, and the heat is evenly transferred to the whole of the mat of a setting heater. The temperature control circuit is powered by an alternating current from a power supply, and the heat is lowered via a temperature sensitive resin to spread evenly across the mat of a setting heater.

[0003] The conventional temperature control circuit comprises: a constant voltage portion for rectifying the alternating current utilizing breakdown of a zener diode and converting the rectified current to a constant voltage; a pulse generating portion for receiving an output from the constant voltage portion to stabilize the constant voltage portion and generating a pulse for applying zero pulse frequency so as to reduce frequency noise; a temperature control portion for receiving a signal from the pulse generating portion and controlling the temperature of a setting heater by means of a variable resistor; a comparator portion for comparing the output from the variable resistor of the mat of the setting heater and generating an output during a given time; a heater control portion such as a silicon control rectifier for receiving the output from the comparator portion and controlling a pulse; a heating portion for preheating the mat of the setting heater by means of the output from the heater control portion; and a heater control display portion such as a light emitting diode (LED) for displaying a preheat condition of the mat of the setting heater.

[0004] However, since the conventional temperature control circuit uses a mat of the setting heater to which a relatively high voltage is applied, deflection of temperature due to hysteresis may be larger. Also, since the conventional temperature control circuit uses devices such as an integrated circuit (IC) or a silicon control rectifier (SCR), susceptible to high voltage and surge, such devices may break down. If overcurrent flows to the circuit and the outer coating of the mat of the setting heater is partially melted, electric shock or burn accidents may be caused.

[0005] Accordingly, the conventional temperature control circuit for a hair iron has many problems such as breakdown of devices and danger of accident. Thus, an improved temperature control circuit for a hair iron, which is capable of intercepting backward voltage and surge to prevent a breakdown of various devices, is urgently needed.

[0006] Therefore, in considering said problems in the art, the present invention seeks to provide a temperature control circuit for a hair iron, which has no switching noises in its silicon control rectifier (SCR), which is capable of protecting devices susceptible to surge or high voltage, and which is capable of reducing burn or electric shock accidents due to overcurrent, to thus be more safe to use.

[0007] According to the invention, there is provided a temperature control circuit for a hair iron in which an alternating current is applied to the hair iron and the temperature of the hair iron is uniformly maintained, said control circuit comprising a constant voltage portion for rectifying the alternating current and converting the rectified current to a constant voltage; a pulse generating portion for receiving an output from said constant voltage portion and generating a pulse signal for applying zero pulse frequency so as to reduce frequency noise; a temperature control portion for receiving a signal from said pulse generating portion and controlling the temperature of a setting heater; a comparator portion for comparing the output of said constant voltage portion with the resistance of the mat of the setting heater and generating an output during a given time; a heater control portion such as a silicon control rectifier for receiving the output signal from said comparator portion to maintain and preheat the temperature of the mat uniformly; a heating portion for receiving the output signal from said heater control portion to heat up the mat of the setting heater; a heater control display portion for displaying a preheat condition of the mat of the setting heater; and a backward voltage prevention portion for preventing breakdown of devices due to surge or backward voltage of said heater control portion.

[0008] In a preferred embodiment of the invention, the backward voltage prevention portion has a varistor for protecting the silicon control rectifier, and diodes.

[0009] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawing which is a circuit showing an embodiment of a temperature control circuit for the hair iron according to the present invention.

[0010] Referring to the drawing, a temperature control circuit 100 includes a constant voltage portion 20 to which an alternating current is applied, a pulse generating portion 30, a temperature control portion 40, a comparator portion 50, a heater control portion 60, a heating portion 70, a heater control display portion 80 and a backward voltage prevention portion 90.

[0011] Constant voltage portion 20 rectifies the alternating current utilizing the breakdown of a zener diode 21 and converts the rectified current to a constant voltage, which is used as a power source for the remaining devices. Pulse generating portion 30 has a zero-crossing circuit consisting of a plurality of transistors

(TR1-TR4). The zero-crossing circuit receives an output from constant voltage portion 20 and generates a pulse signal for applying zero pulse frequency so as to reduce frequency noise and stabilize the frequency. Temperature control portion 40 receives the signal from pulse generating portion 30 and controls the temperature of a setting heater by means of a variable resistor 41, depending on the condition of the hair or the user's preference. Comparator portion 50 has non-inverting input terminals to which power is applied and a diode, a capacitor and a resistor are connected in parallel. Comparator portion 50 compares the output of constant voltage portion 20 against the resistance of the mat of the setting heater and generates an output during a given time. Heater control portion 60, including a silicon control rectifier 61, receives the output signal from comparator portion 50 to maintain and preheat the temperature of the mat uniformly. Heating portion 70 receives the output signal from heater control portion 60 to heat up the mat of the setting heater. Heater control display portion 80 displays a preheat condition of the mat of the setting heater, that is, short condition depending on the value of resistance of a silicon control rectifier 61, by means of a light emitting diode (LED). Backward voltage prevention portion 90 prevents breakdown of devices due to surge or backward voltage of heater control portion 60.

[0012] In the preferred embodiment of temperature control circuit 100, backward voltage prevention portion 90 has a varistor 93 for protecting silicon control rectifier 61, and diodes 91 and 92.

[0013] The silicon control rectifier 61 in heater control portion 60 is connected in parallel with a resistor R14. If, due to voltage drop, a high voltage is applied to diodes 91 and 92 and silicon control rectifier 61, the voltage applied to silicon control rectifier 61 becomes lower than that applied to diodes D4 and D5, and thereby silicon control rectifier 61 can be protected preferentially. Also, since the internal voltage of diodes D4 and D5 is high and the sum of the internal voltage and the voltage applied to silicon control rectifier 61 becomes very high, by connecting diodes 91 and 92 of backward voltage prevention portion 90 in parallel, the breakdown of devices or an electric shock due to instant surge or backward voltage, can be prevented. Also, by connecting diodes 91 and 92 in parallel, what an alternating voltage is applied to silicon control rectifier 61 can be prevented, and thereby the breakdown of the integrated circuit can be prevented.

[0014] A varistor 93 of backward voltage prevention portion 90 is connected in parallel with the silicon control rectifier 61 and thus constitutes a protection circuit for preventing any voltage more than a normal value from being applied to silicon control rectifier 61.

[0015] As mentioned in the above, temperature control circuit 100 for a hair iron according to the present invention is a precise temperature control circuit constructed with an integrated circuit (IC) and has no switching noise in silicon control rectifier 61, by means of a zero-crossing circuit. Also, by using a voltage comparison circuit utilising an integrated circuit IC 1/2 to detect the resistance of the heating elements H1/H2 of the mat of the setting heater, a precise temperature control can be achieved.

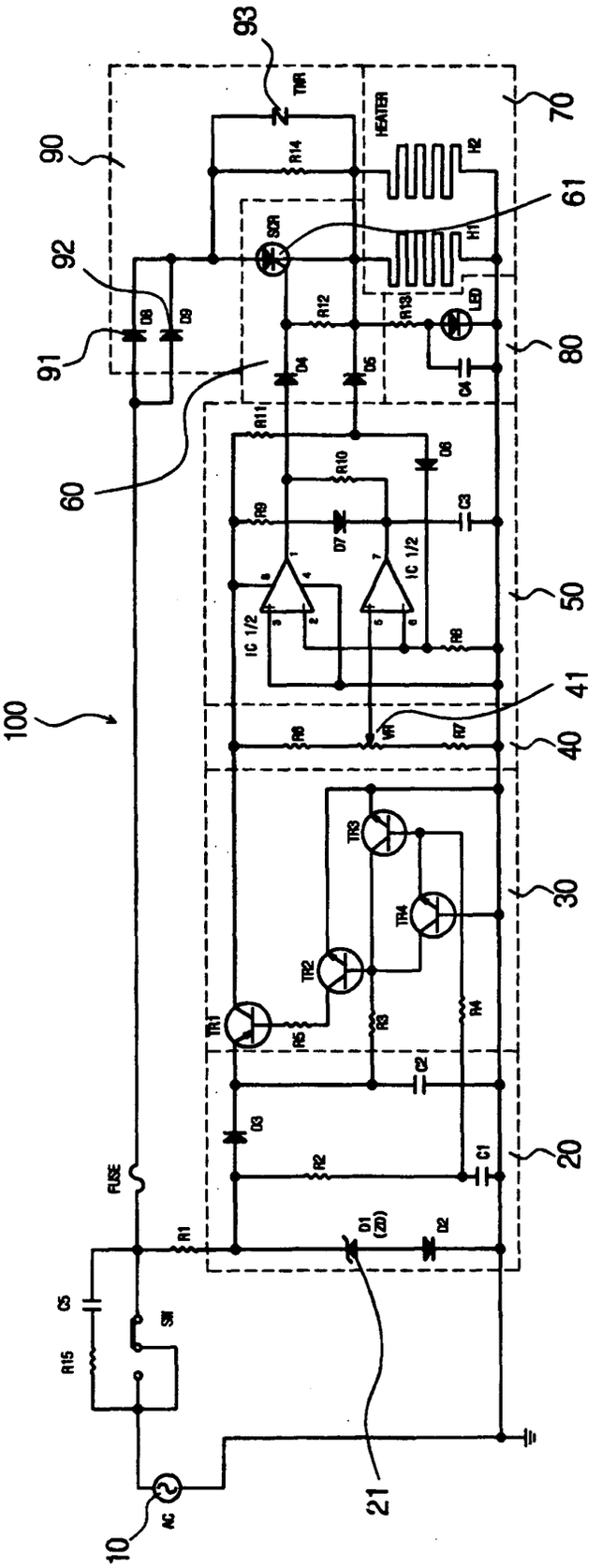
Accordingly, the present invention can prevent breakdown of various devices such as the integrated circuit (IC 1/2) or the silicon control rectifier (SCR) susceptible to high voltage and is further capable of preventing burn or electric shock accidents due to overcurrent, and thus be more safe to use.

Claims

1. A temperature control circuit for a hair iron in which an alternating current is applied to the hair iron and the temperature of the hair iron is uniformly maintained, said control circuit comprising:

   a constant voltage portion (20) for rectifying the alternating current and converting the rectified current to a constant voltage;
   a pulse generating portion (30) for receiving an output from said constant voltage portion (20) and generating a pulse signal for applying zero pulse frequency so as to reduce frequency noise;
   a temperature control portion (40) for receiving a signal from said pulse generating portion and controlling the temperature of a setting heater;
   a comparator portion (50) for comparing the output of said constant voltage portion with the resistance of the mat of the setting heater and generating an output during a given time;
   a heater control portion (60) such as a silicon control rectifier (61) for receiving the output signal from said comparator portion (50) to maintain and preheat the temperature of the mat uniformly;
   a heating portion (70) for receiving the output signal from said heater control portion (60) to heat up the mat of the setting heater;
   a heater control display portion (80) for displaying a preheat condition of the mat of the setting heater; and
   a backward voltage prevention portion (90) for preventing breakdown of devices due to surge or backward voltage of said heater control portion.

2. The temperature control circuit as claimed in claim 1, wherein said backward voltage prevention portion has a varistor (93) for protecting the silicon control rectifier (61), and diodes.


93
TMR
HEATER
70
90
R14
H2
61
SCR
H1
92
D8
D9
R12
R13
LED
91
80
C4
D4
D5
60
R11
D6
R10
R9
C3
D7
IC 1/2
50
IC 1/2
R8
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R6
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30
TR4
TR2
TR1
R5
R3
R4
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D3
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R2
C1
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R1
D1
(Zd)
D2
C5
SW
R15
21
AC
10

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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 5842

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.7)
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

A45D
H01C
H02H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	8 December 2003	Henrikson, O

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08-12-2003

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82