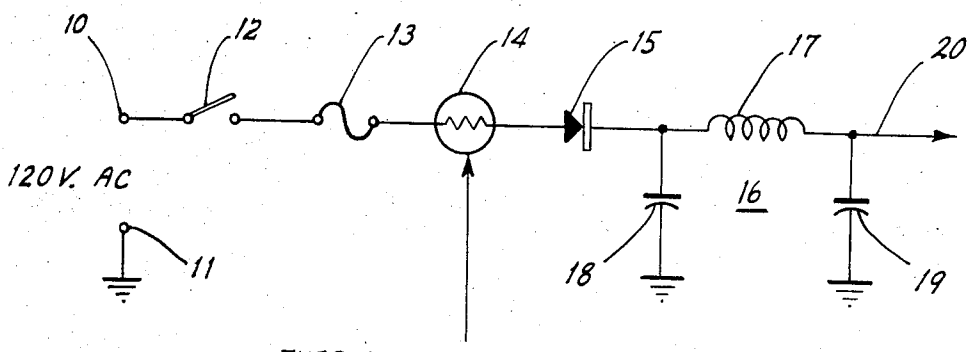
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POWER SUPPLY CIRCUIT

Filed May 4, 1964



THERMISTOR WITH COOLING TIME CONSTANT COMPARABLE TO DISCHARGE TIME CONSTANT OF FILTER CAPACITORS.

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POWER SUPPLY CIRCUIT

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This invention relates generally to power supply circuits and more particularly to power supply circuits for television receivers and the like. While not limited to use in television receivers, the invention is particularly well suited for such use and therefore it will be described with reference thereto.

In present-day television receivers, it is customary to employ a current-limiting resistor in the power supply circuit to protect the rectifier against damage by high initial current. For example, in such a receiver employing a silicon rectifier and a capacitor-input filter, in the absence of the protective current-limiting resistor the sudden charging of the input capacitor of the filter upon turn-on of the receiver could result in very high current since the only limiting resistance would be that of the rectifier itself and that of the connecting wires. This initial surge current could easily damage or destroy the rectifier, and hence it is a practical necessity to limit the initial current by inserting resistance in the current. In some television receivers this limiting resistor is combined with the fuse, which is required by the underwriters, in a unit sometimes designated as a "fusistor."

While a current-limiting resistor is a necessity during initial operation of a television receiver, it serves no useful purpose after the warm-up period and in fact it is then undesirable because it produces a substantial voltage drop and it decreases accordingly the DC supply voltage. In practice this resistor may be responsible for about one-half the total voltage drop in the power supply circuit, and it may reduce the available DC voltage supply by about twenty volts.

One object of the present invention is to provide a line-connected power supply circuit which has a relatively high output voltage.

Another object of the invention is to provide a simple and inexpensive arrangement for substantially reducing the voltage drop due to the inclusion of a current-limiting resistor in a power supply circuit.

Other objects of the invention will become apparent as the description proceeds.

In accordance with this invention, the relatively high output voltage is achieved by utilizing a thermistor to provide the required current-limiting resistance. A thermistor has higher resistance when it is cold than when it is hot, and therefore it is well suited for the purpose of this invention. During initial operation it is cold and it provides the necessary resistance to limit the initial current. However when it becomes heated by the current flowing through it, its resistance decreases substantially and it then causes substantially less voltage drop than an ordinary resistor.

The invention may be fully understood from the following detailed description with reference to the accompanying drawing wherein the single figure is a schematic illustration of a power supply circuit embodying the invention.

Referring more particularly to the drawing, input terminals **10** and **11** are intended to be connected to the usual 120 volt AC source, as by means of the usual supply conductor cord having a plug for connection to the conventional outlet. Terminal **11** is grounded. One terminal of a series combination comprising on-off switch **12**, fuse **13**, thermistor **14**, and rectifier **15**, which may be a silicon diode, is connected to terminal **10**. Connected to the other terminal of this series combination is a filter **16** which

may comprise a series inductor **17** and shunt capacitors **18** and **19** connected to ground. The desired DC voltage is derived from across capacitor **19** at the output conductor **20**.

Assuming that the circuit is in cold condition, when switch **12** is closed the thermistor **14** presents sufficient resistance to limit the current which flows through rectifier **15** and charges the capacitors **18** and **19** to a safe value. Without such limiting of the initial current, the abrupt charging of the capacitors would cause high surge current which might damage or destroy the rectifier **15**.

By the time the capacitors **18** and **19** become charged by the limited current, the thermistor becomes heated by the current flowing through it, and its resistance decreases to a relatively low value. Thus the voltage drop across the thermistor becomes relatively low and does not greatly reduce the DC voltage at conductor **20**.

Prior to this invention, in a television receiver employing a single half-wave rectifier such as that shown, it was necessary to employ a current-limiting resistor of about 4.7 ohms to limit the surge current to 35 amperes. After warm-up the available voltage at conductor **20** was about 22 volts below the peak value of the supply voltage wave. With the present invention, employing a thermistor having a resistance of about 2 ohms when hot, the voltage at conductor **20** is only about 12 volts below the peak value of the supply voltage wave, an increase of approximately 10 volts over the prior art circuits, still the cold resistance of the thermistor limits the initial surge current as required.

Preferably the thermistor is chosen to have a cooling time constant comparable to, and not greater than, the discharge time constant of the capacitors **18** and **19**. This insures that the initial current will always be limited to predetermined value. For example, suppose that switch **12** is opened and then quickly closed again. If the cooling of the thermistor were substantially slower than the discharge of the capacitors, the surge current would not be limited to the extent desired when the switch is reclosed. This might damage the rectifier.

While the invention has been described with reference to a single embodiment shown in the drawing, it will be understood that the invention is not limited thereto but contemplates such modifications and further embodiments as may occur to those skilled in the art.

I claim:

1. A power supply circuit for television receivers and the like, comprising the series combination of a thermistor and a rectifier connected in said circuit, and a filter including shunt capacitance means connected across said circuit at the output side of said series combination, wherein said thermistor has a cooling time constant approximately equal to and not greater than the discharge time constant of said capacitance means.

2. A power supply circuit for television receivers and the like comprising a capacitor input filter, and a series combination of a thermistor and a rectifier connected to said filter for supplying charging current thereto, the cooling time constant of said thermistor being not greater than the discharge time constant of the input capacitance of said filter.

3. A power supply circuit for television receivers and the like, comprising a pair of input terminals, means connecting one of said terminals to a point of fixed reference potential, a series combination comprising an on-off switch, a fuse, a thermistor and a rectifier, means connecting one end of said series combination to the other of said input terminals, and a filter including shunt capacitance means connected between the other end of said series combination and said point of fixed reference potential, wherein said thermistor has a cooling time constant which is not greater than the discharge time constant of said capacitance means.

4. A power supply circuit according to claim 3 wherein said thermistor has a cooling time constant approximately equal to the discharge time constant of said capacitance means.

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