

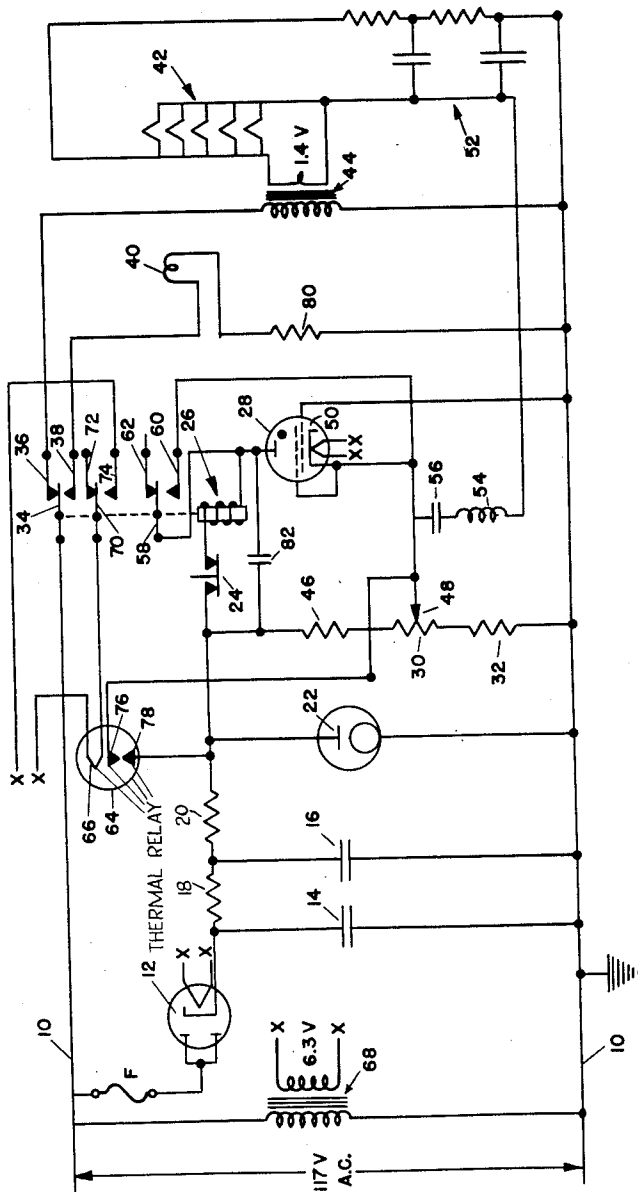
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VOLTAGE MONITORING POWER CUT-OFF DEVICE

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VOLTAGE MONITORING POWER CUT-OFF DEVICE

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The invention relates to a voltage monitoring cut-off device which shall cut off a low voltage supply to a load on overvoltages of the supply.

Although overvoltage cut-outs are varied and satisfactory for normal house voltage or high voltage requirements, satisfactory voltage monitoring devices for low voltages supplies is difficult to obtain.

It is often desirable to provide a sensitive device to monitor low voltages supplies. This is particularly true where life tests are performed on electron tubes and where to equate the characteristics of the tubes it is necessary to prevent slight increases or repeated fluctuations in voltage from being applied to the tubes. Also during these tests it is desirable to cut off low voltage when it rises to such an extent as to shorten the life of the filaments in the tubes under test or as to cause filament burn out.

It is an object of this invention to provide a sensitive mechanism directly responsive to overvoltage conditions on low voltage circuits to cut off the supply on such overvoltage occurrence.

It is another object of the invention to provide means to automatically reapply the low voltage to the load circuit after an interval, the circuit again cutting off should the overvoltage condition persist.

These and other objects of the invention will be clear after reading the following specification and claims when taken in conjunction with the accompanying drawing in which the single figure represents a schematic of the circuit employed to attain the desired objectives.

In the drawing there is disclosed an A.-C. input, for example, a 60 cycle 117 volt supply line 10. This line supplies A.-C. current to a half wave rectifier illustrated at 12, the output of which is filtered by a double pi arrangement as by line shunting capacitors 14 and 16 and line series resistors 18 and 20. Across the A.-C. line is placed a voltage regulating tube 22. The filtered current is then fed via a switch 24 to the coil of a relay 26 and from the coil through to the anode of a grid controlled thyatron 28. When the thyatron is conductive, filtered current flows to the cathode of the thyatron, thence through a potentiometer 30 and resistor 32 back to line, thereby energizing the coil of the relay 26 and effecting closing of certain contacts of the relay, as will be described. On reduction of current flow through the coil of the relay, certain back contacts will be closed. Included in the contacts are movable contact 34, back contact 36, and front contact 38 connected to a signal lamp 40. Movable contact 34 is connected to the A.-C. line while contact 36 is fed to the load whose voltage is to be monitored. In the particular embodiment here typified, the load consists of filaments 42 to which, through a step down transformer 44, a potential of 1.4 volts is applied. The contact 36 is connected to one side of the primary of this transformer, the other side of the primary leading to the common ground line 10. A D.-C. bias to cut off the thyatron 28 is provided in the following manner: Bridging the filtered current line is the bleeder network comprised of series

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connected resistor 46, potentiometer 30, and resistor 32. The tap 48 of the potentiometer is connected to the cathode 50 of the thyatron 28 while the grid of the thyatron is at ground potential.

Also applied to the cathode and grid of the thyatron 28 is the potential on the load 42. This is applied to the cathode via a filtering circuit 52, steadying inductance 54, and capacitor 56 and to the grid, via the ground line 10. The effect of the capacitor 56 and inductance 54 is such as to prevent the thyatron from firing if only a few cycles of the A.-C. input to the load are slightly overvoltage. Persistent variations in voltage on the load, or too high voltage, will be reflected by variations in potential on the capacitor 56 and therefore on the cathode 50. The capacitor 56 may have its charge leak off via potentiometer 30 and resistor 32 and via the inductance 54, the load 42, the resistors of filter network 52, and the ground line 10.

The tap 48 is adjusted so that with normal voltages on the load, the thyatron 28 will cut off. However, should the voltage rise to a persistently high value on the load or there be a sharp increase in voltage thereon, the cathode potential will be made more negative with respect to its grid to cause the thyatron to fire. Conduction through the thyatron will energize the coil of relay 26 to open the contacts 34, 36, to the load and avoid overloading the filaments 44.

As soon as the relay contacts are operated by attraction of the armature or core of the relay, a pair of front contacts 58, 60 close, short circuiting the thyatron but maintaining potential on the relay coil. Should it be desired to restore the circuit to normal monitoring condition, the switch 24 is opened momentarily, thereby allowing the relay 26 to drop out to open contacts 58 and 60, the contact 34 coming into engagement with its contact 36 and the contact 58 coming into engagement with a dead contact 62.

Automatic means are provided for releasing the relay, said means being operative after a time delay. These means include a thermal relay 64. This relay comprises a heater 66 connected to the secondary of a filament transformer 68 and to a switch contact 70 operative between a dead back contact 72 of the relay 26 and a front contact 74, the contact 74 being connected to the transformer 68. So long as voltage was applied to the filaments of the electron tubes under test, current was cut off from the filament of the thermal relay 64 whereby its contacts 76, 78 remained open. Upon energization of the relay 26, the contacts 70, 74 close, thereby heating the filament 66. After a delay, the contacts 76, 78 close. These contacts are connected across the relay 26 via now closed contacts 58 and 60. When the contacts close, the relay 26 is shorted out allowing the back contacts to close to again admit current to the filaments 42, while opening the short circuit of the thyatron at contacts 58, 60 and opening the thermal relay heater circuit at contacts 70, 74. Should the high voltages on the filaments 42 still persist, the thyatron will again fire and the cycle of cutting the A.-C. supply to the filaments, and closing of the contacts of relay 64 will repeat.

The indicator lamp 40 and series connected limiting resistor 80, as stated before, are connected between front contact 38 of the relay and the ground line, the circuit to the lamp being closed by movable contact 34 connected to the line 10 coming into engagement with the contact 38 when the relay 26 closes. A capacitor 82 is placed across the switch 24 and coil of relay 26 to prevent undue surges in the line due to relay operation.

Having thus described the invention, what is claimed is:

1. A voltage monitoring system comprising a direct current source of potential; a series connected switch, electromagnetic coil and gas filled electron tube connected to said source; a load; a load circuit for said load includ-

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ing a second switch in series with the circuit and controlled by said coil; means connected to the load to sense the voltage thereof and apply the same as a bias on said gas filled tube to normally maintain the same at cut off, said tube becoming conductive on excessive voltage on the load thereby energizing the coil to open the second switch and cut off the supply to the load; a third switch controlled by said coil; and means connecting said third switch to opposite ends of the gas filled tube to short out the gas filled tube on operation thereof.

2. A voltage monitoring system comprising a direct current source of potential; a series connected switch, electromagnetic coil and gas filled electron tube connected to said source; a load; a load circuit for said load including a second switch in series with the circuit and controlled by said coil; means connected to the load to sense the voltage thereof and apply the same as a bias on said gas filled tube to normally maintain the same at cut off, said tube becoming conductive on excessive voltage on the load thereby energizing the coil to open the second switch and cut off the supply to the load; a third switch, controlled by said coil; means connecting said third switch to opposite ends of the gas filled tube to short out the gas filled tube on operation thereof; a fourth switch, also controlled by said coil; and a thermal relay having contacts and a heater controlling its contacts with the heater in series with said fourth switch, the contacts of said thermal relay shorting the series connected first switch and coil via the third switch to effect release of the coil controlled contacts.

3. A voltage monitoring system comprising a source of D.-C. potential, a series connected electromagnetic coil and gas filled grid controlled tube across the source of potential, the grid and one line leading to the source being at a common potential, a bleeder network across the

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source of potential including a potentiometer, the movable arm of which is connected to the cathode of the gas filled tube, a two terminal delay line having one terminal connected to the cathode, a load connected circuit having one leg connected to the grid connected line and the other leg leading to the other terminal of the delay line and a switch connected to control the load and controlled by the coil to cut off the load.

4. A voltage monitoring system comprising a source of D.-C. potential, a series connected electromagnetic coil and gas filled grid controlled tube across the source of potential, the grid and one line leading to the source being at a common potential, a bleeder network across the source of potential including a potentiometer the movable arm of which is connected to the cathode of the gas filled tube, a combination of a capacitor and a series connected inductance, a load connected circuit having one leg connected to the grid connected line and the other leg connected to one terminal of the capacitor-inductance combination, the other terminal of said combination being connected to the cathode of the tube, and a switch connected to control the load and controlled by the coil to cut off the load.

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