

means for comparing the voltage peak value of selected half cycles of the mains with said upper and lower limits, the limit defining means comprising voltage regulation means for supplying reference voltages for defining said limits from mains half cycles other than said selected half cycles;

means for defining a predetermined time interval; and

means for providing a first signal state for disconnecting the appliance from the mains when the comparison indicates that said peak value is not within said range, and a second signal state for reconnecting the appliance to the mains when said peak value subsequently remains within said range for said predetermined time interval.

8. A device as claimed in claim 7, wherein said selected half cycles are alternate half cycles.

9. A device as claimed in claim 7, wherein the comparing means comprises two comparators for comparing the instantaneous values of said selected half cycles with the values of the limits.

10. A device as claimed in claim 7, wherein said means for providing the first signal state comprises a timing device for signalling when the peak value is not within the range during a first time interval shorter than said predetermined time.

11. A device as claimed in claim 7, for three-phase operation, and comprising three respective peak value comparing means coupled to common means for signalling an out-of-range condition and second common means for defining the predetermined time interval.

12. A protection device, for an a.c. mains operated appliance, comprising:

means for defining upper and lower limits for a range of mains voltage values;

means for comparing the voltage peak value of selected half cycles of the mains with said upper and lower limits;

means for defining a predetermined time interval;

means for providing a first signal state for disconnecting the appliance from the mains when the comparison indicates that said peak value is not within said range and a second signal state for reconnecting the appliance to the mains when said peak value subsequently remains within said range for said predetermined time interval; and

means for altering said upper and lower limits in dependence upon the signal states to alter the range relative to the mains voltage.

13. A device as claimed in claim 12, wherein the altering means are so responsive to the first signal state that the limit giving rise to the first signal state is altered, relative to the mains voltage, in the sense to make the range smaller relative to the mains voltage.

14. A device as claimed in claim 13, wherein the altering means is operable to obtain a scaled proportion of the mains voltage for comparison with said limits, the scaling being responsive to the first signal state to alter said limit relative to the mains voltage.

15. A device as claimed in claim 12, wherein said selected half cycles are alternate half cycles.

16. A device as claimed in claim 12, wherein the comparing means comprises two comparators for comparing the instantaneous values of said selected half cycles with the values of the limits.

17. A device as claimed in claim 12, wherein said means for providing the first signal state comprises a timing

device for signalling when the peak value is not within the range during a first time interval shorter than said predetermined time.

18. A device as claimed in claim 12, for three-phase operation, and comprising three respective peak value comparing means coupled to common means for signalling an out-of-range condition and second common means for defining the predetermined time interval.

Description

BACKGROUND OF THE INVENTION

This invention relates to a protection device for electricity supplies.

Certain electrical devices, for example refrigerators, freezers, and air conditioning units, are highly susceptible to variations and transients in a mains voltage supply, particularly when the supply is interrupted and then restored. Such variations in the supply can damage the appliance, or shorten its working life.

There has previously been proposed an Automatic Voltage Regulator (AVR), which regulates a supply voltage to an appliance connected to the AVR if the supply voltage is within certain limits. An AVR, however, has disadvantages in that if the supply voltage passes outside the limits of the AVR, the appliance will remain connected and can still be damaged; also an automatic voltage regulator can be costly.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a protection device for an a.c. mains operated appliance, comprising means for comparing the peak value of selected half cycles of the mains with upper and lower limits defining a range relative to the mains voltage and means for providing a first signal state when the comparison indicates that the peak value is not within the range and a second signal state when said peak value subsequently remains with the range for a predetermined time interval.

An embodiment of the present invention can provide circuitry for protecting appliances connected thereto from undesirable transients in an a.c. mains supply by causing the appliance to be disconnected from the mains by said first signal state during such transients, and to be reconnected, by said second signal state, only after the mains supply has remained sufficiently constant for a predetermined time.

It will be apparent that the range may well be maintained substantially the same relative to the mains voltage for all tests, although embodiments can be designed for which the range is varied, e.g. in dependence upon the signal states. There is advantage in reducing the range when the first signal state occurs and subsequently to expand the range when the peak value first goes within the second range.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference will now be made, by way of example, to the accompanying drawings, in which:

FIG. 1 shows circuitry embodying the present invention, and

FIG. 2 shows a modification of FIG. 1.

DESCRIPTION OF PREFERRED EMBODIMENTS

The circuitry of FIG. 1 comprises voltage supply circuitry 1, for supplying a regulated supply voltage and the mains voltage to be monitored; voltage comparison circuitry 2; control circuitry 3; and output and status display

less than 13.33 ms to obtain the desired response even if only one phase is disturbed.

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