voltage value of the reflected wave at time t0 is the waveform information of the reflected wave at time t0, and the reference voltage value of the reference wave at time t0 is the waveform information of the reference wave at time t0.

[0028] At time t0 shown in FIG. 3, since the output voltage values of the waveforms of the three reflected waves indicated by the dot-dashed line b, the double-dot-dashed line c, and the dashed line d are substantially the same as the output voltage value of the waveform indicated by the solid line a, which is the same as the waveform of the reference reflected wave, the calculation part 21 determines “NO” in step S104 in FIG. 4, proceeds to step S106 in FIG. 4, and stands by until a detection interval Δt shown in FIG. 3 elapses. Then, at time t1 after the detection interval Δt elapses from time t0, in step S107 in FIG. 4, it is determined whether the timer has ended. If “NO” is determined in step S107 in FIG. 4, returning to step S104 in FIG. 4, the difference ΔV between the output voltage value of the reflected wave at time t1 and the reference voltage value of the reference reflected wave stored in the reference reflected wave database 25 is calculated, and it is determined whether an absolute value of the difference ΔV exceeds the predetermined value ΔVs.

[0029] At time t1, although the output voltage values of the waveforms of the three reflected waves indicated by the dot-dashed line b, the double-dot-dashed line c, and the dashed line d exhibit a slight difference from the output voltage value of the waveform indicated by the solid line a, which is the same as the waveform of the reference reflected wave, since the difference does not reach the predetermined value ΔVs, the calculation part 21 determines “NO” in step S104 in FIG. 4 again, proceeds to step S106 in FIG. 4, and stands by until a next detection interval Δt elapses. In step S107, if the timer has not ended, the process returns to step S104 in FIG. 4.

[0030] As shown in FIG. 3, at time t2, since the output voltage values of the waveforms of the three reflected waves indicated by the dot-dashed line b, the double-dot-dashed line c, and the dashed line d exhibit a difference of the predetermined value ΔVs or more from the output voltage

CLAIMS:

[Claim 1] An electric circuit abnormality detection device comprising:

a pulse generator which inputs a pulse signal to an electric circuit;

a directional coupler which is provided between connection lines connecting between the electric circuit and the pulse generator and extracts, from the electric circuit, a reflected wave of the pulse signal inputted from the pulse generator to the electric circuit;

a detection unit which is connected to the directional coupler and processes the reflected wave inputted from the directional coupler to detect an abnormality in the electric circuit; and

a low-pass filter provided between the directional coupler and the detection unit,

wherein the detection unit comprises:

a storage part which stores waveform information of a reference reflected wave inputted from the directional coupler when the pulse signal is inputted to a reference electric circuit that has a same wiring pattern as the electric circuit and does not have an abnormality; and

a calculation part which detects an abnormality in the electric circuit by comparing waveform information of the reflected wave inputted from the directional coupler when the pulse signal is inputted to the electric circuit, with waveform information of the reference reflected wave stored in the storage part,

wherein the electric circuit and the reference electric circuit comprise a resistance wire arranged in a plurality of turns and comprise a plurality of bends which reflect the pulse signal inputted from the pulse generator, and

the reflected wave and the reference reflected wave inputted to the detection unit have a waveform obtained after passing, through the low-pass filter, a composite reflected wave in which a plurality of individual reflected waves reflected by the plurality of bends are superimposed.

[Claim 2] The electric circuit abnormality detection device according to claim 1,

wherein after a magnitude of the reflected wave exceeds a predetermined threshold value,

the calculation part of the detection unit detects an abnormality in the electric circuit in a case where a difference between the magnitude of the reflected wave and a magnitude of the reference reflected wave exceeds a predetermined range.

[Claim 3] The electric circuit abnormality detection device according to claim 2,

wherein the electric circuit and the reference electric circuit are heaters in which a resistance wire is arranged in a plurality of turns.