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Development of trigger circuit applied in high temperature of triggered vacuum switch

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Pulse power systems applied in oil well stimulation device are required to work under circumstances of high temperature while the maximum working temperature is over 120°C. In traditional trigger devices, the capacitor discharges via the trigger surface when a high power thyristor closes the circuit, releasing enormous energy but the high power semiconductor devices and the drive circuits cannot operate normally under high temperature. In order to insure normal work against high temperature, a new trigger system without any high power semiconductor elements is designed. In the three-stage switch operated trigger device, the single chip microcomputer switches on the relay while a small capacitor discharges through the relay, triggering a three-electrode spark gap then and another capacitor discharges through the spark gap, triggering the trigger d vacuum switch (TVS) at the final stage. In this paper, double thresholds examining the main current twice are set and the method of examining the voltage level in a period of time is adopted to prevent spurious trigger caused by white noise. In addition, a small pulse transformer is introduced in case of insulation breakdown between the voltage measure circuit and trigger circuit when the voltage difference is large enough (The voltage difference can be as large as 15kV when the main voltage reaches 30kV). Based on the design, a prototype is developed and it is tested to trigger a TVS under the temperature of 120°C. The results show that the trigger device can switch the TVS 100% reliably.

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