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NASA TECH BRIEF

Solid-State Recoverable Fuse Functions as Circuit Breaker

The problem:

To develop a device that protects electronic circuits during overload conditions, and then permits them to continue to function immediately after the overload condition is removed. This is to be accomplished without the use of either one-time fuses or conventional type circuit breakers.

The solution:

A molded, conductive-epoxy recoverable fuse that incorporates low resistance at ambient (room) temperature, and high resistance at an elevated temperature. The fuse is capable of quickly switching back and forth from low to high resistance depending upon the current and temperature to which it is subjected.

How it's done:

The recoverable fuse consists of an epoxy resin that is mixed with a conductive powder, and then molded to the desired size and shape. The material used in fabricating the recoverable fuse is known as a "conductive resin," an epoxy filled with a suitable conductive powder. The powder changes the insulating characteristics of the epoxy to those of an electrical conductor. For example, when specific epoxies having certain thermal coefficients of expansion are mixed with silver plated copper powder, the resulting conductive resin (epoxy) exhibits unique thermoelectrical characteristics. The principal characteristic is that the resin is rendered highly conductive (less than 0.1 ohm) below a critical temperature, and highly nonconductive (more than 100 megohms) above that temperature. Consequently, the transition from low to high resistance is extremely rapid. This results in a repeatable switching action that is readily adaptable for use in electronic circuits.

Note:

Inquiries concerning this innovation may be directed to:

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Patent status:

No patent action is contemplated by NASA.

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Category 01