FUSE FAILURE DETECTOR

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3 Claims

ABSTRACT OF THE DISCLOSURE

A multi-vaned pivotal insulating operator is situated between plural fuse actuators, each connected in parallel with a load fuse in a multi-phase load circuit. The actuators tend to pivot the operator in a common angular direction, whereby the operator may be pivoted into contact with a detector switch.

Background of the invention

Current limiting devices such as spring-loaded fuse actuators have been developed for multi-phase circuits, in which one such device is associated with each phase, and all such devices are operatively associated with a common operator element such as a slide, tripper bar, latch, linkage, or the like. The operator element is therefore movable by any one of the current limiting devices.

Commonly the fuse actuators or corresponding elements are arranged close together in line with a common rectilinear direction of motion. This presents a difficulty in higher voltages multi-phase applications where safety or underwriter requirements provide for a minimum over-surface distance between circuit parts connected with different phases. For example, 600-volt three-phase devices normally require two inches over-surface separation between parts connected to different phases. The problem thus presented is to provide a sufficient surface between the fuse actuators or comparable parts without making the device unduly bulky, expensive or unreliable in operation.

Summary

The foregoing problem is met, according to the present invention, by means of a vaned pivotal operator element which serves the dual function of a common operator element and an insulating member increasing the effective over-surface distance between the fuse actuators. The vanes extend from the operator in such directions as to form corners and each fuse actuator is situated in one such corner. The vanes are of sufficient size to provide the necessary insulation between the actuators, but undue bulkiness is obviated by distributing the actuators angularly about the insulating operator rather than in a line.

Brief description of the drawing

Fig. 1 is a plan view of a preferred embodiment of the invention embodied in a three-phase fuse failure detector; Fig. 2 is a side elevation corresponding to Fig. 1; and Fig. 3 is a detail view in section of one of the fuse actuators.

Description of the preferred embodiment

Phase lines 12, 14 and 16 extend from a three phase power distribution system to a motor-operated switch 18 that may be opened by energization of a motor M. The load side of this switch has the usual fuses 20, 22 and 24 in position to break the phase lines to a three-phase load 26.

The purpose of the fuse failure detector described below is to open the switch 18 by energization of the motor M when any one or more of the fuses 20, 22 or 24 fails. We turn next to a description of the detector serving this purpose, according to the present invention.

A square base 28 of insulating sheet material, such as a phenolic resin or other suitable plastic, supports all of the operative elements on one side, and it may be provided with holes or edge slots (not shown) for mounting to a suitable enclosure such as a metal fuse or switch enclosure. A pintle 30 having a tapered flat head 32 is supported within a centrally located countersunk hole in the base 28.

An operator designated generally at 34 is pivotally mounted on the pintle 30, and comprises a square-shaped central block 36 and three vanes 38, 39 and 40 secured to the block by any suitable means such as screws or cement. The vanes are formed of insulating sheet material such as a plastic. The block 36 has a central hole in which are press fitted a pair of flanged sleeves 42 of metal such as bronze, or Teflon, for its bearing. It will be understood that the complete actuating vane assembly could also be made as a one-side moulding of insulating material with proper friction bushings. The sleeves 42 freely pivot about the pintle 30. A retaining washer 44 and cotter pin 46 retain the operator upon the pintle in a conventional manner. There is a slight offset between the operator and the base 28 formed by the flange on the lower sleeve 42.

The vanes provide a plurality of corners within each of which a fuse actuator is mounted. A fuse actuator 48 is connected in parallel with the load fuse 20, a fuse actuator 50 is in parallel with the load fuse 22, and fuse actuator 52 is in parallel with the load fuse 24. These actuators are of identical construction and are commercially available, and it will suffice to describe briefly here the fuse actuator 48, in connection with Fig. 3.

A pair of mounting clips 54 are screwed to the base 28, and receive the tubular metal ends 56 and 58 of the actuator. These ends are fitted over an insulating tube 60 which is also fitted with an inner metal bearing member 62. A metal cap 64 is received within the member 58. The members 62 and 64 retain the ends of a compression spring 66. An end of the wire forming this spring is soldered at 68 to a fuse wire 70 which is also soldered to the end 56 at 72. The wire forming the spring 66 also has a portion formed into a loop received within a plastic plunger 74. The element 70 normally maintains the spring 66 in compression and retains the spring when the current is sufficiently high to melt the element. A spring thrust of about one pound is preferred. A plunger thrust of approximately 1/8 inch enures as the plunger moves to the position shown in broken lines. It is obvious that the figures given for thrust and displacement are a matter of choice in the design.

The actuators 48, 50 and 52 are placed in mutual right angle relationship so that each delivers the identical torque to the operator 34 in the same angular direction, when it fails. Since the fuse elements 70 of the actuators have a much smaller current capacity than the fuses 20, 22 and 24, if any of the latter fuses should fail, the associated fuse actuator will also fail, releasing its plunger 74 and pivoting the operator 34.

A detector switch 78 having a plunger 80 in contact with the vane 40 is secured to the base 28 by a sheet metal bracket 82. It will be apparent from the drawing that counterclockwise rotation of the operator 34 as a result of operation of any one or more of the fuse actuators 48, 50 or 52 results in depression of the plunger 80 and closure of contacts 84 associated with this plunger in a conventional manner. This closes a circuit connecting a power source with the motor M at a pair of terminals 86, opening the switch 18.

The above-described arrangement of the parts is com-
pact and easily accessible for servicing and adjustment from a single side of the base 28. The vanes 38, 39 and
40 are so arranged as to provide corners in association with the base 28, whereby the over-surface distance be-
tween the fuse actuators, which are at different phase potentials, are adequate to meet strict standards of
safety.

It will be apparent that certain modifications in the structure of the device can be accomplished, particularly
with regard to the arrangement and position of the switch 78. For example, the vane 40 may be shortened
to the dimensions of the vanes 38 and 39, and a fourth vane added to the block 36 to form a symmetrical oper-
ator. In this case the fourth vane may be used to operate the switch 78. Also, it is evident that the switch may
be arranged for operation either by pushing or pulling the plunger 80, and the contacts 84 may be break con-
tacts instead of the make contacts shown in the drawing. The circuit adaptations associated with such modifications
will be evident to one skilled in this art.

It will be understood that other modifications in the structure and in the arrangement of the parts may be
accomplished without departing from the spirit or scope of this invention.

Having thus described the invention, I claim:

1. A fuse failure detector for a multi-phase circuit having a plurality of load fuses, said detector having, in com-

an insulating base,

an operator having a pivotal bearing on the base and

a plurality of insulating vanes fixed in relation to the

bearing and defining a plurality of corners there-

between, each corner including the base and two

vanes,

a plurality of fuse actuators each having a fuse element

connected in parallel with a load fuse, mounted on

the base in one of said corners and provided with

a plunger and a spring releasable by fusion of the

fuse element to propel the plunger, the plungers of

the fuse actuators being arranged to pivot the oper-

ator in a common angular direction,

and a detector switch mounted on the base in position

for contact by the pivoting operator.

2. The combination according to claim 1, with:

a load switch in the multiphase circuit,

and means connected with a source of power through

the detector switch and operable to open the load

switch.

3. The combination according to claim 1, in which the

part of the operator having the bearing has a plurality

of flat sides and the vanes are sheet members attached
to said sides.

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