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POLYPHASE ELECTRIC CIRCUIT PROTECTIVE DEVICE

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Fig. 3

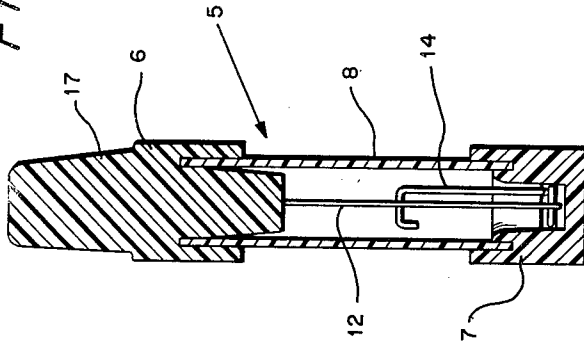
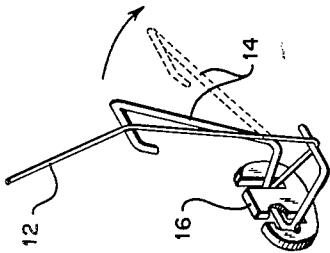


Fig. 4

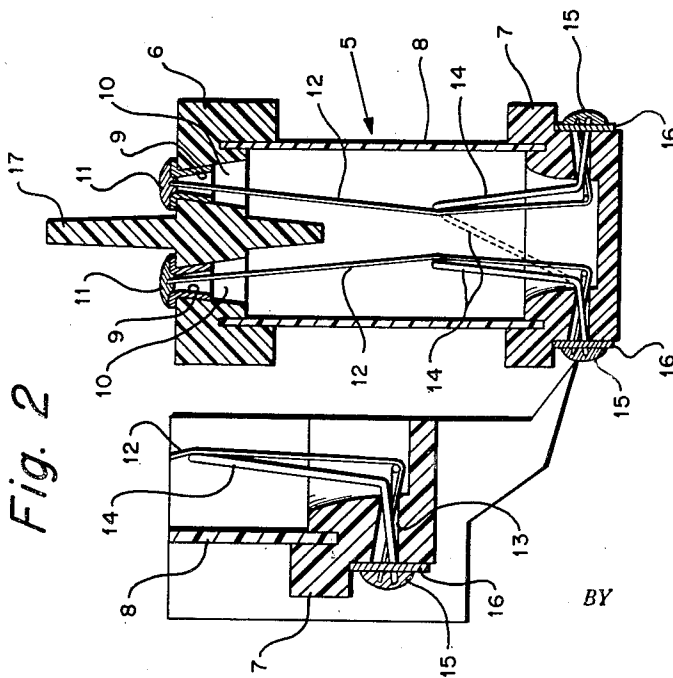


Fig. 2

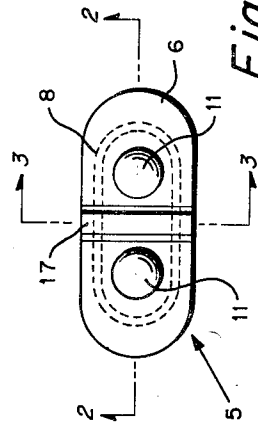


Fig. 1

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POLYPHASE ELECTRIC CIRCUIT PROTECTIVE DEVICE

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4 Claims. (Cl. 200—118)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a polyphase electric circuit protective device and more particularly to a polyphase electric circuit protective fuse in which all of the fused load lines are caused to be isolated from the power source when one line is disconnected due to over load caused by fault conditions.

A common type of protective device arrangement for polyphase circuits uses individual fuses or circuit breakers for each line. Such devices have the disadvantage that a faulted section is not always completely isolated from the source because of the other lines left intact. Another common type of protective device for polyphase circuits is a circuit breaker with coordinated mechanical check devices in which the severance of one filament causes, by mechanical means, the severance of all the other filaments. One disadvantage of these arrangements is that such devices are usually complex and expensive. In addition, units with ratings below 5 amperes are not commercially available.

The present device consists of a polyphase circuit protective fuse using a plural element cartridge. A plurality of fusible filaments electrically insulated from one another, support against movement individual mechanical arms which are spring urged in such a manner that the severance of any one of the plurality of fusible filaments allows its respective mechanical spring arm to move into contact with the other filament or filaments. This causes the overload to be transferred to the remaining line or lines which are likewise disconnected from the power source, thereby completely isolating the faulted load from any possible connection with the power source. This fuse device is designed for use in standard fuse mountings, and due to its relatively simple construction would be practical for design and use in lines under 5 amperes.

An object of the present invention is the provision of an electric circuit protective device which is capable of protecting all the lines in a polyphase circuit.

Another object is to provide a multiple fuse device of simple construction, capable of use with ratings below 5 amperes and mountable on standard fuse fittings.

A further object of the invention is the provision of a fuse device for multiple circuits capable of isolating a faulted load by disconnecting all fused circuits automatically.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the annexed drawing, which illustrates the preferred embodiment, and wherein:

Figure 1 shows a top plan view of a preferred embodiment;

Figure 2 shows a view along section 2—2 of Figure 1 and including a blown-up view of one detail;

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Figure 3 shows a view along section 3—3 of Figure 1; and

Figure 4 is an isometric view of the spring device.

Referring now to the drawing, wherein like reference characters designate like or corresponding parts throughout the several views, there is illustrated as a preferred embodiment a fuse device 5 consisting of a top member 6 and a bottom member 7. These members are preferably constructed of insulating material such as, but not limited to, Bakelite. The intermediate portion of the fuse device 5 is comprised of a hollow cylindrical section 8 of suitable insulating material which may be fiberboard or glass, for example. The top and bottom members 6 and 7, respectively, of the fuse device 5 are press fitted into position on central portion 8, as shown.

Top member 6 is provided with a pair of openings 10, for the insertion of hollow conical elements 9 which are inserted and then pressed into the shape of openings 10 to maintain a tight and secure fit. Plugs of solder 11, added as hereinafter described, close the top of elements 9 and serve to secure the ends of filaments 12. The top surfaces of plugs 11 serve as electric contact surfaces when the device is plugged into a standard fuse holding device, not illustrated.

Bottom member 7 is also provided with two openings 13, through which spring wire members 14 are inserted and soldered at 15 for support. Figure 4 illustrates the assembly of spring 14, filament 12, and a supporting plate 16 placed in openings 13, as illustrated in Fig. 2. The outer surface of solder plugs 15 comprise surfaces in electric contact with the appropriate surfaces on the fuse holder, not illustrated.

Spring members 14 in their normal position flare out diagonally across the space enclosed by intermediate section 8, as shown in broken lines, Fig. 4. However, when the device is fabricated, filaments 12 are drawn tightly up through openings 10 before soldering, thereby forcing springs 14 into the protracted positions shown in solid lines. After applying the solder, the ends of the filaments protruding along the rim of solder plugs 11 are clipped off in a conventional manner, thereby leaving a smooth surface.

It will be noted that top member 6 of fuse device 5 is provided with a central protruding wall 17 which serves to insure separation of the electrical lines contacting the soldered plugs 11.

In the use of the device shown the fuse is clipped into a conventional fuse socket, not illustrated. When one of the lines is overloaded causing the burning and severance or destruction of the associated filament 12, the spring member 14 restrained by the severed filament 12 springs out diagonally across the space enclosed by intermediate section 8 and contacts the opposite filament 12, as shown in broken lines in Fig. 2. The bottom electrical outlets at soldered plugs 15 are always connected to the load side of the fuse holder, this being assured by the asymmetrical configuration of fuse 5. It is apparent that when the released spring member 14 contacts the opposite filament 12, the faulted load is placed upon the latter which has heretofore remained intact. This causes the remaining filament 12 to be burned out, thereby causing the disconnection of both lines. In this way all the loads on the lines passing through the fuse device 5 are disconnected both from the power source and the faulted load, causing the fault to be completely isolated from all possible connection with a power source.

The embodiment illustrated is designed for a three phase circuit in which the third phase is a ground or unfused line. The fuse fits into a standard socket or fuse mount in which the top electrical contacts are con-

nected to the power source, and the bottom leads are for connection to the loads. As already noted, the unsymmetrical construction prevents the fuse from being inserted incorrectly in the socket.

In a unit of more than two filaments the structural configuration can be such that the function is either simultaneous or progressive acting. For example, where three fuse filaments 12 are utilized, a triangular arrangement of springs 14 is used such that the first spring 14 upon release would contact a second filament 12 which in turn would spring into contact with a third filament 12. This operation is described as progressive. For a simultaneous acting arrangement using three filaments, the first spring 14 upon release is designed to fall into contact with both the other fuse filaments 12. Of course, by the use of conventional mechanical expedients, the number of filaments used would depend upon the number of circuits to be protected.

It is obvious from the above description of the invention that certain alternative arrangements would be obvious to those skilled in the art. For example, a lever could be used in place of each spring where the lever is operated by a spiral or proportional spring, or, also a knee action type link restrained by a filament.

Various modifications are contemplated and may be resorted to by those skilled in the art without departing from the spirit and scope of the invention, as hereinafter defined by the appended claims, as only a preferred embodiment thereof has been disclosed.

What is claimed is:

1. A polyphase electric circuit protective device having line and load connections, a first filament destructable at an overload condition connecting a first line connection with a first load connection, a second filament destructable at an over-load condition connecting a second line connection with a second load connection, means responsive to the destruction of said first filament for electrically and physically connecting within said device said first load connection to said second filament for also destroying said second filament, and means responsive to the destruction of said second filament for electrically and physically connecting within said device said second load connection to said first filament for also destroying said first filament thereby insuring complete isolation of a load from the power source.

2. A polyphase electric circuit protective device consisting of two end sections and a hollow intermediate section, a pair of fusible elements electrically insulated from one another passing through said intermediate section and connecting said end sections, an outside soldered electrical contact surface on each end section for and connected to each filament, a spring member for each filament, each said member having one end mounted in its respective filament contact surface and extending into said intermediate section and restrained by its respective filament from contacting the other said filament, whereby an overload in one filament causing its destruction will transfer the overload to the other filament causing the latter's destruction thereby completely isolating the load end of said device from the power end.

3. A polyphase electrical circuit protective device for disposition between a polyphase electrical power source

and polyphase equipment comprising insulating means including a hollow tubular like member, a first and a second cover member, each cover member having a recess to receive said tubular member in mating relationship, a first pair of apertures disposed in said first cover member, a first button and a second button of electrically conducted material pressed into said apertures, said second cover member having a second pair of apertures at right angles to the first pair of apertures, a third button and a fourth button of electrically conductive material disposed at said second pair of apertures, a pair of spring members, each spring member having a first position aligned with said second pair of apertures, a second portion parallel to said tubular like member, a third portion bent at right angles to said second portion, and a fourth portion bent at substantially right angles to said third portion and toward said first portion, the second, third and fourth portions of each of said spring members being parallel with the second, third and fourth portion, respectively, of the other spring member, a pair of fusible filaments, each filament being joined at one end to one of the first and second buttons and at its other end being joined to one of said spring members, said filament members intercepting a line parallel to the third portions of said spring members and each filament being disposed adjacent to one of the spring members at the side of its respective spring member nearest the other spring member, each of said filaments being of conductive material and restraining the spring member adjacent to it in unbroken filament condition, each of said spring members being biased to contact the other spring member in unrestrained position, whereby over-load in a faulty section is sufficient to break a filament, thereby disconnecting polyphase equipment and the faulty section from the power source to safeguard equipment and prevent further breakdown.

4. A polyphase electric circuit protective device having the external leads unsymmetrically arranged comprising a pair of fusible elements for completing a pair of electrical circuits through said device when the latter is plugged in service, spring means associated with each of said elements mounted within said device having one end supported in intimate electrical contact with its associated element on the load side of said device and another end being spring urged into contact with the opposite fusible element, each of said elements normally restraining its associated spring means away from said contact until destruction of one of said elements due to electrical overload releases its associated spring means, thereby transferring the overload condition to the other fusible element for causing the latter's destruction and the complete isolation of one end of said device from the other end.

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