Aug. 10, 1948. J. W. BRYAN 2,446,739

REPEATING ELECTRIC FUSE

Filed Oct. 24, 1947

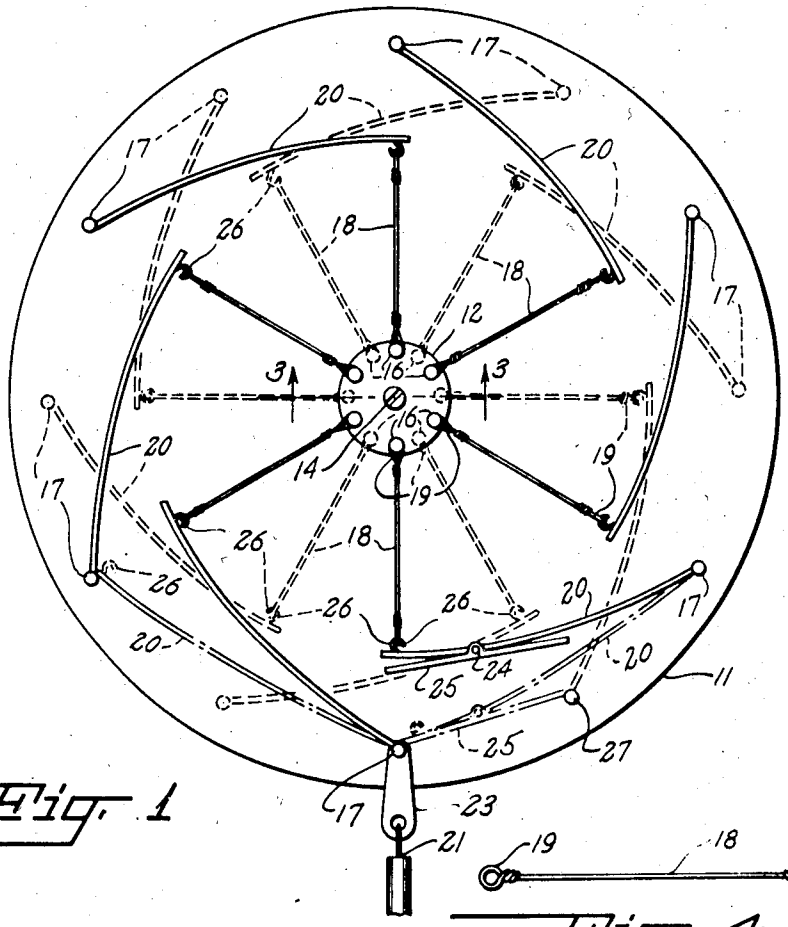


Fig. 1

Fig. 4

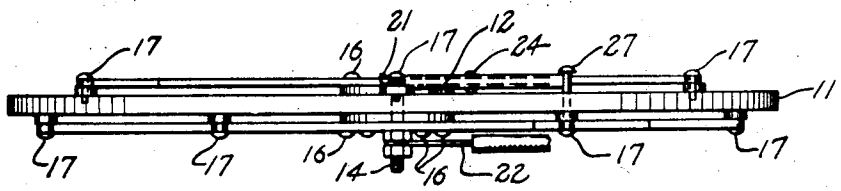


Fig. 2

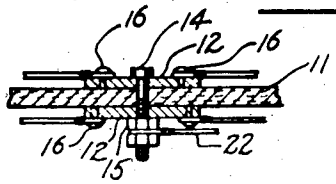


Fig. 3

INVENTOR.
John W. Bryan
BY
McMorrow, Berman & Davidson
Attorneys

Patented Aug. 10, 1948 2,446,739

UNITED STATES PATENT OFFICE

2,446,739

REPEATING ELECTRIC FUSE

John W. Bryan, Traphill, N. C.

Application October 24, 1947, Serial No. 781,862

1 Claim. (Cl. 200—126)

1

This invention relates generally to improvements in thermal circuit breaking devices in which any desired number of fuse elements may be connected in successive order into a protected circuit without the attention of an attendant.

One of the objects of the invention is to provide an arrangement in which an electrical circuit is broken wherever a pulse of current therein exceeds a predetermined value.

Another object is to provide means for successively and automatically connecting into the circuit a new fuse element whenever the preceding element has been burned out.

A further object is the provision of a repeating fuse structure which is inexpensive, easy to manufacture and which is adapted to convenient replacement of inexpensive fuse elements already expended.

Further objects and advantages will be apparent from the description and accompanying drawings, in which:

Figure 1 is a plan view of the repeating electrical fuse.

Figure 2 is a side elevation of the fuse of Figure 1.

Figure 3 is a cross-section of the central portion of the fuse taken along line 3—3 of Figure 1.

Figure 4 is an enlarged view of a fuse element suitable for use with the structure of Figure 1.

The repeating fuse is conveniently constructed on a base 11 of insulating material cut from sheet stock or molded to the desired form. A pair of metallic discs 12 are fastened to the sides, respectively, of the base 11 by means of a bolt 14 passing through the center of the base, and secured by the nut 15. Electrically and mechanically connected to the discs 12 are a suitable number of studs 16 which project slightly from the discs and are preferably provided with notches or heads to receive and hold in place a wire loop 19 of a fuse element 18. The loops 19 are of sufficient size to slip over the heads of the studs thus facilitating installation or removal of the fuse elements. The fuse element is constructed of material having electrical and mechanical characteristics selected to burn out at a predetermined current load. The loops 19 are formed from the fusible material of the fuse element itself thus reducing cost of manufacture and assuring uniformity.

Terminal studs 17 are preferably secured to the base by a punching or pressing operation, which also secures one end, respectively, of the contact springs 20 to the base in fixed orientation thereto. The studs 17 may be provided with square shanks or keys for the purpose of maintaining the orientation of the spring such that when the free end thereof is released by the breaking or burning of the fuse element the spring unflexes and moves over into contacting position with the next succeeding stud 17. The unflexed position preferably provides a slight residual spring tension to assure good electrical contact between adjoining studs 17. The ends of the springs and the studs may be silvered or otherwise plated if desired to improve contact for low voltage applications. As shown in Figure 1, the fuse element has one loop slipped over a stud 16 and the other loop in electrical contact with the flexed spring 20 by way of the hook 26. The tension of the flexed spring maintains good electrical contact from stud 17 via spring 20, hook 26, fuse element 18 to stud 16.

2

Any circuit to be protected by the fuse may be connected thereto by way of a lead 21, lug 23, a first stud 17, a first spring 20 and hook 26, a first fuse element 18, a first stud 16, plate 12, center bolt 14, a lug 22 secured to the central bolt, and thence to the return lead of the protected circuit.

The springs 20 are of a length suitable to span the space between successive studs 17 and contact is maintained between the center bolt and the lug 21 wherein one fuse element connects a spring with a corresponding stud 16. Contact between the first stud 17 and successive studs 17 by way of corresponding springs 20 is maintained except where a fuse element holds the corresponding spring away from contact with the next succeeding stud 17.

The last spring in the series, taken clockwise in Figure 1, is provided with a pin 24 and a bridging bar 25 pivoted on the pin 24. This bar is of suitable length to bridge the first stud 17 witn an auxiliary stud 27 which is mounted in the base 11. A second repeating fuse assembly may be electrically connected to the first by interconnecting the center bolts thereof and the stud 27 of the first assembly to the first stud 17 of the second assembly. Two assemblies may be placed on the same base, as shown in Figures 1 and 2. Also a number of units may be assembled on a single interconnecting center bolt and the first studs 17 of the various units electrically connected to studs 27 of preceding units. In this manner any desired number of fuse elements may be assembled in an interconnected group of assemblies, and each element is thus connected into the protected circuit in succession as the preceding element breaks the circuit.

When the desired number of protecting fuse

elements are assembled, as described, the operation of the repeating fuse is as follows:

The current in the protected circuit enters and leaves the fuse assembly by leads 21 and 22, the current passing through the first spring and fuse element. When a surge of current of sufficient strength occurs the first fuse element is heated to the fusing temperature, thereby breaking the element and the conducting spring is released. The first spring thereupon snaps over to the second stud 17 and connects the second spring and fuse element into the protected circuit by way of the second stud 17, second fuse 18 and the center bolt 14. Any further surge of current of greater than predetermined value causes the second fuse element to burn out and the second spring to make contact with the third spring by way of the third stud 17. This action repeats as often as dangerous current surges occur and as long as a fuse element remains on one of the interconnected assemblies. No attendant is required over long periods of time, and the protected circuit is restored quickly after each such current surge without appreciable loss of service. The attendant for equipment employing this improved fuse system may, therefore, by periodic inspection of the fuse assemblies, maintain continuous service. Any burned out elements are readily replaced without disturbing the assembly or the assembly may be quickly removed and replaced if desired.

If it is desired to delay the resumption of service by holding the circuit open for a time after each short circuit or current surge for any desired period in each instance this may be done by employing a mechanical delay element of conventional design to prevent immediate movement of spring 20 from its flexed position into contact position against the next stud 17. For this purpose a dash pot may be employed to slow the motion of the spring or an escapement mechanism may be connected to accomplish a longer delay in the motion of the spring.

Various changes may be made in the design and manufacture of the repeating fuse without departing from the spirit of the present invention.

What is claimed is:

An automatic multiple fuse comprising an insulated base plate, a centralized terminal plate fixed on said base plate, a series of circumferentially spaced studs projecting therefrom, a series of circumferentially spaced contacts projecting from said base plate surrounding said terminal plate in concentrically spaced relation to said terminal plate, a series of conductive leaf springs secured at one end to said contacts and free at their opposite ends, said leaf springs being outwardly tensioned to electrically engage their free ends with circumferentially adjacent ones of said contacts when released so as to bridge adjacent contacts, and fusible elements stretched between said studs and the free ends of related leaf springs whereby said leaf springs are deflected inwardly and tensioned out of engagement with the contacts related thereto, whereby fusing of one of said fusible elements permits the leaf spring related thereto to spring outwardly and engage the circumferentially adjacent contact and thereby restore a circuit in which said terminal plate and said studs are connected, a second series of similar studs, contacts, fusible elements, and leaf springs on the opposite side of said base plate, an intermediate contact between two of adjacent contacts of the first series and electrically connected to a contact of the second series, and a bridging element carried by one of the leaf springs of the first series in position to bridge said intermediate contact and an adjacent contact of the first series whenever the last of the first series fusible elements is fused and the related leaf spring is released to engage such adjacent first series contact, whereby the circuit is restored by the first fusible element of the second series thereof.

JOHN W. BRYAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
493,328	Bonebrake	Mar. 14, 1893
500,248	Young et al.	June 27, 1893
560,819	Reagan	May 26, 1896

FOREIGN PATENTS

Number	Country	Date
469,660	France	May 26, 1914