B. D. HORTON.

ELECTRICAL FUSE.

APPLICATION FILED JUNE 9, 1914.

1,280,478. Patented Oct. 1, 1918.

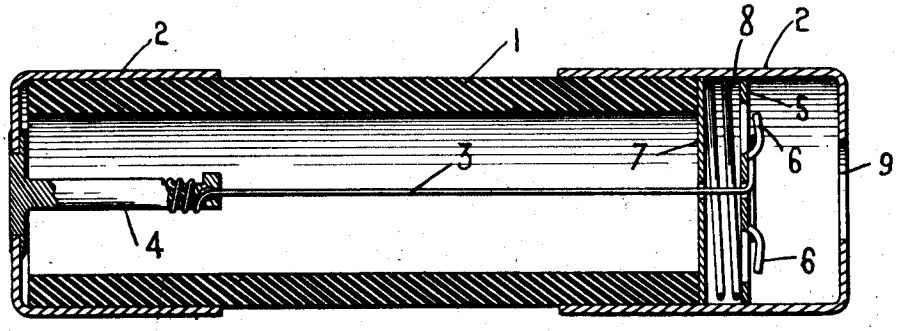


FIG. 1

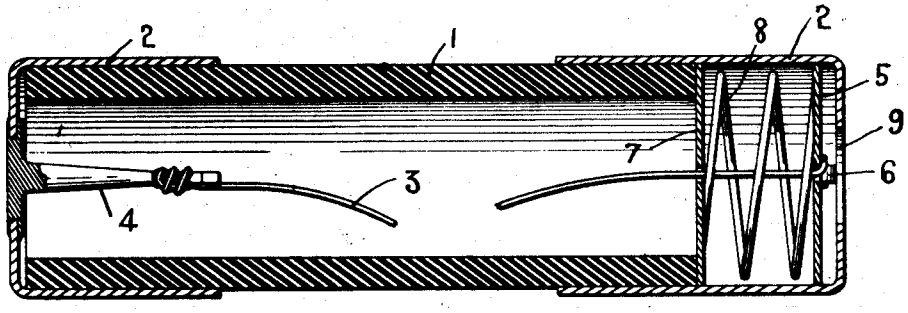


FIG. 2

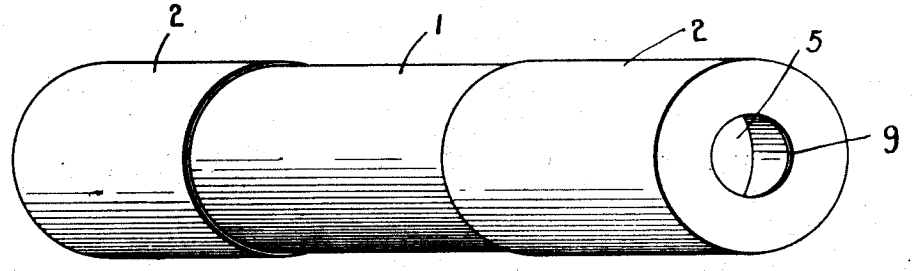


FIG. 3

WITNESSES:

Arthur Chaquet

Wm. L. Dunn

INVENTOR.

Bryson D. Horton,

BY Clifford E. Dunn

ATTORNEY.

UNITED STATES PATENT OFFICE.

BRYSON D. HORTON, OF DETROIT, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ECONOMY FUSE AND MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW YORK.

ELECTRICAL FUSE.

1,280,478. Specification of Letters Patent. Patented Oct. 1, 1918.

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To all whom it may concern:

Be it known that I, BRYSON D. HORTON, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Electrical Fuses, of which the following, taken in connection with the accompanying sheet of drawings, is a full, clear, and concise description thereof.

In electrical fuses it is important that the fuse member should blow under overload conditions within a definite time after overloading occurs as otherwise damage to sensitive parts of the circuit may take place before the circuit is broken. This is particularly true in the case of small fuses where comparatively light overloads may occur, which, however, may be sufficient in course of time to cause injury to some part of the circuit. Heretofore, as far as I am aware, it has not been possible to construct commercial fuses in which the period of time which it will take for the fuses to blow under overload conditions is determinate within close limits.

I have discovered that a definite relation exists between the time required for a fuse to blow under given load conditions and the tension to which the fuse wire or member is subjected. In general, it may be stated that the time element decreases as the tension increases, but not by a direct proportion. I have discovered, on the contrary, that the relation between the tension on the element and the time of blowing is not constant, but that for low tensions slight changes in tension produce large changes in the time element, while for high tensions even considerable changes in tension will produce very little change in the time element. I have further found that at or near a particular tension which, of course, is in each case dependent upon the material of which the fusible element is made, its size and the conditions of its use, the marked change in the relation between tension and time element to which I refer takes place. This point of change I will hereinafter refer to as the "critical tension" and this tension can be determined within quite definite limits for each particular fuse. If the fuse member be subjected to any tension above the critical tension it will be seen that the time element will become practically a constant, regardless of variation of tension above the critical.

Expressing the foregoing in another way, I have found that with a given size and material of wire and a given current strength there is a wide range in the blowing time where different tensions are used. Plotting tensions as ordinates and times as abscissas, a most valuable discovery is made in the curve resulting. It will be found that the curve drops almost vertically, as the tension is reduced, the time to fuse, however, increasing only slightly (which accounts of course for the nearly vertical drop). When the tension is reduced further however, it is found that the time to fuse increases very rapidly and the curve after making a sharp bend carries out substantially parallel to the horizontal axis. The sharp bend or knee may be called the critical point and it will be obvious that if the fusible element has such a tension on it that it will fall on the vertical part of the curve a fuse of great accuracy, that is, one which will operate at a certain fixed predetermined value, can be produced.

In applying my discovery to the improvement of fuses I construct a fuse in which the fusible element is normally maintained under a tension greater than the critical tension, as determined for a fusible element having the characteristics given. By thus doing, it will be seen that the time of blowing of the fuse can be closely determined and the action of fuses similarly constructed will be reliable and can be depended upon as slight variations in the tension of the strips of different fuses, such as will unavoidably occur in the commercial manufacture of the fuses in quantities or other manufacturing irregularities, will not affect the time of blowing of the fuses to a substantial extent. Thus I am enabled to produce fuses in large quantities and economically, but nevertheless with substantially uniform characteristics as to time of blowing.

In the accompanying drawings:

Figure 1 illustrates in longitudinal cross-section a fuse constructed in accordance with my invention before being blown.

Fig. 2 is a similar view illustrating the same in blown condition.

Fig. 3 is a perspective view of a fuse incorporating my invention.

In detail, 1 indicates the shell or body portion, usually of fibrous material, 2 indicates the end caps which serve as terminals adapted to be detachably connected with the usual spring clips of fuse holders, 3 is the fusible element which is in electrical connection with the end caps, one end being made fast to a slotted or notched terminal post 4, preferably by solder so that when the fusible element gets hot enough to melt the solder, it will not pull off since it is wound tightly around the reduced shank portion of the terminal, due to the notching. The terminal 4 is made fast to the end cap 2 by solder or in any other convenient manner. The opposite end of the fusible element 3 is made fast to a movable plate member 5, lips 6 being stamped upwardly therefrom into hook form to provide for the attachment of the said fusible element. A perforated plate 7 through which the fusible element is threaded is employed and between this plate and the slidable plate 5 a compression spring 8 is interposed, this compression spring bearing upon the slidable plate 5 with spring tension which is transmitted to fusible element 3 putting the latter under strain or tension.

The extent or degree of tension under which this fusible element is placed is governed by its proportion as well as the proportions of the other parts above alluded to and as stated, when properly proportioned throughout a reasonably definite blowing time can be predetermined and obtained. Therefore, the spring 8 is constructed so as to exert a predetermined spring tension against the slidable plate 5 so that the fusible element 3 will be under that predetermined definite strain. By duplicating this construction a plurality of fuses may be obtained which very closely approximate each other in blowing time.

It will be understood that when the fusible element 3 is disrupted or melted by reason of excessive current, the sliding plate 5 is forced longitudinally outwardly under the tension of the spring 8 into the position shown in Fig. 2 in which position the plate 5 is observable through the opening 9 in the end of the cap 2 thus indicating the fact that the fuse has blown.

I do not wish to be understood as limiting myself to any exact details of construction or to any definite proportions of parts, nor to any specific blowing times, those mentioned being merely illustrative by way of example only, but on the contrary my invention broadly speaking, comprehends a fuse provided with a predetermined tensioned fusible element adapted to blow in a definite predetermined time.

Having thus described my invention what I claim as new herein and desire to secure by Letters Patent is:

1. A fuse member normally maintained under a tension greater than the critical tension for such member.

2. A fuse member normally maintained under a tension greater than that indicated by the elbow of the curve produced by plotting the time element against the tension for said member.

3. An electrical fuse provided with a fusible element normally under a predetermined spring tension greater than the critical tension for said element.

4. An electrical fuse comprising a shell and end cap portions, fusible and indicating elements therein, one end cap portion being provided with a notched terminal post, and the opposite end cap portion housing the indicating element, the fusible element being connected with the notched terminal post and the indicating element and means normally exerting a predetermined definite spring tension on the fusible element greater than the critical tension for said element and adapted to operate the indicating element upon the disruption of said fusible element.

5. The method of predetermining the functioning of a time fuse which consists in placing a fusible element having a known critical tension under a tension greater than its critical tension.

6. The method of predetermining the functioning of a time fuse which consists in ascertaining the critical tension of a fusible member and maintaining said member under a tension greater than its critical tension.

7. A step in the method of predetermining the functioning of a time fuse, which consists in ascertaining the critical tension of a fusible member by coördinating time and tension until a curve is developed which substantially parallels one of the ordinants.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

BRYSON D. HORTON.

Witnesses:
LILLIAN C. HEMPEL,
ALICE O. HARBACK.