No. 851,751. PATENTED APR. 30, 1907.

O. C. HOFFMANN.

JUMP SPARK INDICATOR.

APPLICATION FILED MAR. 21, 1905.

Fig. 1.

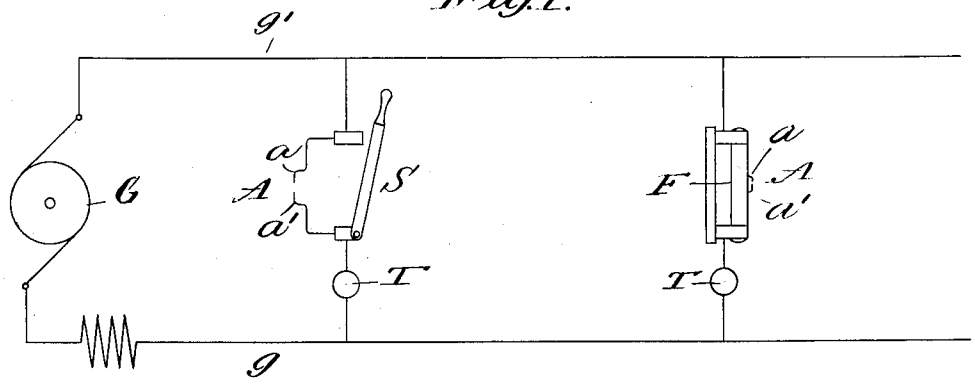


Fig. 2.

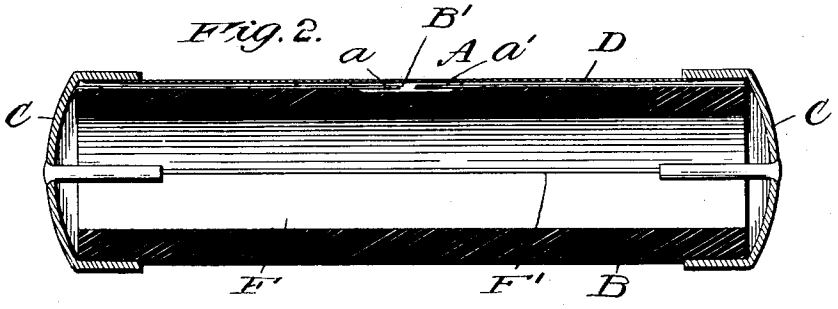


Fig. 3.

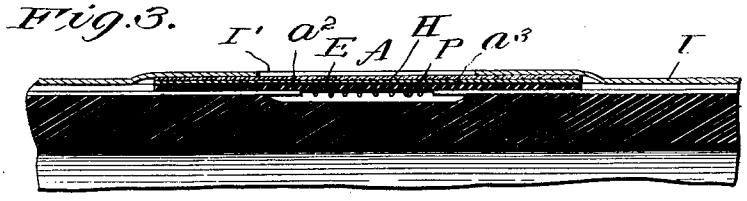


Fig. 4.

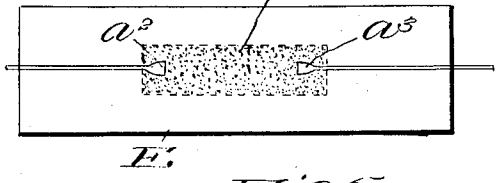


Fig. 5.

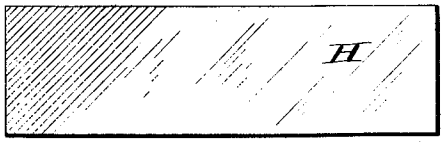
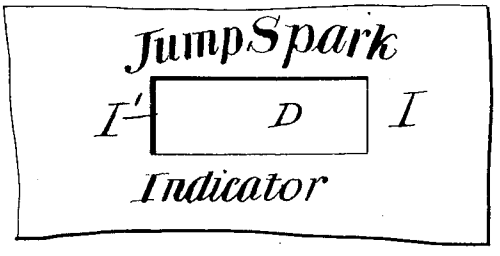


Fig. 6.



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UNITED STATES PATENT OFFICE.

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JUMP-SPARK INDICATOR.

No. 851,751. Specification of Letters Patent. Patented April 30, 1907.

Application filed March 21, 1905. Serial No. 251,333.

To all whom it may concern:

Be it known that I, OTTO C. HOFFMANN, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Jump-Spark Indicators, of which the following is a specification.

My invention relates to electrical jump spark apparatus, and especially to the jump spark when associated with means, chemical or otherwise for recording its passage or visually indicating that the spark has passed, which may be taken alone or associated with other devices. When so associated I prefer to employ it in connection with some device for opening electric circuits, such as switches, electric fuses, etc. When employed with fuses it has especial bearing on an adaptability to the class known as inclosed fuses. Inasmuch as it may be employed to indicate whether the fuse has been blown or is intact, this may be accomplished in two ways. First, by the spark itself, and secondly, by furnishing in connection with the spark some means for recording the fact that it has passed, such as the discoloration of specially prepared or chemicalized paper, mica, etc. When applied to inclosed fuses the jump spark indicator has been found to possess great advantages over any other known type, and especially advantages over the auxiliary fuse or indicator fuse. The use of the auxiliary indicator fuse has been found to disturb the calibration of the fuse itself to a more or less extent. Under conditions of the present day demand and specification for inclosed fuses, the current carrying capacity and the blowing point, under different time limits, has been brought to such a degree of exactitude that every disturbing factor must be avoided to secure anything approaching the desired accuracy. The auxiliary indicating fuse consists of the small wire attached to the terminals of the fuse which constantly carries more or less of the current. It always stands attached to the two fuse terminals in shunt of the fuse and the current arriving at the terminals obeys Ohm's law, a greater or less quantity always being carried by the auxiliary fuse; this is subject to accident of manufacturing and is never found twice alike; furthermore the auxiliary fuse changes in temperature; it is found to vary with the relative temperature, inasmuch as the latter is at or near the surface of the inclosing envelop or casing of the fuse. All these difficulties are avoided if an indicator can be secured which is not closed as to circuit, and therefore, does not shunt any of the current away from the fuse itself, and thereby avoiding all disturbance of the calibration of the main fuse. This most desirable end has at last been attained by the employment of the present jump spark indicator, which is an open circuited arrangement, and by means of which no current is shunted away from the main fuse, nor no current carried over any path except the main fuse until after the main fuse has not only been ruptured, but after the arc has been absorbed or extinguished and the path practically opened. Whereupon the onrushing current leaps the spark gap or gaps; this is due to the electromotive force of rupture or discharge from the inductance, such as it may be, of the circuit as a whole, or of such portion of it as may be included within the branch of the circuit controlled by the fuse; all of which is well understood in the art, and it is a well known fact that the momentary electromotive force at such a time, rises to values far in excess of the normal difference of potentials at the terminals of the fuse, and in some instances may arise far in excess of the maximum electromotive force of the distribution system to which the fuse may be connected. And it is this rise in electromotive force that is utilized for the purposes of breaking down the di-electric leaping the gap and causing the spark to pass. This once accomplished it becomes an easy matter to devise some means, such as paper or other suitable material which may be or become chemicalized, etc. for recording the passage of such spark and thereby obtaining a visual indication and record of the operation. It being known that this operation could never take place without the main fuse first having been open circuited, it becomes, therefore, a most faithful indicator of the condition of the fuse or other circuit opening device with which it is organized to co-operate.

The invention may be embodied in a number of forms. A sufficient illustration, however, is given in the drawings for complete understanding of one embodiment thereof, which may be described as follows:

Figure 1 represents a general diagrammatic representation of a system of distribu-

tion of electrical supply with the jump spark indicators in position. Fig. 2 is a longitudinal section of inclosed fuse with jump spark indicator in position. Fig. 3 is enlarged view of one of the walls of an inclosed fuse with an alternate form of jump spark indicator. Fig. 4 is a diagrammatic view of an alternate form. Figs. 5 and 6 are details.

Fig. 1 illustrates an electric circuit with the generator G circuit-mains g and g', circuit opening means such as switch S and inclosed fuse F, each of which are shown as being supplied with a jump spark device A shown as consisting of two terminals a and a'. The fuse F is shown as mounted upon a fuse base of usual construction and connected in circuit with the service or translating devices T.

In Fig. 2 is illustrated an inclosed fuse F made up of the caps CC and the shell B and the fuse F'. A depression in the outer wall of the shell of the fuse is shown at B' in which is located the jump spark device A consisting of the terminals a and a', over all of which is located a suitable cover D which may or may not be transparent. This cover D may be translucent or it may consist of a film or sheet so organized as to change its color on the passage of electric spark at A. The terminals a and a' run along on or within a casing in which they make suitable connection to terminals CC.

The alternate form shown in Fig. 3 relates simply to detail of structure of the indicator which here instead of consisting in a single air gap at A, consists of a plurality of air gaps located between conducting particles P, such for instance, as carbon, iron or suitable material which may be sprinkled and caused to adhere upon the surface of a non-conductor and in contact with which the two terminals a^2 and a^3 are connected. The surface E may be chemicalized or otherwise render the passage of the spark between the particles P visible, or record such passage in any visible manner, and this again may receive a covering; transparent or translucent, such as mica H, and the whole may be protected by a label having an aperture or otherwise provided for inspection of the jump spark device or the result of its operation which is indicated at I; also may be seen in Fig. 6, the aperture if any being indicated by I'

It will readily be understood that the particles themselves may be of such character as to be changed chemically by the passage of the spark or the co-operation between them and the paper E may be such that a visual indication of the character named may be had.

It will be readily understood that the invention may take on many different characteristics and any form of jump spark apparatus, or any character of material which will fulfil the conditions herein named may be used and associated with any form of circuit opening device without departing from the spirit of this invention.

To illustrate one method of carrying the present invention into effect, I would state that P may represent carbon particles; the cover D may be omitted or it may consist of mica, and the prepared paper or surface E may consist of paper wetted with ammonium sulfate solution and dried before being used.

Having thus fully described the nature of the invention and the method of its operation, what we claim and desire to secure by Letters Patent is:

1. In combination with a non-inductive electric conductor, terminals for such conductor, and a jump spark device located in shunt of such conductor, and means associated with the jump spark device for visually indicating the passage of the spark.

2. A fuse for an electric circuit, and a spark gap indicator connected in shunt to the fuse.

3. An inclosed fuse having terminals and a jump spark device in shunt with said terminals, and means for recording the passage of the spark exterior to the inclosing envelop of the fuse.

4. In an inclosed fuse, terminals for the fuse and a jump spark device exterior to the inclosing envelop in shunt circuit in relation with the terminals and a shield for the device.

5. In an inclosed fuse, a terminal for a fuse, a jump spark device in contact with the terminal, and a part chemically affected by the spark acting at the same time as a shield for the device.

6. In an inclosed fuse a terminal for the fuse, a jump spark device in contact with the terminal and a double shield for the device, one of such shields consisting of a transparent substance.

7. In an inclosed fuse a terminal for the fuse, a casing for the fuse, a depression in the case, a jump spark device in contact with the terminal located in the depression in the casing.

8. In an inclosed fuse a terminal for the fuse; a casing for the fuse, a depression in the case, a jump spark device in contact with the terminal located in the depression in the casing; and a cover for the depression.

9. The combination with a main fusible conductor, of a case inclosing said main conductor, an open auxiliary conductor exterior to said case and connected to said main conductor, and means exterior to said case for indicating the passage of current through said auxiliary conductor.

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

OTTO C. HOFFMANN.

Witnesses:
WILLIAM H. CROSBY,
ARTHUR D. DONA.