

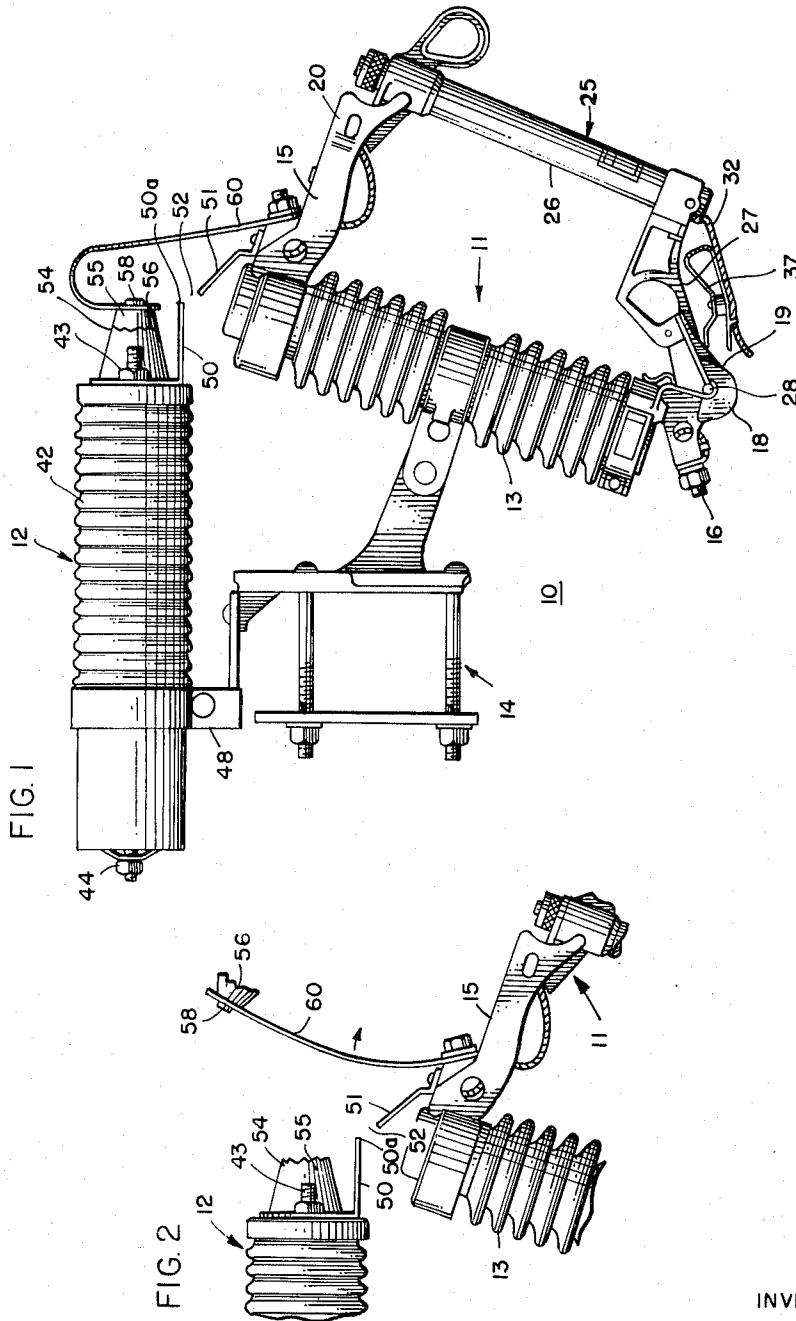
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D. O. MISARE ET AL

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HIGH VOLTAGE ARRESTER CUTOUT

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HIGH VOLTAGE ARRESTER CUTOUT

Donald O. Misare, Riverside, Ill., and Philip C. Henry, St. Petersburg, Fla., assignors to Joslyn Mfg. and Supply Co., Chicago, Ill., a corporation of Illinois
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The present invention relates to a new and improved combination high voltage arrester cutout and more particularly, the present invention is concerned with improved lightning protection of such combination units.

Combination arrester cutout assemblies for use on high voltage transmission structure are commercially available. The combination arrester cutout generally includes a dropout type fuse circuit adapted to interrupt current faults, and a suitable, externally gapped lightning arrester connected to afford protection to the cutout. The lightning arrester commonly provided commercially in the combination arrester cutout is provided with a characteristic element connected serially with one or more internal isolating gaps which function to keep the main portion of the transmission system voltage off the characteristic element in the absence of surges. The characteristic element serves to bypass to ground the surge current resulting from abnormal line voltages and to interrupt the flow of system follow current as soon as the abnormal condition has terminated. One such lightning arrester suitable for use in the present invention is illustrated and described in the co-pending application of Edward H. Yonkers, Serial No. 157,293, filed November 16, 1961, on Valve Type Lightning Arrester, and assigned to the same assignee as the present invention. The fuse cutout may also be of a type known in the art and, more specifically, may be similar to the fused cutout assembly more fully described in United States Patent 2,862,082 and assigned to the same assignee as the present invention.

In the type of commercial installation described above, difficulty has been experienced in that if the lightning arrester fails, due to abnormal load conditions such as excessive voltages or direct lightning strikes, the arrester will fail and will afford no internal resistance to ground. Accordingly, the only protection of the transmission line component against an open short to the ground is afforded by the external gap formed in the lightning arrester system. Any small over-voltage would be sufficient to spark the external gap or to cause discharge in the gap, and the discharge would be sufficient on over-voltages to cause continuous and repetitious blowing of the component fuses. Not only is it necessary to afford fuse protection, but such repetitive line failures are undesirable from the customer standpoint. It is difficult to detect such a failed lightning arrester so that replacement may be made.

In another type of lightning protector system, the lightning arrester is serially connected with an explosive type disconnecter between the external lead of the high voltage component and the ground. One suitable disconnecter is illustrated and disclosed in Riley Patent No. 3,100,246 granted August 6, 1963 on a Disconnecter, and assigned to the same assignee as the present invention. The disconnecter has adequate time delay so that discharges through the lightning arrester unit, sufficient to cause failure of the lightning arrester, will thereafter explode the charge and the disconnecter and will consequently break to remove the arrester from the electrical transmission circuit. Although such a failed arrester in a combination arrested cutout can be readily detected, in the meantime the fuse cutout is afforded no protection whatsoever by the arrester unit and subsequent over-voltage conditions may cause the fuse cutout to interrupt the transmission line component.

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Accordingly, it is an object of the present invention to provide an improved high voltage combination arrester cutout which overcomes the above-mentioned difficulties.

A further object of the present invention is to provide a new and improved high voltage combination arrester cutout.

A further object of the present invention is to provide a new and improved high voltage combination arrester cutout unit which will provide a visual indication of a failed arrester, and will additionally provide continued protection to the fuse cutout against lightning surges during the interim period between the failure of the arrester and replacement thereof.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with these and many other objects of the present invention, there is provided a combination arrester cutout unit for high voltage distribution systems. The cutout is of the dropout type fuse assembly including an insulator having stationary terminal members carried at opposite ends thereof adapted for connection to high voltage components of the transmission system, and a dropout fuse tube having a fuse link capable of interruption upon abnormal amperage faults and normally electrically interconnecting the terminals. An externally gapped lightning arrester of the type having an insulating shell housing a characteristic element formed of valve material in series with internal isolating gaps is connected to one terminal of the cutout through an external gap structure to form an external atmospheric isolating gap between the lightning arrester and the fuse cutout. In accordance with the present invention, an explosive type disconnecter is connected across the external gap. In one embodiment of the invention, the explosive disconnecter is connected by means of prestressed resilient spring which is effective to snap free of the lightning arrester upon an explosive failure of the disconnecter.

Advantageously a combination arrester cutout unit according to the present invention not only provides a ready visual indication of a failed arrester on the cutout, but additionally affords continued protection to the fuse cutout against lightning surges during the interim period between the failure of the arrester and replacement thereof.

For a better understanding of the present invention, reference may be had to the accompanying drawing wherein:

FIGURE 1 is an elevational view of a combination arrester cutout unit according to the present invention; and

FIGURE 2 is a fragmentary view of the combination arrester cutout of FIGURE 1, illustrated after a failure of the explosive disconnecter.

Referring now to the drawings, there is illustrated a high voltage combination arrester cutout 10 including a dropout type fuse assembly 11 and a lightning arrester 12. The fuse assembly 11 may be similar to the fuse assembly more fully described in the aforementioned U.S. Patent 2,862,082. Briefly, the fuse assembly 11 includes an elongated insulator 13 supported by a suitable bracket 14 from a transmission line superstructure. Upper and lower stationary terminal members 15 and 16 are carried at opposite ends of the insulator 13 for connection to the high voltage transmission line component. The lower terminal member 16 is provided with a pair of trunnion supports in the form of hook members 18 which are spaced apart and which are provided with overhanging portions 19. The upper terminal member 15 is also provided with a suitable trunnion portion 20. The upper and

lower terminal members 15 and 16 are provided with suitable means for connection to a high voltage transmission line.

A dropout fuse structure, generally illustrated at 25, includes a fuse tube or cartridge 26 having a downwardly and rearwardly extending arm 27 extending from the lower end thereof and provided with a cross-trunnion 28 hooked in the hook members 18 to pivotally interconnect the fuse tube 26 to the lower terminal member 16. The fuse structure 25 further includes an upper terminal 30 adapted to hook or engage the trunnion portion 20 of the upper terminal member 15 to provide electrical contact with the fuse tube 26.

The fuse assembly 11 is provided with a suitable fuse link 32, the upper end of which is secured to the upper terminal 30. The lower end of the fuse link 32 extends through the open lower end of the fuse tube 26 and is secured to suitable spring structure 37 adapted to snap the fuse link 32 out of the tube 26 upon rupture of the fuse link 32.

It is understood that the fuse link 26 will fail upon abnormal amperage fault such as continuous shorts to ground. However, the lightning arrester 12 discharges abnormal lightning surges to ground thereby protecting the fuse cutout assembly 11.

The lightning arrester 12 may be of known construction and, in the illustrated embodiment, may be of the type described and claimed in the above-mentioned application of Yonkers. Accordingly the lightning arrester need not be herein described in detail. However, briefly, the lightning arrester 12 includes an outer cylindrical housing 42 of dielectric material having opposed terminals 43 and 44. The lightning arrester 12 contains a suitable characteristic or valve material serially connected with suitable internal isolating spark gap means within the housing 42 and electrically connected serially between the terminals 43 and 44. The lightning arrester 12 is supported on a bracket 48 supported by the bracket 14. One terminal 44 is adapted to be connected to ground potential. An external electrode 50 is electrically connected to the other terminal 43 and it is provided with an electrode portion 50a spaced apart from an opposed electrode 51 connected to the terminal 15 to provide an external isolating spark gap 52. If desired, the external electrodes 50 and 51 may provide for adjustability of the length of the isolating gap 52 in a known manner.

In accordance with the present invention, the combination arrester cutout 10 additionally includes an explosive disconnector 54. The explosive disconnector 54 may be of the type described in and claimed in the above-mentioned Riley patent and, accordingly, need not be herein described in detail. However, briefly, as best illustrated in FIGURE 3, a known explosive disconnector 20 includes a housing 55 having at one end a thin, fractureable section 56. The disconnector 54 includes a first terminal connected to one terminal 43 of the lightning arrester 18 and having a second terminal 58 connected to the upper terminal 15 of the fuse cutout assembly 11 by a suitable conductor 60. Additionally the disconnector 54 includes a threaded second terminal 58. Serially connected between the terminals of the disconnector within the housing 55 is a suitable explosive material. The disconnector 54 has an adequate time lag upon a destructive discharge through the lightning arrester unit 15 that the lightning arrester 15 would first fail, and thereafter the explosive material in the disconnector 54 would explode, rupturing the housing 55 along the line 56 and separating the terminals thereof.

It is understood that an explosive rupture of the disconnector 54 will drive the terminal 58 and connected housing free of the lightning arrester 12 to break the circuit thereto. The normal stiffness of the conductor 60, made of copper or other suitable conducting material, will maintain the disconnector 54 separated. However, if desired, in order to snap the disconnector 54 free upon

explosion of the material therein, the conductor 60 may be a pre-stressed leaf spring of electrically conductive material. As illustrated, the spring conductor 60 has one end connected to the terminal 58 of the explosive disconnector and the other end connected to the terminal 15 of the fuse assembly.

From the above detailed description, the operation of the improved combination arrester cutout unit is believed clear. However, briefly, it will be understood that the lightning arrester unit includes an externally gapped lightning arrester 12 provided with an explosive disconnector 54 connected to a high voltage lead 15 of the fuse cutout by means of a suitable conductor 60. The conductor 60 and the explosive disconnector 54 are serially connected across the external isolating gap 52 of the lightning arrester 12. If a discharge occurs through the lightning arrester unit 12 of sufficient magnitude to cause failure of the lightning arrester 12, the lightning arrester 12 then acts as a short and, with suitable time delay, the explosive material in the explosive disconnector 54 will be fired, rupturing the explosive disconnector 54 breaking the circuit through the disconnector. If the conductor 60 consists of a prestressed spring, the spring will aid in snapping the upper terminal 58 of the explosive disconnector 54 apart from the remainder of the disconnector. This provides a visual indication of a defective lightning arrester unit, as best illustrated in FIGURE 2. Advantageously the lightning arrester unit 12 according to the present invention, continues to afford continued protection against lightning surges during the interim period after failure and before replacement of the lightning arrester unit 12 due to the external isolating spark gap 52. Although the lightning arrester unit 12 after firing of the explosive disconnector 54 affords reduced resistance to ground which may result in occasional blowing of the component fuses, nevertheless adequate protection is afforded to prevent destruction of the high voltage system.

Although the present invention has been described by reference to a single embodiment thereof, it will be apparent that numerous other modifications and embodiments will be devised by those skilled in the art which will fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A combination arrester cutout unit for use with a high voltage power distribution system comprising: a dropout type fuse unit including spaced cutout terminals and means including a fuse link capable of interruptions upon abnormal amperage faults and normally electrically connected across said terminals; a lightning arrester for passing abnormal voltage surges to ground; a pair of spaced apart spark gap terminals defining an external isolating gap; said lightning arrester and said gap being normally serially electrically connected between ground and one of said cutout terminals; arrester disconnector means electrically connected to one of said spark gap terminals; and electrical conducting means electrically connecting the other of said spark gap terminals to said arrester disconnector means, said arrester disconnector means explosively isolating said spark gap terminals from one another upon an over voltage condition, said disconnector means and said electrical conducting means indicating a failure of the lightning arrester, said gap providing protection after isolating by said arrester disconnector means.

2. The structure defined by claim 1 wherein the electrical conducting means connected across the gap comprises a deflectable member normally disposed in a predetermined position in engagement with said arrester disconnector means but deflectable to a different position in the event of operation of said arrester disconnector means.

3. The structure defined by claim 1 wherein the lightning arrester and the fuse unit are carried upon a com-

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mon support bracket which, in turn, is mountable upon at least one distribution system component.

4. A combination arrester cutout unit for use with a high voltage power distribution system comprising: a dropout type fuse unit including an insulator and spaced cutout terminals carried by said insulator and adapted for connection to distribution components, a dropout fuse tube carried by said insulator and having a fuse link capable of interruptions upon abnormal amperage faults and normally electrically connected across said terminals; bracket means adapted to support said insulator from a transmission system component; a lightning arrester mounted on said bracket for passing abnormal voltage surges to ground and being of the type having an insulating shell carrying spaced terminal means and housing a characteristic element in series with an isolating gap, said characteristic element being formed of valve material having a nonlinear resistance; a pair of spaced apart spark gap terminals defining an external isolating gap, said lightning arrester and said gap being normally serially electrically connected between ground and one of said cutout terminals; arrester disconnecter means electrically connected to one of said spark gap terminals; and electrical conducting means electrically connecting the other of said spark gap terminals to said arrester disconnecter means, said arrester disconnecter means explosively isolating said spark gap terminals from one another upon an over voltage condition, said disconnecter means and said electrical conducting means indicating a failure of the lightning arrester, said gap providing protection after isolating by said arrester disconnecter means.

5. A combination arrester cutout unit for use with a high voltage power distribution system comprising: a dropout type fuse unit including spaced cutout terminals and means including a fuse link capable of interruptions upon abnormal amperage faults and normally electrically connected across said terminals; a lightning arrester pro-

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vided with a pair of spaced terminal means for passing abnormal voltage surges to ground; a pair of spaced apart spark gap terminals defining an external isolating gap; one of said spark gap terminals being electrically connected to one of said terminal means and the other of said spark gap terminals being electrically connected to one of said cutout terminals; the other of said terminal means being adapted normally to be serially electrically connected to ground; arrester disconnecter means electrically connected to one of said spark gap terminals; and electrical conducting means electrically connecting the other of said spark gap terminals to said arrester disconnecter means, said arrester disconnecter means explosively isolating said spark gap terminals from one another upon an over voltage condition, said disconnecter means and said electrical conducting means indicating a failure of the lightning arrester, said gap providing protection after isolating by said arrester disconnecter means.

6. The structure defined by claim 5 wherein the electrical conducting means connected across the gap comprises a deflectable member normally disposed in a predetermined position in engagement with said arrester disconnecter means but deflectable to a different position in the event of operation of said arrester disconnecter means.

7. The structure defined by claim 5 wherein the lightning arrester and the fuse unit are carried upon a common support bracket which, in turn, is mountable upon at least one distribution system component.

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BERNARD A. GILHEANY, *Primary Examiner*.

H. A. LEWITTER, *Assistant Examiner*.