Feb. 2, 1954 C. W. PETERSEN 2,668,210

ISOLATING GAP ELECTRODE

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FIG. 1.

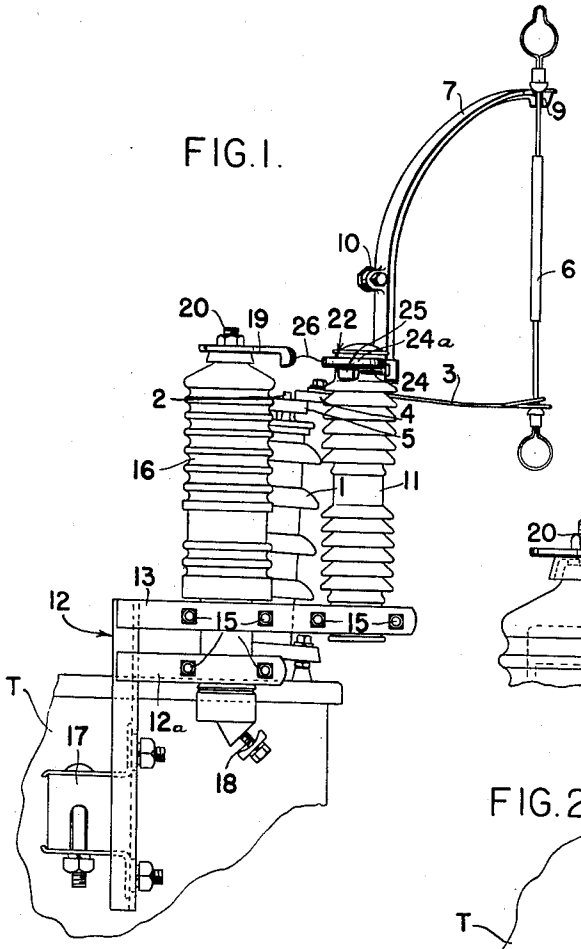


FIG. 3.

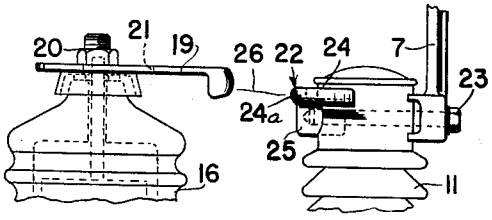


FIG. 2.

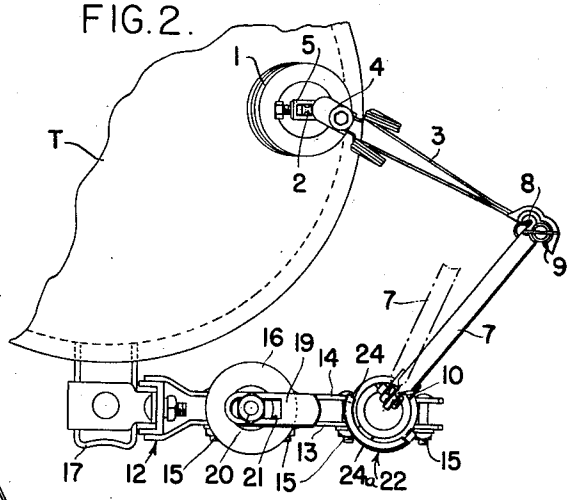
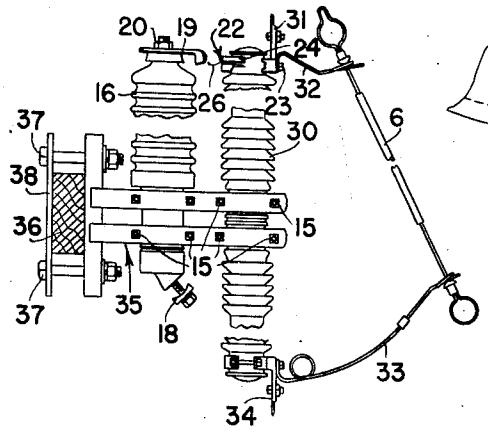


FIG. 4.



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ISOLATING GAP ELECTRODE

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3 Claims. (Cl. 200—115)

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This invention relates generally to electrical protective devices, and more specifically to the spark gap electrodes which serve to normally electrically isolate surge arresting devices during periods when surge conditions are not present.

Protective equipment for electrical apparatus has long been provided for arresting lightning and other surges, and also for overload current protection. Many attempts have been made to provide all-over protection in a unitary structure with varying degrees of commercial success. The present invention contemplates the use of independently functioning protective devices, including a surge arrester and a fuse cutout for overload protection. Both devices are preferably mounted on a single bracket in the proximity of one another and of the equipment to be protected.

It is essential to provide a spark gap means for electrically isolating the arrester until such time that it is needed to dissipate line surges. For safety reasons, it is preferable to mount the fuse cutout in such position that replacement of expended fuses may be performed from safe operating distances from "hot" lines or equipment which may endanger the operator.

To provide for a safe and convenient mounting of the fuse cutout-arrester combination, it often becomes necessary to reset spark gap electrodes for establishing predetermined gap dimensions. This adjustment was inconvenient to make after the equipment was mounted on pole cross-arms or transformer tanks, and often required modification of associated parts. It is contemplated by the present invention to provide a universal spark gap device which provides a constant gap dimension without subsequent adjustment and modification, no matter the mounting position of the various cooperating parts.

When such protective equipment is mounted directly on transformer brackets in conjunction with transformer primary bushings, it often is necessary to provide specially constructed fuse cutouts for each of various type transformers for specific bushing positions in relation to mounting brackets. The present invention contemplates a novel spark gap device which is universally adaptable to all types of transformers, no matter the position of the bushings with respect to mounting position of the protective apparatus.

The predominate object of this invention is therefore to provide spark gap electrodes for a combination surge arrester and fuse cutout protective device for electrical equipment, whereby a predetermined spark gap distance is retained no

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matter the mounting position of the arrester or cutout with respect to the protected equipment.

Another object of this invention is to provide a spark gap electrode for electrical apparatus that is universally adaptable for any of many mounting positions of cooperating protective equipment.

These and other objects are effected by the invention as will be apparent in the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Figure 1 is a fragmentary side elevational view of a protected transformer including a surge arrester and fuse cutout combination employing the novel spark gap arrangement.

Figure 2 is a top plan view of the combined surge arrester and fuse cutout shown in Figure 1 provided for mounting directly on a transformer and employing the novel spark gap device.

Figure 3 is a fragmentary side elevational view showing the preferred manner of mounting the cooperating electrodes of the novel device on cooperating arrester and fuse cutout installations.

Figure 4 is a fragmentary side elevational view showing another embodiment of the novel device.

The novel protective device may be most advantageously disclosed as shown in Figures 1 and 2, for transformer mounting, wherein the transformer is denoted generally by the reference character T.

The transformer is shown provided with a primary bushing 1 including an upper terminal 2. The fuse cutout includes a lower fuse contact spring 3, which is electrically connected to the bushing terminal 2 through a contact 4 and a solderless connector 5. The fuse link 6 is suspended between the contact spring 3 and the upper fuse contact arm 7 and engaging either of the slotted portions 8 or 9 of the contact arm 7, whichever is most convenient for mounting. A terminal 10 is provided on the upper contact arm for electrical connection with the line.

The upper fuse contact arm 7 is supported by the free end of fuse cutout insulator 11, which is mounted on a hanger 12. The hanger 12 preferably comprises spaced parallel metal straps 13 and 14 formed to grippingly engage members supported therefrom. The supported insulator 11 is held in place with bolt and nut assemblies 15 protruding through openings in each of the parallel straps 13 and 14 which urge the straps toward one another to grippingly engage the supported members. A surge arrester 16 is supported by the hanger assembly in substantially the same

manner as described above. For further support, additional straps 12a may be provided as shown in Figure 1.

The hanger 12 may be conveniently supported by any conventional type transformer mounting brackets, the unit being universally adaptable no matter the position of the bracket, designated by reference character 17, with relation to the bushing 1.

The surge arrester 16 is preferably provided with a solderless connector 18 for electrical connection with ground or neutral. It is usual practice to use an expulsion type arrester with this installation, but it is within the scope of this invention to provide any protective surge arresting device requiring an external spark gap.

The novel universally adaptable spark gap device will hereinafter be described: A spark gap electrode 19 is affixed to the upper end of the arrester 16. The electrode is held in adjustable engagement with the arrester by the nut and stud assembly 20 and elongated opening 21 clearly shown in Figure 2. The opposite spark gap electrode 22 is mounted on the insulator 11 and is electrically connected to the upper fuse contact arm 7 by a bolt 23 which concurrently engages the lower portion of the contact arm 7 and a tapped hole in electrode 22.

The novel electrode 22 is provided with a portion 24 which has arcuate electrode surface 24a, which surface is preferably concentric with the axis of the insulator 11. The portion 24 is integral with the attaching portion 25 which is provided with a tapped hole to receive the bolt 23.

The electrode 20 is provided with an elongated opening 21 which permits initial adjustment of the predetermined spark gap distance 26. After the desired spark gap distance is established between the electrodes 19 and 22, the insulator 11 may be rotated in the hanger 12 to line up the fuse contact arms 3 and 7 for mounting the fuse link 6. The bolt and nut assemblies 15 are then tightened to securely support the insulator 11.

Since the transformer bushing 1 is positioned differently with respect to the transformer mounting brackets on various types of transformers, the lower fuse contact spring positions would be varied accordingly. It will be obvious that no matter the position of the upper contact arm 7 with respect to the bushing 1, the spark gap distance 26 will remain constant between the electrode 19 and the arcuate portion 24 of electrode 22. This adaptability may be emphasized by the broken line portions in Figure 2 showing how the insulator 11 may be rotated in the hanger 12 to change the position of the contact 7 with relation to the bushing 1. The spark gap distance 26 remains constant no matter the change of position of the contact arm 7.

The universality of the novel device will also permit the most advantageous positioning of the fuse contacts for convenience in re-fusing. Thus, a lineman may re-fuse from a safer position below or from the side of the transformer using an operating stick to replace the fuse link. Thus, he need not reach over the top of the transformer and will maintain a safe operating distance from live parts. It will be apparent that the device will work equally well with all types of transformers. For convenience in drawing, a rural type transformer is shown provided with a single primary bushing, the other line lead being electrically connected with the secondary ground or neutral lead.

It will be obvious that the novel external spark gap device may be used in conjunction with any installations requiring universally mounted protective equipment, and may also be conveniently adapted for cross-arm mounting of this equipment.

A convenient cross-arm mounting arrangement is shown in Figure 4 where the spark gap electrode 22 is positioned at the upper end of an insulator 30 in a manner substantially identical to that described with reference to Figures 1, 2 and 3. A line terminal 31 and the upper fuse contact 32 may be fastened to the insulator along with the electrode 22 by bolt 23. The fuse link 6 is here suspended between the contact 32 and the contact spring 33 in like manner as described with reference to Figures 1, 2 and 3. The contact spring 33 is supported by the lower end of insulator 30, which also has a terminal 34 attached thereto. The terminal 34 is adapted to electrically connect the fuse cutout with the protected equipment, i. e., transformer.

Both the fuse cutout and surge arrester 16 are positioned proximate to one another on the hanger 35 in substantially the same manner as described above. The cooperating gap electrode 19 is initially positioned on the upper end of the arrester 16 to provide a predetermined gap distance 26 with electrode 22. Electrical connection with ground or neutral is preferably made through the solderless connector 18 of arrester 16. The hanger 35 may be conveniently fastened to cross-arm 36 with bolt and nut assemblies 37 and backing plate 38, or with any of many well-known mounting devices.

It will be apparent that the novel spark gap arrangement shown in Figure 4 will function with effectiveness equal to the embodiment disclosed in Figures 1, 2 and 3. The fuse cutout insulator 30 may be rotated to any desired position in the hanger without necessitating additional gap adjustments. Thus, the live portions of the protective equipment may be positioned at safe operating distances for re-fusing and other maintenance operations.

It will be obvious that the gap electrodes 19 and 22 may be interchanged if so desired (not shown) without changing the inherent operating characteristics of the gap arrangement. It will also be obvious that both electrodes of the spark gap may be of arcuate sectors should it be desired to rotatably mount both the arrester and fuse cutout (not shown) while maintaining a constant spark gap distance.

It will be apparent that a novel spark gap means for cooperating devices used in protection of electrical apparatus has been provided, and which means is universally adaptable for any of many mounting arrangements of companion protective equipment.

I claim:

1. In an electrical protective assembly including a support member, a surge arrester having a terminal and a fuse cutout having a terminal, the combination of a pair of cooperating isolating gap electrode members, said surge arrester and said fuse cutout each being supported in adjacent spaced relationship by said support member, the axes of revolution of said arrester and said cutout being substantially parallel to one another, one of said electrode members being in electrical connection with and secured to the terminal of said arrester, the other of said electrode members being in electrical connection with and secured to the terminal of said cutout, said electrode members being positioned to lie in sub-

stantially a common plane, and one of said electrode members having an arcing surface in said plane substantially arcuate in contour and rotatable about one of said axes of revolution, whereby a predetermined spaced, fixed gap dimension is normally maintained between said electrode members.

2. In a protective device for electrical transformers including a primary transformer bushing having a terminal, a support member, a surge arrester having a terminal and a fuse cutout comprising two fuse contact members and an insulating member, the combination of a pair of cooperating isolating gap electrode members, said surge arrester and said insulating member each being supported in adjacent spaced relationship by said support member, one of said fuse contact members being in electrical connection with and secured to said primary bushing terminal, the axes of revolution of said arrester and said insulating member being substantially parallel to one another, one of said electrode members being in electrical connection with and secured to the terminal of said arrester, the other of said electrode members being in electrical connection with and secured to one of said fuse contact members, said electrode members being positioned to lie in substantially a common plane, and one of said electrode members having an arcing surface in said plane substantially arcuate in contour and rotatable about one of said axes of revolution, whereby a predetermined spaced, fixed gap dimension is normally maintained between said electrode members.

3. In an electrical protective assembly including a surge arrester having a terminal and a fuse cutout having a terminal, the combination of a pair of cooperating isolating gap electrode members, said surge arrester and said fuse cutout each being supported in adjacent spaced relationship by said support member, the axes of revolution of said arrester and said cutout being substantially parallel to one another, the first of said electrode members being in electrical connection with and secured to the terminal of said arrester, the second of said electrode members being in electrical connection with and secured to the terminal of said cutout, said electrode members being positioned to lie in substantially a common plane, and said second electrode member having an arcing surface in said plane substantially arcuate in contour and rotatable about the axis of revolution of said fuse cutout, whereby a predetermined spaced, fixed gap dimension is normally maintained between said electrode members.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
496,308	Heinze	Apr. 25, 1893
2,327,865	Brown et al.	Aug. 24, 1943
2,372,035	Wade	Mar. 20, 1945
2,519,289	Roman et al.	Aug. 15, 1950
2,549,853	Rorden	Apr. 24, 1951