June 29, 1926. 1,590,440

E. PFIFFNER

EXCESS VOLTAGE CONDUCTOR FOR HIGH WORKING VOLTAGES

Filed May 13, 1924

Fig. 1

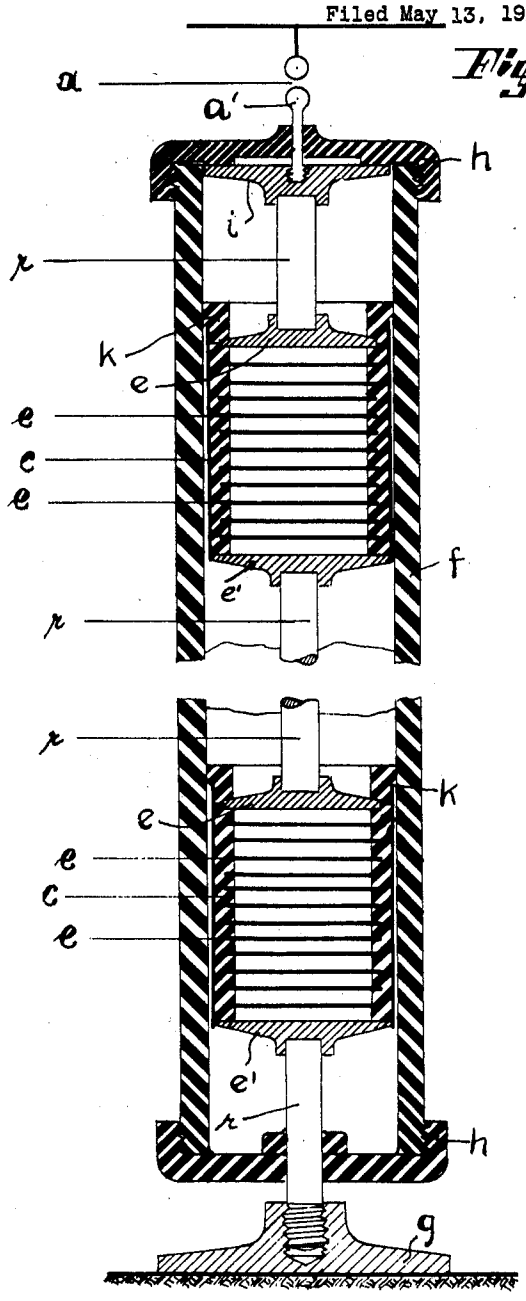
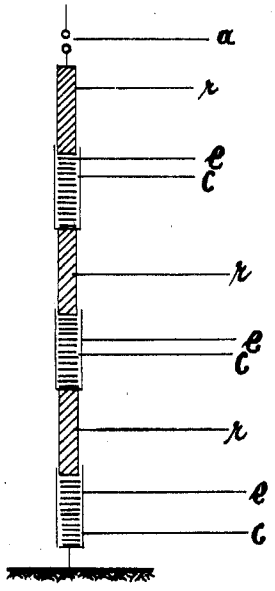


Fig. 2



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UNITED STATES PATENT OFFICE.

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EXCESS-VOLTAGE CONDUCTOR FOR HIGH-WORKING VOLTAGES.

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This invention relates to an excess voltage conductor. Such conductors useful as protective devices have usually been built as multiple spark gaps comprising a series of connected electrodes. Such devices are capable of operating only at a certain maximum limit of voltage.

It is well known that if spark gaps be connected in series, the operating voltage increases with a certain increase in the number of spark gaps connected in series, and with an increase of spark gaps beyond this number the increase in voltage does not correspond with the increase in the number of spark gaps, that is, if a curve be plotted with the number of spark gaps arranged in series as abscissæ, and the overall voltage as ordinates, the curve is linear for a short distance and flattens out rapidly when a certain number of spark gaps be exceeded.

The object of this invention is to form an excess voltage conductor where the relationship between the number of spark gaps and the overall voltage is substantially linear so that a conductor for any desired overall voltage may be constructed. This is obtained by dividing the spark gaps into groups arranging a discharge resistance between the groups and shielding each of the groups by a condenser shield or coating.

The invention will be better understood by reference to the accompanying drawing in which—

Fig. 1 shows such conductor in longitudinal section.

Fig. 2 is a diagrammatic view of a number of groups of spark gaps arranged in series according to this invention.

In Fig. 1, a, a' is an adjustable spark gap connected in front of the discharge column. The pole a' is connected to the conductor i through the cap h. To this conductor i is connected a resistance r which is in turn connected to the first of the series of electrodes e of the first group of spark gaps. The last electrode e' of said group is connected to the second discharge resistance r which is in turn connected to the first electrode e of the second group of series connected electrodes. The last electrode e' of said group is connected to a further discharge resistance r which, as shown in Fig. 1, passes through the lower cap h and is connected to a grounding plate g. Each group as shown in Fig. 1 is surrounded with a condenser armature c separated from the electrodes by the insulating material k in which the electrodes are fixed. The armature c is connected to the lower electrode e' of each group.

The caps h and cylinder f which enclose this conductor are made of suitable insulating material or formed in any manner, due regard being taken to insulate the electrode from the coating to prevent short circuiting.

Fig. 2 shows the same electrodes schematically indicating that any number of groups may be employed as desired, three groups being shown in Fig. 2. This schematic arrangement shows the series connected electrodes in each group, the groups being connected in series with discharge resistances between them and the condenser connected in parallel with each group connected to the end of each group opposite the counter pole, that is, the condenser armature is connected to the end of each group which is nearest the grounded point.

Obviously the condenser armature need not surround each group but electrodes may be formed in annular shape with the armature disposed as a central cylinder around the axis of the electrode.

The above description should not be taken as limiting but merely descriptive of the best manner employed in my invention which I claim to be:—

1. An excess voltage conductor for high working voltages comprising a plurality of groups of spark gaps arranged in series, a resistance between said groups, a condenser shield for each group, the shield of each group being connected to the end of the group nearest the ground connection.

2. An excess voltage conductor for high working voltages comprising a plurality of groups of spark gaps arranged in series, resistances between said groups, a condenser shield for each group, the shield of each group being connected to the end farthest from the ground connection of the next succeeding group.

3. An excess voltage conductor for high

working voltages comprising, a group of spark gaps, a resistance in series with said group, a condenser shield for said group connected to said resistance, a second group of spark gaps in series with said resistance, a second condenser shield for said second group, a second resistance in series with said second group, said second condenser shield being connected to said second resistance, means for earthing said second resistance.

In testimony whereof I hereunto affix my signature.

EMIL PFIFFNER.