Aug. 5, 1924. 1,504,193

E. D. TREANOR

ELECTRICAL PROTECTING APPARATUS

Filed Oct. 3, 1921 2 Sheets-Sheet 1

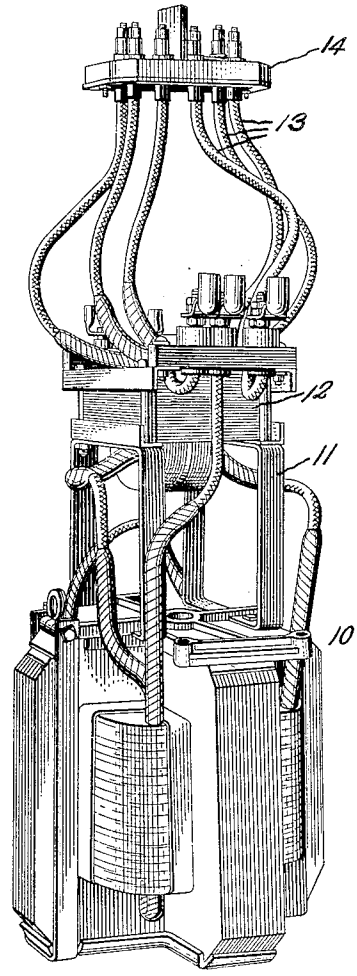


Fig. 1

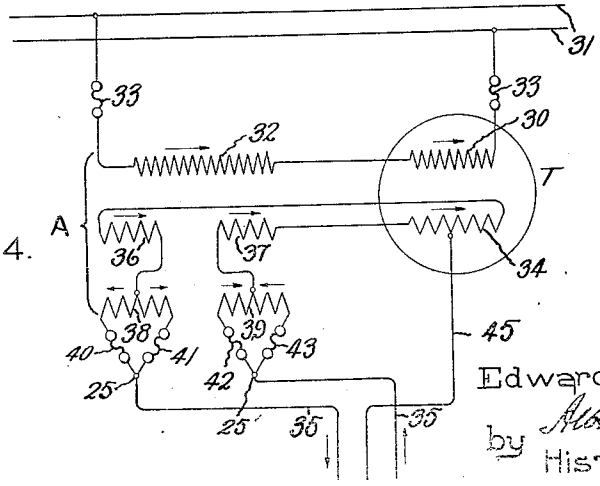


Fig. 4.

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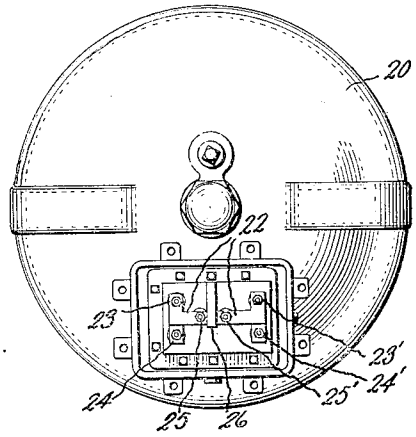


Fig. 2.

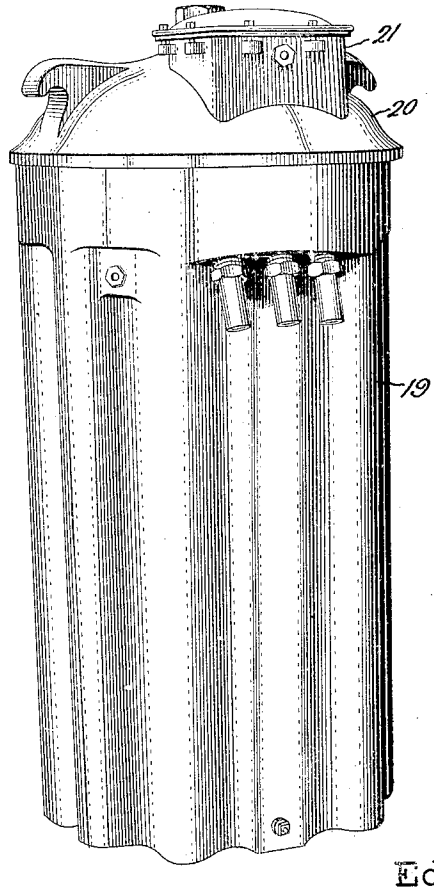


Fig. 3.

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Patented Aug. 5, 1924. 1,504,193

UNITED STATES PATENT OFFICE.

EDWARD D. TREANOR, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL PROTECTING APPARATUS.

Application filed October 3, 1921. Serial No. 505,092.

To all whom it may concern:

Be it known that I, EDWARD D. TREANOR, a citizen of the United States, residing at Pittsfield, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Electrical Protecting Apparatus, of which the following is a specification.

My invention relates to electrical protecting apparatus such as is used in connection with alternating current distributing systems or networks and has for its general object an improved construction and arrangement of parts.

Where a distributing network is supplied from a number of transformers in parallel, it has been found desirable to provide means for isolating a transformer from the network in case its primary fuses are blown as the result of the occurrence of some fault in the windings of the main transformer. For this purpose, an auxiliary transformer has been connected in the secondary side of the main transformer and arranged to blow fuses in the secondary circuit when the magnetic fluxes in this secondary transformer become unbalanced by the fault in the windings of the main transformer. Heretofore, such auxiliary transformers and fuses have been constructed and supplied separately from the main transformer and it is one of the objects of my invention to provide a construction whereby the main transformer and its auxiliary may be combined in a single unit.

A further object of the invention is to separate the fuses from any part of the apparatus which may contain vapor from the oil or other cooling liquid so as to prevent all damage of an explosion of such vapor when the fuses are blown. In obtaining this result, I secure the main and auxiliary transformers together so that both may be immersed in the same body of oil and enclose the combination in a casing, the fuses being located outside this casing and away from the oil. The casing is preferably arranged to provide mounting space for the transformer terminals and secondary fuses.

One embodiment of my invention is illustrated in the accompanying drawings in which Fig. 1 is a perspective view of a main and an auxiliary transformer combined in accordance with the invention; Fig. 2 is a side view of a casing adapted to house the transformers; Fig. 3 is a top view of the casing shown in Fig. 2; and Fig. 4 is a diagram of the transformer circuits and connections.

As shown in Fig. 1, a main transformer 10 is provided with a frame or superstructure 11 on which is mounted an auxiliary transformer 12 from which leads or connections 13 proceed to a terminal board 14.

The transformer casing 19 is tall enough to house both transformers immersed in a body of oil or other cooling medium and has a cover 20 provided with a compartment 21 formed thereon to enclose and support the terminal board 14.

On the terminal board 14 are the secondary fuses 22 which are adapted to be blown by current from the auxiliary transformer when its fluxes become unbalanced. These fuses 22 are shown as L-shaped strips of fusible metal secured between the terminals 23, 24, 25 and 23′, 24′, 25′. The terminals 23 and 24 are connected with the ends of one of the auxiliary transformer windings supplying current for blowing fuses, while the terminals 23′ and 24′ are similarly connected with the other fuse blowing winding of the auxiliary transformer. The terminals 25 and 25′ are connected respectively to conductors leading to the network. An insulating partition 26 is provided between the terminals 25 and 25′.

In the diagram shown in Fig. 4, the primary 30 of the main transformer T is connected across the trunk line feeders 31 in series with the winding 32 of the auxiliary transformer A, this primary winding 30 being protected by primary fuses or cut-outs 33. The secondary winding 34 of the main transformer T is connected to supply current through the feeders 35 to the network. The two terminals of the winding 34 are connected respectively with the two sections 36 and 37 of what may be deemed a secondary winding of the auxiliary transformer A. The section 36 of this winding is connected to the middle point of a fuse blowing winding 38 of the transformer A, the other section 37 being similarly connected to a second fuse blowing winding 39.

The terminals of the fuse blowing winding 38 (indicated at 23 and 24 in Fig. 2) are connected respectively to secondary fuses 40

and 41, these fuses leading to a common terminal 25 to which is also connected one of the network feeders 35. The terminals of the other fuse blowing winding 39 are similarly connected through secondary fuses 42 and 43 to the terminal 25′ to which is also connected another of the network feeders 35. A neutral feeder 45 for the network is tapped into the midpoint of the secondary winding 34 of the main transformer T.

Under normal operating conditions, the magnetizing effect of the current in the winding 32 of the auxiliary transformer A is sufficient substantially to neutralize the magnetic effect of the current in the sections 36 and 37 of the secondary winding of this transformer. Consequently, there is normally no flux in the core of this auxiliary transformer to induce current in the fuse blowing windings 38 and 39. Each of these windings 38 and 39 is so connected that current flowing through it to the network from the winding 34 divides into two parts flowing in opposite directions as indicated by the arrows, the magnetizing influence of the two parts of the current being opposed so that substantially no magnetic flux is induced.

If one or both of the main fuses 33 are blown because of an overload on the main transformer T, this transformer is then left connected as a load on the network, the current from the network, however, being limited merely to a small magnetizing current in the winding 34. Nothing further happens, as this current is not sufficient to blow the secondary fuses. If, however, a fault occurs in the windings of the main transformer T, such as to allow the primary current to increase, then one or both of the main fuses 33 will blow. This will interrupt the current in the winding 32 of the auxiliary transformer and leave the main transformer connected as a load on the network. Current from the network may also start to increase but its magnetic effect in the windings 36 and 37 is no longer neutralized as there is no current in the winding 32. Magnetic flux is therefore induced by this current in the windings 36 and 37 so as to induce current in the closed circuit formed by the winding 38 and the two secondary fuses 40 and 41 and also in the similar closed circuit formed by the winding 39 and the two secondary fuses 42 and 43. These induced currents, being added to the current flowing through these secondary fuses from the network feeders will blow the secondary fuses, thus isolating the transformer from the network.

These secondary fuses are located on the terminal board and within the compartment 21 formed on the cover 20. The main and auxiliary transformers are immersed in oil or other cooling medium below the cover 20 and within the tank or casing 20 so that no explosive vapor can reach the fuses and become ignited when the fuses are blown.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

In electrical protecting apparatus, the combination with a main transformer, of an auxiliary transformer provided with a fuse-blowing winding adapted to have fuse-blowing current induced therein upon an unbalancing of the magnetic fluxes in said auxiliary transformer, said auxiliary transformer being mounted upon a superstructure carried by said main transformer to form a unitary structure, a fuse in circuit with said fuse-blowing winding, a casing enclosing said main and auxiliary transformers, and a separate compartment containing said fuse and carried by said casing to separate the fuse from the transformer space within the casing, whereby vapor from within the transformer space is prevented from reaching said fuse.

In witness whereof, I have hereunto set my hand this 30th day of Sept., 1921.

EDWARD D. TREANOR.