

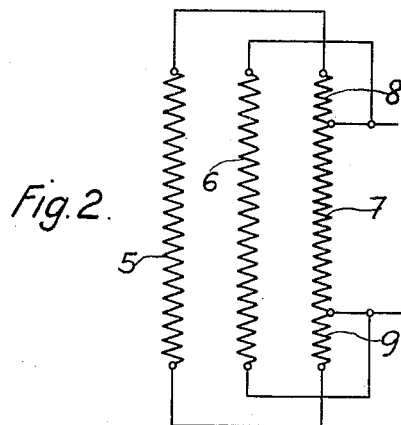
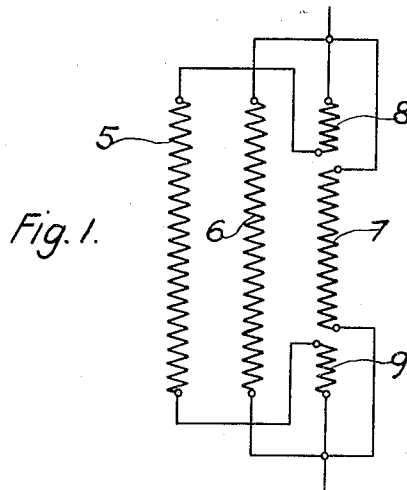
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NONMAGNETIC CORE REACTANCE COIL

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## UNITED STATES PATENT OFFICE

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## NONMAGNETIC-CORE REACTANCE COIL

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This invention relates to improvements in electrical equipment and, particularly, to reactance coils having a non-magnetic core.

Reactance or so-called choke coils for the protection of circuits against current surges and over-current waves have been formed, heretofore, with concentric circular coils provided with a core of iron or other magnetic material. Experiments have shown that choke or reactance coils in which the flux path is not in a magnetic material have smaller stray flux losses in addition to the usual losses than coils having a magnetic flux path. Furthermore, the additional losses are distributed over the windings rather than being concentrated on the innermost winding and are therefore at points on the coils exposed to the most favorable cooling conditions.

But when the coils are concentrically arranged, the coils are of different diameters and, consequently, have different inductivities which require a uniform current density in all of the sections to obtain uniform utilization of the copper. The parallel connected coils must, therefore, be so equalized that an equal potential drop occurs across the terminals thereof. It has been proposed to form the outer coil with a number of turns lower than that of the other coils or to divide the coils into different portions so connected that the number of turns in the coils are equal or to use copper of different cross-section for the different coils. If the coils are divided into several portions, so connected as to have equal impedances, the coils may be formed of the same size copper, with the same number of turns and of the same axial length. The coils are then suitably so arranged and spaced that a strong chimney effect prevails in the space between them.

It is, therefore, among the objects of the present invention to provide an improved reactance coil having a non-magnetic core with concentrically arranged coils.

Another object of the invention is to provide a reactance coil having a plurality of coils in which one of the coils is used to obtain equal impedance in the remaining undivided coils.

Objects and advantages, other than those

above set forth, will be apparent in the description of the drawing which shows diagrammatic representations of a portion of electrical equipment embodying the present invention.

Figure 1 schematically shows one method of connecting the several coils of a reactance coil, and

Fig. 2 schematically shows a modified form of the invention.

Referring to the drawing by characters of reference, numerals 5, 6 and 7 indicate the inner, intermediate and outer coils respectively of a reactance coil having a plurality of concentrically arranged windings. Outer coil 7 is divided into coil portions 8 and 9 in addition to the main portion 7 of the same coil. Inner coil 5 is connected in series with coil portions 8 and 9 of the outer coil and the intermediate coil 6 is connected in parallel relation with coil portion 7 of the outer coil. Inner coil 5 and coil portions 8 and 9, and intermediate coil 6 and coil portion 7, are connected as shown to provide three parallel circuits of substantially equal impedance.

Current flows through coil portion 9, coil 5 and coil portion 8 which are connected in series and arranged in parallel to coil 6 which is itself connected in parallel with coil portion 7, as may be seen in Fig. 1. The arrangement in Fig. 2 is similar to that above described excepting that coil portions 8 and 9 are wound in the opposite direction from the direction of the coils of the remainder of the structure. Neither of the coil arrangements are constructed about a magnetic core, but are left without a core or are provided with a core of suitable non-magnetic material.

It will be understood that the coil portions may be so proportioned that temperature increases are distributed in the radial plane of the coils so that the greatest losses occur where the cooling is most efficient.

Although but one embodiment has been illustrated and described, it will be understood that various other embodiments are possible, and that various changes may be made without departing from the spirit of the invention or the scope of the claims.

The invention claimed is:

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1. In reactance apparatus of the character described, a coil comprising a plurality of coil portions, and a second coil connected in series relation with one of said coil portions, such series and another of such coil portions being connected in parallel relation.

2. In reactance apparatus of the character described, a coil comprising end coil portions and a coil portion intermediate the same, and a second coil connected in series relation with said end coil portions and disposed intermediate the latter in such series, such series and said intermediate coil portion being connected in parallel relation.

In testimony whereof I have hereunto subscribed my name this 11th day of January, A. D. 1929.

LUDWIG ROEBEL.

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