Oct. 12, 1948. C. H. DUNTON 2,451,324

SHIELD FOR TRANSFORMERS

Filed Oct. 16, 1945

FIG. 1.

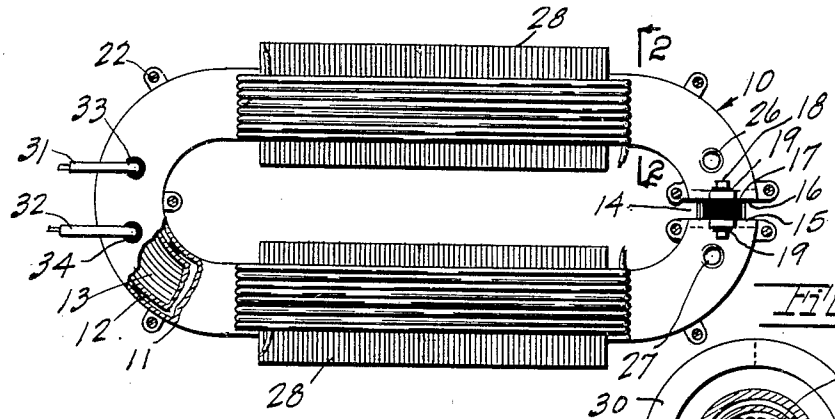


FIG. 5.

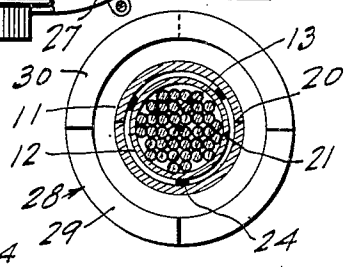
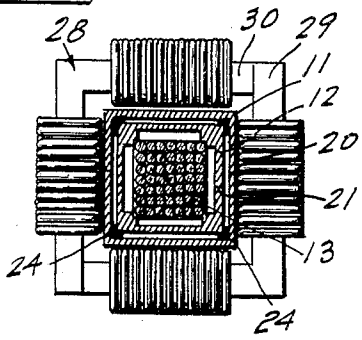


FIG. 2.



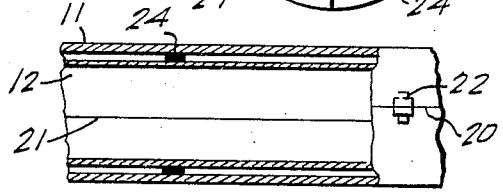


FIG. 3.

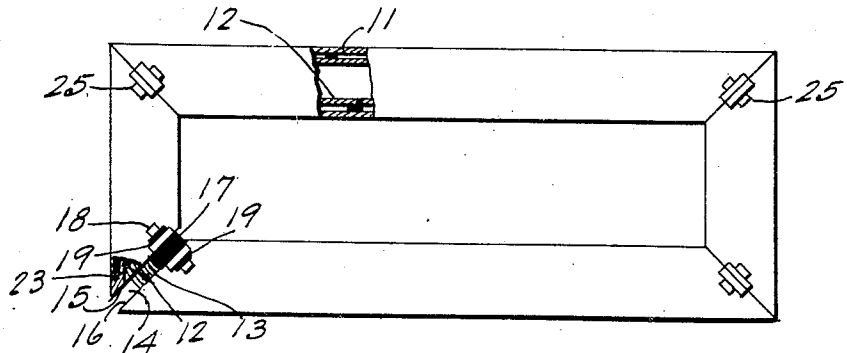


FIG. 4.

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SHIELD FOR TRANSFORMERS

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4 Claims. (Cl. 175—356)

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This invention, a transformer, is a modification of the transformer disclosed in my United States Patent No. 2,388,473, and offering certain improvements with consequent advantages thereover, in that certain flux leakage is overcome resulting in increased power factor and efficiency.

Similar to that disclosed in the previous application, this transformer has its secondary shielded from the primary by a conductive shield, the original transformer having a single conductive shield formed of a series of rings and with the rings insulated from each other, thus dividing the shield into a multiplicity of sections, and without any air-gap, while this improved transformer has a double shield one within the other and with adjacent terminals separated to form an air-gap and with the two conductively connected at the terminals, so that a current flows in one shield in one direction thence back in the opposite direction through the other shield to form a complete circuit, which due to the flow of current in opposite directions in the two shields neutralizes any flow of magnetic flux direct between primary and secondary.

Unlike the original transformer mentioned above, which has a shield which completely shields the secondary, this transformer has a complete double shield with the exception of the space occupied by the air-gap which is located at a most remote point from the primaries.

In the previous transformer it was found that there was some leakage of flux between the rings forming the shield, and this has been completely overcome by the complete circuit arrangement of the coaxial sleeves with air-gap, resulting in marked efficiency.

The objects and advantages of the invention are as follows:

First, to provide a transformer with a new and unusual type of flux-isolating shield between primary and secondary.

Second, to provide a transformer of increased efficiency, and a power factor as close to unity as possible.

Third, to provide a transformer with a conductive shield between the primary and secondary and which consists of two coaxial sleeves one within the other and enclosing the secondary with the exception of terminal portions separated to form an air-gap, and with the respective sleeves functioning as conductors for carrying current in opposite directions to form a complete circuit.

Fourth, to provide a shield for the secondary of

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a transformer consisting of an inner shield and an outer shield conductively connected at terminal ends and with an air-gap between the terminal ends and with the shield longitudinally divided for assembly at will about the pre-wound secondary.

Fifth, to provide circulating paths throughout all parts of the transformer for cooling fluids.

In describing the invention reference will be made to the accompanying drawings in which:

Fig. 1 is a top plan view of my new transformer with a small section broken away to disclose the secondary winding within the shield.

Fig. 2 is an enlarged cross-section taken on line 2—2 of Fig. 1.

Fig. 3 is a vertical section through the shield illustrated in Fig. 2.

Fig. 4 illustrates a rectangular type of shield.

Fig. 5 is a modification in which the shield is circular in cross-section.

The invention consists of a shield 10 for the secondary of a power transformer which completely stops the flow of flux direct between the primary and secondary. It consists of two sleeves, 11 and 12 which completely enclose the secondary 13 throughout its circular extent with the exception of the space 14 between the terminal ends 15 and 16 which space provides an air-gap or break in the circuit of the shield. Suitable spacers 17 of insulation are provided for the gap and the bolts 18 are suitably insulated from the shield as indicated at 19.

The shield is divided as indicated at 20 and 21 to facilitate manufacture and for rapid and easy assembly about the secondary, the two halves being bolted together at assembly as indicated at 22.

The inner and outer shields are conductively connected at the terminal ends 15 and 16 as indicated at 23 and suitable spacers 24 maintain suitable spacing between the two sleeves.

As illustrated in Fig. 1, the shield may be continuous from terminal to terminal and with round ends, or may be made up in sections as illustrated in Fig. 4, in which the respective sections are secured together such as by bolting indicated at 25, all sections being conductively connected except at the gap 14.

The shield may have any suitable cross-sectional form, being illustrated as square in Fig. 2 and circular in Fig. 5.

A suitable inlet 26 and outlet 27 for the cooling fluid are provided adjacent to the respective terminals of the shield and provide for circulation between the secondary and the inner shield

and between the inner and outer shields for thorough absorption of heat.

The magnetizable cores **28** are preferably formed of interlapping laminations as indicated at **29** and **30** for convenience in assembly of the transformer.

The secondary is form-wound to fit within the shield. The secondary is then laid in one half of the shield and the other half is then placed on top with the secondary terminals **31** and **32** brought out through the insulating bushings **33** and **34**. The two halves are then bolted together as indicated at **22**, the insulating spacers **17** are placed between the terminal ends and these terminal ends are then bolted in position with suitable insulation between the bolts and shield, so that no current can flow in a complete circuit throughout the shield.

The primaries are also form-wound, the core laminations being assembled about the shield and within the primary windings.

Thus, a double shield is provided between the primary and secondary windings with current flowing in opposite directions in the respective members of the shield and effectively blocking the flow of flux direct between the primary and secondary.

I claim:

1. A shield for the secondary of a transformer consisting of two coaxial conductive members one within the other and having spaced walls and terminal ends with the secondary winding of the transformer enclosed in the inner of the two members, and with the two members conductively connected only at each terminal end to form a complete circuit through one member, across the connection at one terminal end, back through the other member, and across the connection at the other terminal end.

2. A shield consisting of an inner shield and an outer shield enclosing the inner shield and each having terminal ends, and with the walls of the shields between the terminal ends spaced, and the terminal ends conductively connected to provide a complete circuit between the two shields for flow of current, with the current flowable in opposite directions in the respective shields.

3. A shield for a transformer consisting of an inner sleeve and an outer sleeve enclosing the inner sleeve and each having terminal ends, and with the walls of the sleeves spaced apart except at said terminal ends and conductively connected at the terminal ends only to provide a complete circuit through the two sleeves for flow of current, with the current flowable in opposite directions in the respective sleeves; each of said sleeves being formed in two connectable sections with the parting lines of the respective sleeves staggered relative to and parallel with the planar axis of the shield for convenience in applying the shield over the secondary winding of a transformer.

4. A shield for the secondary of a transformer comprising; a hollow body of conductive material for enclosing the secondary and extending substantially throughout the circuitous length of the secondary and having terminal ends insulated from each other to interrupt completion of a circuit through the walls of the hollow body, and a second conductive hollow body enclosing said hollow body and insulated therefrom and having its walls spaced from the walls of said hollow body, and having terminal ends in common with the terminal ends of said hollow body and conductively connected thereto, to form a complete circuit through the hollow body and second conductive hollow body, with the current flowing in opposite directions in said hollow body and said second hollow body.

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