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POWER TRANSFORMER

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FIG. 1

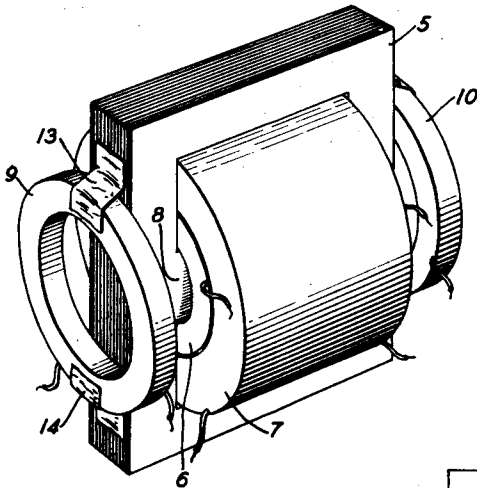


FIG. 2

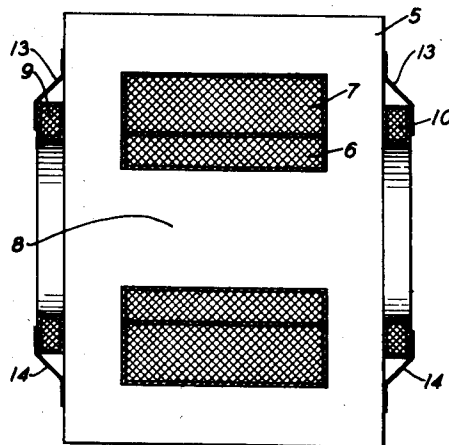
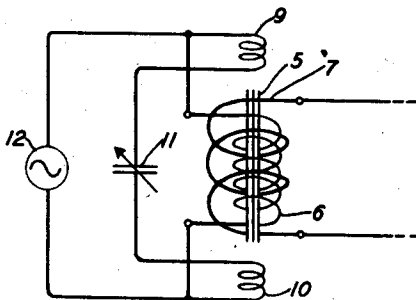


FIG. 3



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POWER TRANSFORMER

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5 Claims. (Cl. 171-97)

This invention relates to power transformers and its object is to reduce the stray flux from such a transformer.

Although the invention is of general application to power transformers it will be illustrated as applied to a transformer having a shell type core with the usual primary and secondary windings surrounding the center leg of the core. As is well understood in the art there is a certain amount of stray flux from such a core, the leakage being principally at the two ends of the center leg. Such leakage is generally objectionable in that it may be picked up by adjacent apparatus and give rise to disturbing potentials in a signaling circuit.

In accordance with this invention it is proposed to place external to the core at each end of the center leg or at any point where leakage of the stray flux occurs, an auxiliary winding having a diameter such that most of the stray flux from each end of the center leg passes through the associated winding. A path in shunt to the primary winding comprises in series the two auxiliary windings and a small condenser, the condenser being of high impedance to the power supply. The flux due to the magnetizing component of the primary current will lag by about 90 degrees the applied voltage. Since the two auxiliary windings are connected in series with a high impedance condenser the flux due to current in the auxiliary windings will lead by approximately 90 degrees the applied voltage. Hence these two fields will be substantially 180 degrees apart and the specified condenser may be adjusted in value until the stray flux and the opposing flux of the auxiliary windings are of equal magnitude thereby substantially neutralizing the stray external field of the transformer.

For a better understanding of the invention reference is made to the following detailed description taken in connection with the accompanying drawing in which

Fig. 1 represents in perspective a power transformer constructed in accordance with this invention;

Fig. 2 is a sectional view of Fig. 1; and

Fig. 3 shows the wiring connections for the transformer.

Fig. 1 illustrates an unpotted power transformer comprising a shell type core 5 with the usual primary and secondary windings 6 and 7 mounted on the center leg 8 of the core.

In order to reduce the stray flux at each end of center leg 8, cylindrical coils 9 and 10 are

suitably mounted externally of the core at the opposite ends of center leg 8. The axis of each auxiliary coil is parallel to the axis of the primary winding 6 and the internal diameter of each of the auxiliary coils is preferably somewhat greater than the width of center leg 8 as shown in Fig. 2. Suitable mounting lugs such as lugs 13 and 14 may be employed for supporting the auxiliary coils in contact with the adjacent face of the laminated core 5.

As shown in Fig. 3 the primary winding 6 is shunted by a path containing in series the two auxiliary windings 9 and 10 and a small condenser 11. The stray flux due to the magnetizing component of the primary current will lag by about 90 degrees the applied voltage from alternating current source 12. If the windings 9 and 10 are of low impedance to the applied voltage and if condenser 11 is of high impedance to the applied voltage the flux due to the current in the auxiliary windings 9 and 10 will lead the applied voltage by 90 degrees. Hence the field set up by each of the windings 9 and 10 will be substantially 180 degrees out of phase with the leakage field and condenser 11 may be adjusted to make the opposing fields of substantially equal magnitude. Under these conditions the stray flux from core 5 will be substantially neutralized. In one test the external field of a power transformer was reduced about 18 decibels by the use of the neutralizing arrangement above described.

In the event it is desired to provide a metal housing or casing for the power transformer the auxiliary coils 9 and 10 will also be placed within the housing but external to the core.

In case the transformer is of the usual type employed as a power supply for a radio receiver or multistage amplifier, each of the auxiliary coils 9 and 10 may be a multilayer coil with about 200 or 300 turns and condenser 11 will normally have a value of about 1 microfarad.

It is, of course, to be understood that this invention may be employed for neutralizing the stray magnetic field of transformers having cores of a different configuration from that disclosed in Fig. 1. In each case the neutralizing coil of this invention should cover that part of the core where the greatest amount of the stray magnetic field enters or leaves the core.

What is claimed is:

1. In combination, a transformer core, primary and secondary windings surrounding at least a portion of said core, means comprising said primary winding for creating a flux in said

core and means for reducing the stray flux from said core, said second means comprising an additional winding and a condenser, said additional winding being external to said core, said
5 additional winding and said condenser being connected in shunt to said primary winding.

2. In combination, a magnetic circuit, means for creating a flux in said circuit and means for reducing the stray flux from said circuit, said
10 means comprising a winding adjacent but external to said core and connected to said first means for providing a flux opposed to the stray flux.

3. In combination, a magnetic core, means
15 comprising a primary winding on said core for producing a flux in said core and means for reducing the stray flux from said core, said second means comprising an auxiliary winding and a condenser in series with said auxiliary winding, said auxiliary winding being closely adjacent
20 but external to said core, said auxiliary winding and said condenser being serially connected in circuit with said primary winding, said auxiliary winding being of low impedance at the frequency
25 of the supply current producing said flux, said condenser being of high impedance at the frequency of the current producing said flux.

4. In combination, a shell type magnetic core, a winding on the center leg of said core, a source

of alternating current connected to said winding for producing a flux in said core, an additional winding adjacent and external to said core at each end of said center leg, said auxiliary windings being substantially axially aligned with said
5 first winding, a condenser connected in series with said auxiliary windings, said condenser and said auxiliary windings being connected in shunt to said first winding.

5. In combination, a shell type magnetic core,
10 a winding on the center leg of said core, a source of alternating current connected to said winding for producing a flux in said core and means for reducing the stray flux from said core, said means comprising an auxiliary winding adjacent
15 and external to said core at each end of said center leg and substantially aligned with said first winding, a condenser connected in series with said auxiliary windings, said condenser and said auxiliary windings being connected in shunt
20 to said first winding, said auxiliary windings being of low impedance at the frequency of said source, said condenser being of high impedance at the frequency of said source, said condenser having a capacity such that the flux produced
25 by said auxiliary windings is substantially equal in magnitude to the stray flux but differing in phase by substantially 180 degrees.

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