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O. J. UNDERWOOD

2,548,179

TRANSFORMER

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Fig. 1.

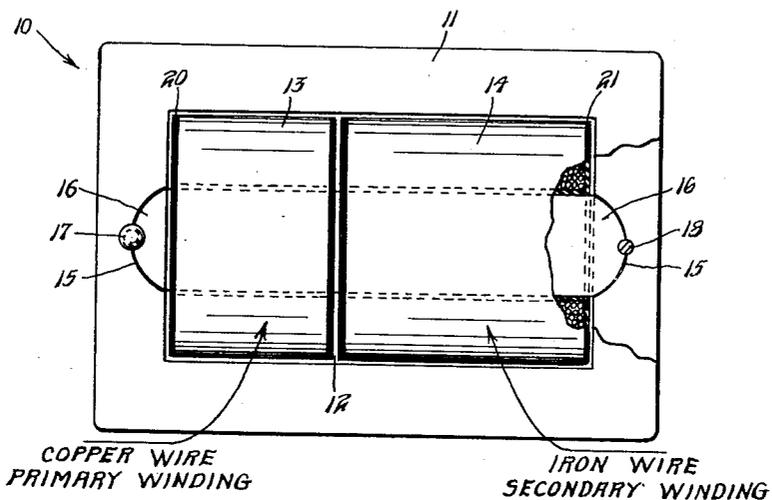
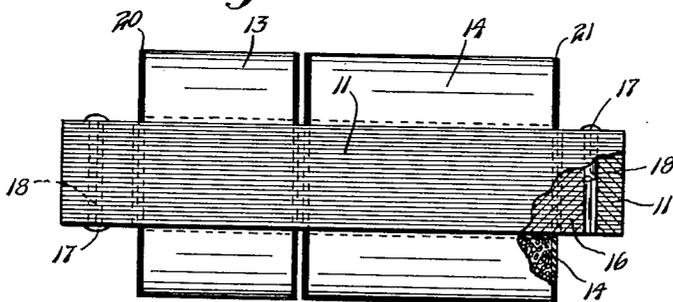


Fig. 2.



Inventor
ORVILLE J. UNDERWOOD

By
George H. Fisher
Attorney

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TRANSFORMER

Orville J. Underwood, Minneapolis, Minn., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware

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5 Claims. (Cl. 171-242)

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My invention relates to transformers of the leakage type. Transformers of this type generally require a special core lamination in which provision is made for a leakage flux path. These leakage flux paths are generally made of a higher reluctance material than the core structure or if the same type of magnetic material is used an air gap is provided to vary the reluctance through the leakage path. Difficulty arises in the manufacture of such a core structure when different materials are used for the magnetic core structure, or if an air gap is required, there is difficulty in the assembly of the core structure to maintain the minimum required air gap.

The present invention is directed to a leakage type transformer in which a conventional transformer lamination is used without provision for a leakage path, that feature being provided for in the secondary winding of the transformer.

It is therefore an object of this invention to provide an improved transformer of the leakage type.

It is also an object of this invention to provide a leakage type transformer in which the secondary winding is made of an electrical conductive and magnetic material which will form a leakage path for the transformer as well as provide for an electrical circuit for the current induced therein.

It is a further object of this invention to provide a leakage type transformer which employs a conventional transformer lamination, there being no required leakage path therein.

Another object of this invention is to provide a leakage type transformer which is simple to manufacture, and is easily assembled at a reduced cost.

These and other objects of this invention will become apparent with the reading of the accompanying specification and drawings wherein:

Figure 1 is side elevation view of the transformer with parts broken away, and

Figure 2 is a plan view of the transformer with parts broken away.

The present transformer includes a magnetic core structure generally indicated at 10 which is composed of a stack of thin laminations of magnetic material, such as soft iron. Each of the laminations 11 is rectangular in shape having an opening 12 therein wherein the primary winding 13 and the secondary winding 14 are positioned. Two of the surfaces on the opening of the rectangular lamination have semicircular notches 15 punched therein. The core structure 10 further includes a rectangular shaped cross

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member or leg 16 whose extremities are rounded or semicircular to fit in the semicircular notches 15 in the outer rectangular shaped core lamination 11. The centrally disposed cross leg is also a laminated structure and serves to mount the primary winding 13 and secondary winding 14 in a conventional manner.

The core structure 10 is formed by stacking the rectangular shaped outer laminations 11 and the inner cross leg laminations 16 in a manner which can best be seen in Figure 2, the laminations being held together by rivets 17 or any other suitable fastening means. The rivets 17 extend through a cylindrical bore or aperture 18 positioned at a point where the semicircular ends of the centrally disposed member 16 fits into the semicircular notches 15 of the outer rectangular core lamination 11. The heads of the rivets 17 are flattened out to extend over both portions of the laminations of the core structure 10 and thereby securely hold or form the laminations into a solid core structure.

Prior to the assembly of the core structure 10, the centrally disposed laminations 16 are formed in a stack and the primary winding 13 which is wound on an insulating spool 20 is mounted on the stack. Primary winding 13 is formed of any conventional electrically conductive material, such as copper. The secondary winding 14 is similarly wound on an insulating spool 21 and is formed of a magnetic material, preferably iron which is also a good electrically conductive material. The secondary winding is also positioned on the stack of laminations forming the cross leg 16 and is positioned abutting or in near abutting relationship to the primary winding 13. The material and number of turns on the primary winding, as well as the number of turns on the secondary winding, are so chosen that the diameter of each of the primary coil 13 and secondary coil 14 will be such that they will fit into the aperture 12 in the core structure 10.

It will be noted that there is no provision in the core structure 10 for a leakage path. However, the secondary winding, when formed of a magnetic material, provides such a leakage path from the centrally disposed leg 16 to the outer core laminations 11. Because there is certain spacing or air gap between each turn of iron wire on the secondary winding due to winding tolerances and further because each turn of wire has a certain amount of insulation thereon, the required air gap or section of higher reluctance in the leakage path is thereby obtained to give a leakage path of higher reluctance than the normal flux path for

the core structure 10. The secondary winding must be so shaped that it substantially fills the opening 12 in the outer core laminations 11 so that no further air gap will be present between the iron wires and the magnetic core laminations 11 of the core structure. The insulating bobbin 21 for the secondary winding 14 is also so chosen that a minimum of air gap is present between the iron wire turns on the secondary winding 14 and the laminated centrally disposed leg 16.

In the present leakage transformer design, the requirements for the special leakage path in the laminated structure is eliminated and the tolerances in assembly of the laminations to insure a minimum air gap in the leakage path is further eliminated. The present transformer operates as a conventional leakage type transformer, the leakage flux traversing the magnetic path of the secondary winding in such a manner that it will not thread both windings equally. This leakage flux is composed of the main energizing flux created by the energized primary winding and the counter flux created by the induced current in the secondary winding. By providing the secondary winding with iron wire, a wire of a magnetic material, as well as electrically conductive material, a flux path for this counter flux between the main leg of the core and the outer portion of the frame is obtained. This reduces the affect of the counter flux on the primary winding, thereby reducing the current flow in the primary winding and eliminating the necessity of a leakage path integral with the laminated core structure.

In considering this invention it should be kept in mind that the present disclosure is intended to be illustrative only and that changes may be made in the types of materials and the form of the core structure. The scope of the invention should be determined only by the appended claims.

I claim as my invention:

1. A leakage transformer having a continuous magnetic circuit with a primary winding and a secondary winding in inductive relationship mounted thereon, said secondary winding being made of a magnetic material to shunt a portion of said continuous magnetic circuit and provide a path for the leakage flux such that it does not equally thread both of said windings.

2. A leakage transformer having a continuous

core member of magnetic material including a centrally disposed leg, a primary winding and a secondary winding positioned on said leg in inductive relationship thereto, said secondary winding being made of a magnetic material to provide a leakage flux path from said centrally disposed leg to said continuous core member.

3. A leakage type transformer having a continuous magnetic circuit and including a secondary winding made of a magnetic material and conductively independent of a primary winding which provides a magnetic path through said secondary winding to said continuous magnetic circuit and independent of said primary winding.

4. A transformer comprising a continuous core member of laminated magnetic material, a primary energizing winding on said core member, a secondary winding of magnetic and electrically conductive material on said core member and conductively independent of said primary winding and said core member, said secondary winding being disposed relative to said primary winding and said core to provide a magnetic shunt path around said primary winding.

5. A transformer comprising a magnetic core continuous in form with a centrally disposed leg of magnetic material, a primary winding positioned on said centrally disposed leg, a secondary winding positioned on said centrally disposed leg adjacent to said primary winding, said secondary winding being made of a magnetic material and being conductively independent of said primary winding.

ORVILLE J. UNDERWOOD.

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