Sept. 5, 1950 R. T. REARDON 2,521,536

ELECTRIC INDUCTION DEVICE

Filed June 5, 1948

Fig. 1.

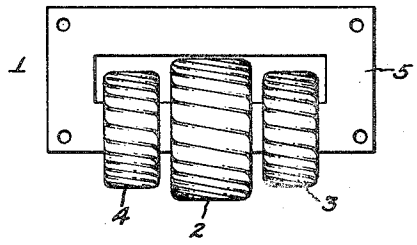
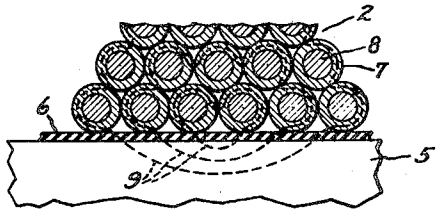



Fig. 2.




Inventor:
Robert T. Reardon,
by Ernest G. Britton
His Attorney.

Patented Sept. 5, 1950

2,521,536

# UNITED STATES PATENT OFFICE

2,521,536

## ELECTRIC INDUCTION DEVICE

Robert T. Reardon, Fort Wayne, Ind., assignor to General Electric Company, a corporation of New York

Application June 5, 1948, Serial No. 31,347

1 Claim. (Cl. 171—119)

1

This invention relates to electric induction devices and more particularly to transformers and reactors.

It is often necessary, particularly in circuits which contain gaseous discharge lamps having negative resistance characteristics, to utilize some means of limiting the circuit current. This may be done by the addition of resistance to the circuit but the usual method, resulting in greater economy, is to use a current limiting reactor. This may be an inductive device which has high leakage reactance resulting in an increased voltage drop as the current drawn through the device increases. It is customary to incorporate, since higher than line voltages may be necessary for the operation of gaseous discharge lamps, this high reactance in a step-up transformer resulting in a high reactance current limiting transformer. In the conventional high reactance transformer construction the high leakage flux is achieved by providing a low reluctance leakage path utilizing magnetic shunts between the primary and secondary coils.

In accordance with the particular application of this invention set forth here the use of the magnetic shunts to provide a low reluctance leakage path is eliminated by winding either the primary or secondary coils of the transformer, or both, of wire which is formed of two materials; one a low resistance material such as copper and the other a magnetic material such as iron. In this manner the high reluctance of the air path which would normally be transversed by the leakage flux is decreased by the presence of the magnetic material in the winding. It should be noted that only a portion of the primary or secondary windings need be wound with this specially prepared wire.

It is an object of this invention to provide a new and simple high reactance transformer construction which eliminates the use of magnetic shunts.

It is another object of this invention to provide a new and simple high reactance transformer construction which achieves a low reluctance leakage path by utilizing a coil winding which possesses magnetic properties.

Still another object of this invention is to provide a new and simple high reactance transformer construction which has primary or secondary coils, or both, wound entirely or partially of wire which is formed from two materials; one presenting high electrical conductivity and the other presenting high magnetic conductivity.

A further object of this invention is to provide

2

a new and simple induction apparatus which occupies less space than the usual device.

The invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claim.

In the drawing Fig. 1 is a plan view of a particular embodiment of the invention as applied to the construction of a luminous tube transformer and ballast. Fig. 2 is a cross sectional view taken through the primary coil of the transformer and ballast shown in Fig. 1.

Referring now to the drawing, there is shown in Fig. 1, by way of example, a luminous tube transformer and ballast 1 having a primary coil 2 and secondary coils 3 and 4 prepared in accordance with this invention. The transformer coils 2, 3 and 4 are mounted on a magnetic core 5 which presents a low reluctance flux path and are separated from the core 5 by the insulation 6. In Fig. 2, the cross sectional view of the primary winding 2 of the transformer and ballast 1 shown in Fig. 1, the primary coil 2 is wound from a preferred form of wire having an outer section 7 formed from a magnetic material having a relatively high electrical resistivity and a center section 8 formed from a highly conductive material having a low magnetic permeability. Thus the wire may, for example, have an outer iron section 7 formed on a copper core 8. It should be noted that either the primary coil 2 or the secondary coils 3 and 4 or primary and secondary coils or portions thereof may be prepared from this preferred form of wire.

As can be seen in Fig. 1, the disposition of the transformer coils 2, 3 and 4 is such that the secondary coils 3 and 4 are mounted on the magnetic core 5, one on either side of the primary coil 2. In the conventional form of luminous tube transformer and ballast, magnetic shunts are interposed between the primary coil and the secondary coil in such a manner as to present a low reluctance leakage flux path. The transformer 1 construction disclosed by this invention achieves a high reactance ballasting effect by the use of a low reluctance leakage flux path and in so doing eliminates the magnetic shunts which are normally present. The shunts are, in effect, replaced by the magnetic outer surface 7 of the wire from which, in the illustrated case, the primary coil 2 is wound. A leakage path, as shown by the lines 9 in Fig. 2, is formed by the magnetic surface of the wire and, therefore, a substantial amount of flux produced by current flow in the primary 2 is not utilized in linking the primary

and secondary coils 2, 3 and 4. Since the shunts are eliminated a more compact ballast and transformer 1, which is important from the commercial standpoint, may be constructed.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the invention and, therefore, it is aimed in the appended claim to cover all such changes and modifications as fall within the true spirit and scope of the invention.

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

In an electric transforming device at least one primary coil member and one secondary coil member mounted on a magnetic core member and being insulated therefrom, said magnetic core member presenting a substantially closed magnetic path, at least one of said coil members having a plurality of contiguous turns constructed of wire formed from two different materials, said wire having a copper core and an outer sheath of iron



affixed thereto, said copper and said iron being conductively connected in parallel, said iron sheath of contiguous turns of said wire being in contact so as to establish with said core a relatively low reluctance substantially closed leakage flux path of magnetic material.

ROBERT T. REARDON.


REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,306,815 | Houchin | June 17, 1919 |
| 1,406,002 | Goodman | Feb. 7, 1922 |
| 1,406,328 | Atherton | Feb. 14, 1922 |
| 1,792,756 | Osnos | Feb. 17, 1931 |
| 1,836,615 | Owen | Dec. 15, 1931 |
| 1,972,319 | Rypinski | Sept. 4, 1934 |
| 2,075,906 | Maude | Apr. 6, 1937 |
| 2,223,737 | Moses | Dec. 3, 1940 |