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H. H. IDE

TRANSFORMER

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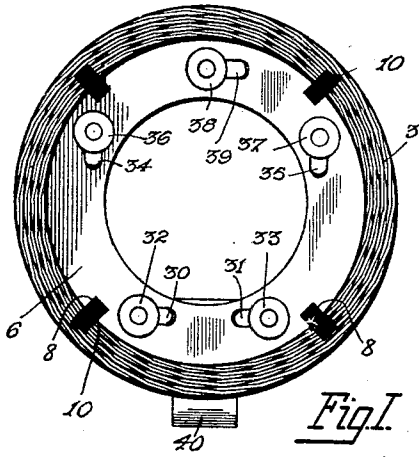


Fig. 1.

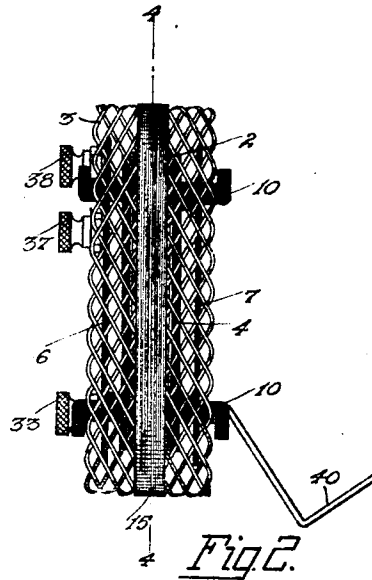


Fig. 2.

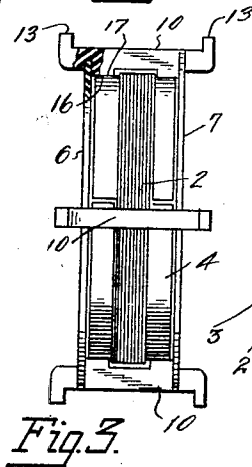


Fig. 3.

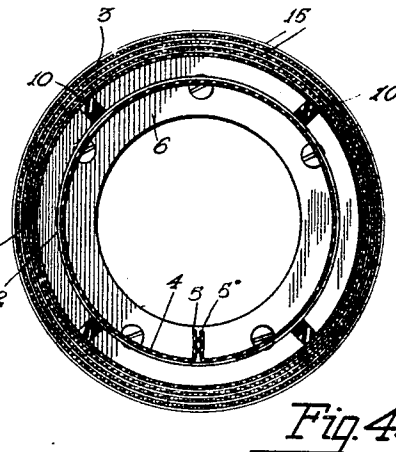


Fig. 4.

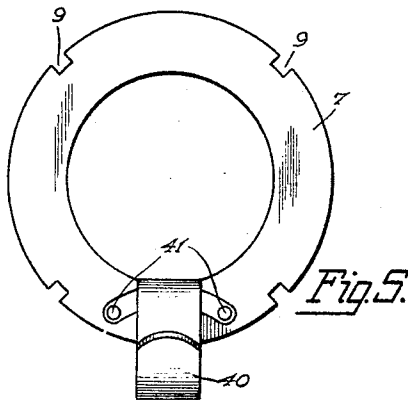


Fig. 5.

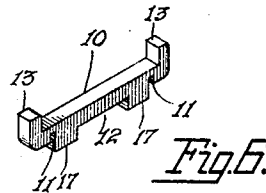


Fig. 6.

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UNITED STATES PATENT OFFICE.

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TRANSFORMER.

Application filed August 7, 1924. Serial No. 730,591.

My invention relates to transformers and has to do more particularly with transformers of the type known as air core transformers such as are used in circuits of radio receiving sets. An object of my invention is to produce a transformer of the above type which is simple in construction, easy to assemble and cheap to manufacture, and which will at the same time be most efficient in its operation.

In transformers of the above type the primary and secondary windings are built up upon a suitable core, and to maintain their desired form collodion or other liquid compound is used to hold them in their desired shape. This means of retaining the windings in their desired shape by the use of compounds which solidify is objectionable as it tends to increase the distributed capacity of the coil, and to overcome this objection I have provided a novel means for maintaining the respective coils in their desired form.

A feature of my invention is the provision of a novel secondary coil construction in which a binder of fine silk is placed upon the convolutions of the coil simultaneously as the successive convolutions of wire are placed on a winding form. The said strand of silk injected simultaneously with the successive convolutions of wire assumes the form of a narrow band of successive layers which as the coil is built up holds the individual convolutions of the winding in position and retains the coil in its desired form when removed from the winding form without the use of cement or other solidifying liquid and reduces the distributed capacity of the coil to a minimum.

Another feature of my invention is the provision of a novel split ring supporting means for the primary coil of my transformer which retains the coil in its desired shape and the means for associating it with the secondary of the transformer.

Still another feature of my invention is the provision of novel supporting means for the primary and secondary coils and the method of assembly and means for holding the coils as a whole in a unit assembly.

The above features as well as others not specifically pointed out above will be clearly pointed out in the ensuing specification and for a clearer understanding of my invention reference may be had to the accompanying

drawing in which like reference characters in the several views denote like parts and in which:

Fig. 1 is a view of the transformer in elevation;

Fig. 2 is a right side view of Fig. 1;

Fig. 3 is a side elevation of the transformer with the secondary winding removed to clearly illustrate the supporting means and primary winding in assembled position;

Fig. 4 is a sectional view along the line 4-4 of Fig. 2;

Fig. 5 is a plan view of one of the supporting ring members of the transformer and a mounting bracket secured thereto; and

Fig. 6 is a perspective view of one of the bridge spacing members.

Referring now in detail to my invention as illustrated in the accompanying drawing, the transformer in general comprises a primary winding 2 and a secondary winding 3 which may be of the diamond wound type and which is wound upon a suitable form in the well known manner.

A split ring member 4 of suitable bakelite is provided which supports the primary winding 2 of the transformer. The split ring 4 is constructed of a strip of thin sheet bakelite which is heated to permit the same to become pliable so that it may be formed in its desired shape. The ends 5 and 5' of the strip, which is of a predetermined length, are bent at right angles to the plane of the strip and after this operation the strip is shaped in the form of a ring with the angular ends 5 and 5' extending inward. The primary winding 2 of the transformer coil is now placed upon the split ring 4 and due to its split construction it has a tendency to expand to certain degrees which forms means for maintaining the primary winding 2 upon its supporting member or split ring 4.

I provide ring members 6 and 7 of suitable insulating material, the said ring members 6 and 7 being provided with square slots 8 and 9 respectively. Bridge members 10 are provided each bridge member 10 having a pair of notches 11, the said notches 11 being of a size to receive the ring members 6 and 7. A slot 12 intermediate of the ends of the bridge members 10 is provided in each member 10, and a pair of ears 13 are also provided thereon and integrally formed therewith.

The secondary winding 3 of the transformer is wound upon a suitable winding form and is of the diamond wound type. I provide novel means for retaining the secondary coil 3 in its desired form without the use of any cements. This retaining means is in the form of a binder 15 which may be of suitable material, such as a strand of tussah silk. This strand of tussah silk is placed upon the windings of the coil 3 simultaneously as the successive convolutions of wire are placed upon the winding form. The strand of silk takes the form of a narrow band of successive layers intermediate of the sides of the coil 3. This binding 15 of successive layers of silk throughout the coil tends to hold the convolutions of the secondary coil 3 in position against movement or shifting, and when the required number of turns have been placed upon the winding form a similar narrow band of silk binder 15 is wound around the circumferential face of the coil 3 and the end thereof is suitably secured by the application of a suitable cement to prevent unraveling. With this method of construction I provide a coil 3 which is built up of a plurality of convolutions of wire which are maintained in position against shifting by means of a silk thread binder 15. With this method of construction the form of the coil is retained without the aid of cements and the distributed capacity of the coil is reduced to a minimum and at the same time the coil is rigid and retains its form and will not collapse through ordinary handling when assembling the transformer.

Having described the construction of the different parts of my transformer a description of the assembly procedure will now be described.

To assemble the transformer the bridge members 10 are spaced around the ring member 5 with the notches 11 in the respective bridge members 10 resting in the slots 8 of the ring member 6. With the bridge members 10 in position upon the ring member 6, as just described, the primary winding 2 on its supporting split ring 4 is now inserted between the bridge members 10 supported on the ring member 6. The circumferential face 16 of the split ring 4 when positioned between the bridge members 10 engage the respective faces 17 of the bridge members 10 with its supported primary winding 2 in alignment with the groove 12 in the bridge member 10. The secondary winding 3 is now placed upon the bridge members 10 by pressing the bridge members 5 down against the split ring 4 slightly springing the same, and when in this position the secondary winding 3 is slipped over the free ends of the bridge members 10 that are supported upon the ring members 6. When the secondary winding 3 is in position upon the

bridge members 10 the said winding 3 rests between the integrally formed ears 13 on the bridge members 10. Now when the downward pressure is released from the free ends of the bridge members 10 the split ring 4 forces the bridge members 10 against the inner circumferential face of the secondary coil 3 by the spring effect of the split ring 4, it being of such a size as to exert pressure on the bridge members 10 to press them against the inner face of the secondary winding 3. After the windings 2 and 3 are in position as just described, ring member 7 is placed in position to align the slots 9 in its periphery with the free ends of the bridge members 10. When the ring member 7 is thus positioned by pressing outward on the different free ends of the bridge members 10 the secondary coil 3 is slightly spread as there is enough flexibility in the secondary coil 3 to permit this. The ring member 9 may now be forced inward until the notches 11 in the bridge members 10 register with the slots 9 in the ring member 7. The spreading of the coil when forcing the free ends of the bridge members 10 places a tension upon the coil 3 so that when the slots 9 in the ring member 7 register with the notches 11, in the bridge members 10, this tension forces the bridge members 10 down causing the notches 11 in the respective bridge members 10 to enter the slots 9 in the rim of the ring member 7. There is enough flexibility in the coil 3 to maintain the bridge members 10 in the slots 8 and 9 of the ring members 6 and 7 and there is also enough flexibility in the split ring 4 which supports the coil 2 to maintain the bridge members 10 in engagement with the inner circumferential face of the secondary coil 3.

With this type of construction just described it will be seen that the bridge members 10 are supported on the ring members 6 and 7 to retain them in spaced relation. The bridge members 10 support the secondary winding 3 and also separate the secondary winding 3 from the primary winding 2 upon the split ring 4, and help retain the windings 2 and 3 in position. The ends of the primary winding 2 extend through the split portion of the ring 4 between the angular extensions 5 and 5' and extend through a suitable orifice in the ring member 6 and are soldered to the terminals 30, and 31 of the binding posts 32 and 33 secured to the ring member 6. The respective ends of the secondary winding 3 are secured to terminals 34 and 35 of the binding posts 36 and 37 secured to the ring member 6. A binding post 38 secured to the ring member 6 is also provided with a terminal 39 to form terminal means for a tap which may be taken from the secondary winding 3, it being understood that any number of taps may be provided.

To disassemble the transformer the ends engaging the ring member 7 of the bridge members 10 are pressed outward until the notches 11 in the bridge members 10 disengage the slots 9 in the ring member 7, whereupon the ring member 7 may be removed. The ends of the bridge members 10 may also be pressed outward to permit the notches 11 in the bridge members 10 to disengage the slots 8 in the ring members 6 whereupon the ring member 6 may be removed.

For mounting the transformer as a unit in position, I provide a bracket 40 which is secured to the ring member 7 by rivets 41, the said bracket 40 providing suitable means for mounting the same to a suitable mounting board or panel.

From the foregoing description it may be seen that I have provided a transformer which is constructed of a minimum number of parts and in which the parts are easily assembled and secured together as a unit assembly without any fastening means, such as screws or the like. The primary and secondary windings of the transformer are most efficient due to their method of construction and the supporting means for the same in combination with their novel and efficient construction produces a transformer in which the losses due to leakage are reduced to a minimum.

While I have described a preferred embodiment of my invention, it is to be understood that I do not wish to be limited to the exact structure as shown but I aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A transformer comprising a primary winding and a secondary winding, a wire wound in successive convolutions to form a diamond wound secondary winding, binder means interposed over the convolutions of said secondary winding to retain said secondary winding in its desired form, self-expanding means for supporting said primary winding, and grooved members adapted to engage a pair of ring members to serve as supporting means for the said secondary winding.

2. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a secondary winding, binder means interposed over the convolutions of said secondary winding throughout the entire length of winding to retain said secondary winding in its desired form, self-expanding means for supporting said primary winding, supporting means for said secondary winding including a pair of ring members, and grooved members adapted to be held in en-

gagement with said ring members by the tension of the said secondary winding.

3. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a diamond wound secondary winding, binder means interposed over the convolutions simultaneously with the winding of said convolutions through the length of said winding to form retaining means to retain said secondary winding in its desired form, self-expanding means for supporting said primary winding, means for supporting said secondary winding including a pair of ring members and a plurality of grooved members adapted to be held in engagement with said ring members by the resiliency of the secondary winding.

4. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a diamond wound secondary winding, a fibre strand forming a binder interposed over the convolutions simultaneously with the winding of said convolutions throughout the length of said secondary winding to form retaining means for sustaining said winding in its desired form, self-expanding means for supporting said primary winding, and supporting means for said secondary winding, said last means including a pair of ring members and a plurality of grooved members adapted to be held in engagement with said ring members by the resiliency of the secondary winding.

5. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a diamond wound secondary winding, a fibre strand interposed over the convolutions of said secondary winding simultaneously with the winding of said convolutions throughout the length of said secondary winding to form a binder for the said convolutions to retain them in position and maintain the said secondary winding as a whole in its desired form, and a resilient member adapted to engage a plurality of grooved members to support the primary winding in association with the secondary winding.

6. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a diamond wound secondary winding, a fibre strand interposed over the convolutions of said secondary winding simultaneously with the winding of said convolutions throughout the length of said secondary winding to form a binder for said convolutions to retain them in position and maintain the said secondary winding as a whole in its desired form, and a split ring member upon which said primary winding is supported.

7. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a diamond wound secondary winding, binder means interposed over the said convolutions simultaneously with the winding of said convolutions throughout the length of said secondary winding to form retaining means to retain said secondary winding in its desired form, a split ring member, and a strand of wire wound upon said split ring member to form said primary winding.

8. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a diamond wound secondary winding, binder means interposed over said convolutions simultaneously with the winding of said convolutions throughout the length of said secondary winding to form retaining means to retain said secondary winding in its desired form, a split ring member, a strand of wire wound upon said split ring member to form said primary winding, the expanding tendency of said split ring retaining said primary winding upon said split ring.

9. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions to form a diamond wound secondary winding, binder means interposed over said convolutions simultaneously with the winding of said convolutions through the length of said secondary winding to form retaining means to retain said secondary winding in its desired form, a split ring member, a strand of wire wound upon said split ring member to form said primary winding, the expanding tendency of said split ring retaining said primary winding upon said split ring, and supporting means for supporting and separating said windings.

10. A transformer comprising a primary winding and a secondary winding, a strand of wire wound in successive convolutions

to form a diamond wound secondary winding, binder means interposed over said convolutions simultaneously with the winding of said convolutions through the length of said secondary winding to form retaining means to retain said secondary winding in its desired form, a split ring member, a strand of wire wound upon said split ring member to form said primary winding, the expanding tendency of said split ring retaining said primary winding upon said split ring, supporting means for supporting and separating said winding, said supporting means held in assembled position by said secondary winding and said split ring supporting said primary winding.

11. A device of the character described including a primary winding and a secondary winding, said secondary winding comprising a wire wound in successive convolutions, retaining means including flexible insulating means wound concurrently with the winding of the coil to retain said coil in its desired form, and a resilient member adapted to engage the primary winding and a plurality of grooved members to support and maintain the said primary winding in association with the said secondary winding.

12. A device of the character described including a primary winding and a secondary winding, said secondary winding having convolutions of wire wound back and forth across a winding member, retaining means wound concurrently with the winding of the wire around the winding member to retain the winding in its desired form, and a resilient member adapted to engage the primary winding and a plurality of grooved members to support and maintain the said primary winding in association with the said secondary winding.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 5th day of August, 1924.

HARRY H. IDE.