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HIGH-FREQUENCY CORE DEVICE WITH RELATIVELY MOVABLE CORES

Filed June 1, 1965

Fig. 1

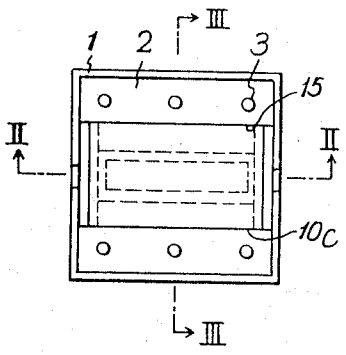


Fig. 4

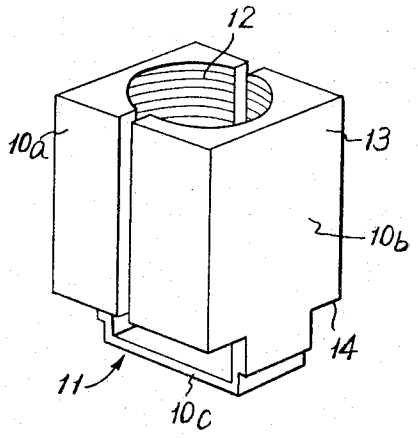


Fig. 2

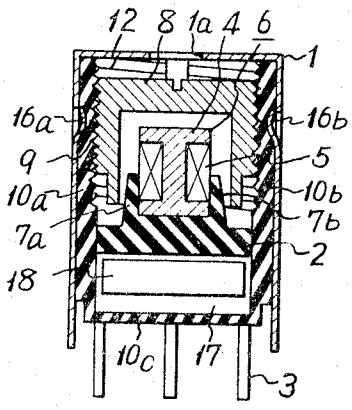
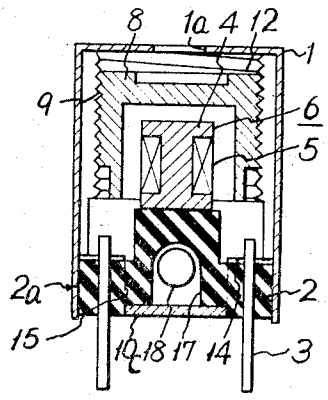


Fig. 3



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HIGH-FREQUENCY CORE DEVICE WITH RELATIVELY MOVABLE CORES

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2 Claims. (Cl. 336—135)

This invention relates to a high-frequency coil device, and more particularly to an intermediate-frequency transformer which can be miniaturized and manufactured at low cost.

In the conventional type of intermediate-frequency transformer, a pair of upstanding pieces having screw-threads formed in the opposed inner surfaces thereof are provided integrally with an insulating base plate on the opposite sides thereof, and a movable cylindrical magnetic core formed with screw-threads is interposed between said pair of upstanding pieces by enabling the screw-threads of the core to be meshed with those of the upstanding pieces. With such arrangement, since said pair of upstanding pieces are previously provided on the insulating base plate, difficulties will be experienced in mounting an inductance element (drum-type magnetic core) on the base plate, and in attaching terminals to the ends of a coil.

Accordingly, it is a primary object of this invention to completely solve such difficulties as experienced in the conventional type of intermediate-frequency transformer.

An important object of this invention is to provide a high-frequency coil device, comprising a base plate having a plurality of terminal pins projected therefrom, a magnetic core inserted in said base plate and having a winding wound on the center portion thereof, a holder mounted to said base plate, said holder consisting of holding portions extending from the opposite sides of the base plate in opposing relationship with the magnetic core and a plate portion formed integrally with said holding portions so as to connect the lower ends of the holding portions with each other and adapted to be disposed in engagement with the lower surface of the base plate, and a movable cylindrical magnetic core inserted in said holder.

Other objects features and advantages of this invention will become apparent from the following description taken, by way of example, in conjunction with the accompanying drawings, in which:

FIGURE 1 is a bottom plan view illustrating an example of the high-frequency device according to this invention;

FIGURES 2 and 3 are longitudinal sectional views taken along lines II—II and III—III of FIGURE 1, respectively; and

FIGURE 4 is a perspective view showing an example of the holder applicable to the device of this invention.

Referring to the drawing, reference numeral **1** represents a cylindrical metal case whose one end is open. The open end of the metal case **1** is closed by an insulating base plate **2** whose end surface **2***a* is disposed in engagement with the inner surface of the case **1**. **3** indicates a plurality of pins extending through said base plate **2**, and **4** designates a drum-type magnetic core mounted on the base plate **2**. A winding **5** is wound on the magnetic core **4** so as to constitute an inductance element. As shown in FIGURE 2, there is integrally provided on the base plate **2** arcuate projections **7***a* and **7***b* of semicircular shape which are disposed in engagement with the lower flange of the magnetic core **4**, thereby facilitating the positioning of the magnetic core **4**. Reference numeral **8** indicates a movable cylindrical

magnetic core having one end thereof closed and disposed so as to accommodate therein the drum-type magnetic core **4**. **9** indicates screw-threads formed on the outer circumferential surface of said movable magnetic core **8**.

As illustrated in FIGURES 2 and 4, in accordance with this invention, a holder **11** made of a flexible material such as synthetic resin is provided independently of the base plate **2**, said holder **11** consisting of a plate portion **10***c* and holding portions **10***a* and **10***b* extending from the opposite sides of the plate **10***c* in opposing relationship with the magnetic core **4**, and the plate portion **10***c* provided integrally with said holding portions **10***a* and **10***b* so as to connect the lower end of the holding portions with each other and adapted to be disposed in engagement with the lower surface of the base plate **2**. The holding portions **10***a* and **10***b* have the opposed inner surface configured in approximately cylindrical shape and formed with screw-threads **12** adapted to be meshed with the screw-threads **9** of the movable magnetic core **8**. The movable cylindrical magnetic core can be screwed into the holder with a flexibility resulting from the flexibility of the plate portion **10***c*. Further, the outer surfaces **13** of the holding portions **10***a* and **10***b* are configured in a rectangular parallelepiped shape which can be accommodated in the case **1** so that the outer surface **13** may be disposed in contact with the inner surface of the case **1**. Meanwhile, the insulating base plate **2** is held between the lower surfaces **14** of the holding portions **10***a* and **10***b* and the plate portion **10***c*, as illustrated in FIGURE 3. Reference numeral **15** indicates an engaging groove which is continuously formed in the bottom and side surfaces of the insulating base plate **2**, said engaging groove **15** being adapted to be engaged with the plate portion **10***c* of the holder **11** so that the outer surface of the plate portion may be approximately flush with that of the base plate **2**.

With the aforementioned arrangement, the base plate **2** can be easily made. As mentioned above, in the conventional type of such device, the base plate is provided with the upstanding pieces corresponding to the holding portions **10***a* and **10***b* and having screw-threads formed in the opposed surface thereof. This makes it difficult to remove from a molding jig the base plate molded and cured during the molding operation thereof. In accordance with this invention, however, it is very easy to remove the base plate from the molding jig during the molding operation thereof since such screw-threads are not formed in the base plate, and consequently the molding efficiency will become approximately five times as high as that in the well-known art. Further, the holding portions **10***a* and **10***b* can be easily spaced from each other since the holder **11** is made of a flexible material. Consequently, in spite of the fact that the screw-threads are formed in the opposed inner surface of the holding portions, the base plate can be easily removed from the molding jig, so that the base plate may be easily made. In assembling this device, the inductance element **6** is inserted between the projections **7***a* and **7***b* provided on the base plate **2**, and it is attached to the base plate with a bonding agent, as desired. Further, the holder **11** is attached to the base plate **2** by disposing the plate portion **10***c* in engagement with the engaging groove **15** of the base plate **2**, and the movable magnetic core **8** is held between the holding portions **10***a* and **10***b* which have slightly been opened, so that the screw-threads **9** are disposed in meshing relationship with the screw-threads **12**. By inserting thus produced assembly in the case **1**, the device of this invention can be easily assembled. Apparently, it is possible to change the inductance by rotating the magnetic core **8** by means of a screw-driver inserted through an aperture **1***a* formed in the case **1**.

Referring to FIGURE 2, it is obvious that the assembly consisting of the holder **11**, the magnetic core **8** and the base plate **2** to which is mounted the inductance element **6** is accurately retained in the case **1** by inwardly curved lips **16***a* and **16***b* formed in the opposite side surfaces of the case by means such as punching. Further, the rotational torque of the magnetic core **8** can be adjusted by means of the lips **16***a* and **16***b*. In convention type of such miniature intermediate-frequency transformer, damages are very often caused during the assembling process due to the fact that a fixed capacitor for tuning is mounted in such a manner that the same is exposed out of the back of the insulating base plate. In this invention, however, a recess portion **17** is formed in the lower surface of the base plate **2**, and a capacitor **18** is accommodated in the recess portion **17** and serves as a resonant circuit in cooperation with the winding **5**. The plate portion **10***c* of the holder **11** may also serve as a cover for the recess portion **17** and in turn for the capacitor **18**. In the conventional type of such transformer, it often happens that the metal case and the terminal pins are shorted by a slightly larger amount of solder adhered to the terminal pins during the soldering of the winding to the terminal pins, because the spacing between the metal case **1** and the terminal pins is narrow.

In the case of the device of this invention, however, the holder is interposed between the terminal pins and the metal case, thereby ensuring complete insulation.

In the foregoing, description has been made as to the case where the screw-threads **12** are formed in the holding portions **10***a* and **10***b*, while such screw-threads may be omitted, as desired.

It will be apparent that many modifications and variations may be effected without departing from the scope of the novel concepts of this invention.

What is claimed is:

1. A high-frequency coil device comprising an insulating base plate, a plurality of terminal pins projecting from said plate, a magnetic core mounted on said base plate, a winding wound on the center portion of said magnetic core, a holder consisting of a flexible plate portion and holding portions extending upwardly from the opposite sides of said plate portion in parallel relationship, each of said holding portions having inner screw threads, said plate portion being integral with said holding portions to connect the lower ends of said holding portions with each other and being disposed in engagement with the lower surface of said base plate, and a movable screw-threaded cylindrical magnetic core screwed into said holder with flexibility caused by the flexibility of said plate portion.

2. A high-frequency coil device as claimed in claim **1**, comprising a case made of a metal and having a pair of inwardly curved lips formed on opposite side surfaces thereof, a pair of holding portions being made of a flexible material and being engaged with an inner surface of said case, the rotational torque of said movable cylindrical magnetic core depending upon the pressure upon said holding portions exerted by said pair of inwardly curved lips.

No references cited.

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