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PERMEABILITY, TUNED HIGH-FREQUENCY COUPLING DEVICE

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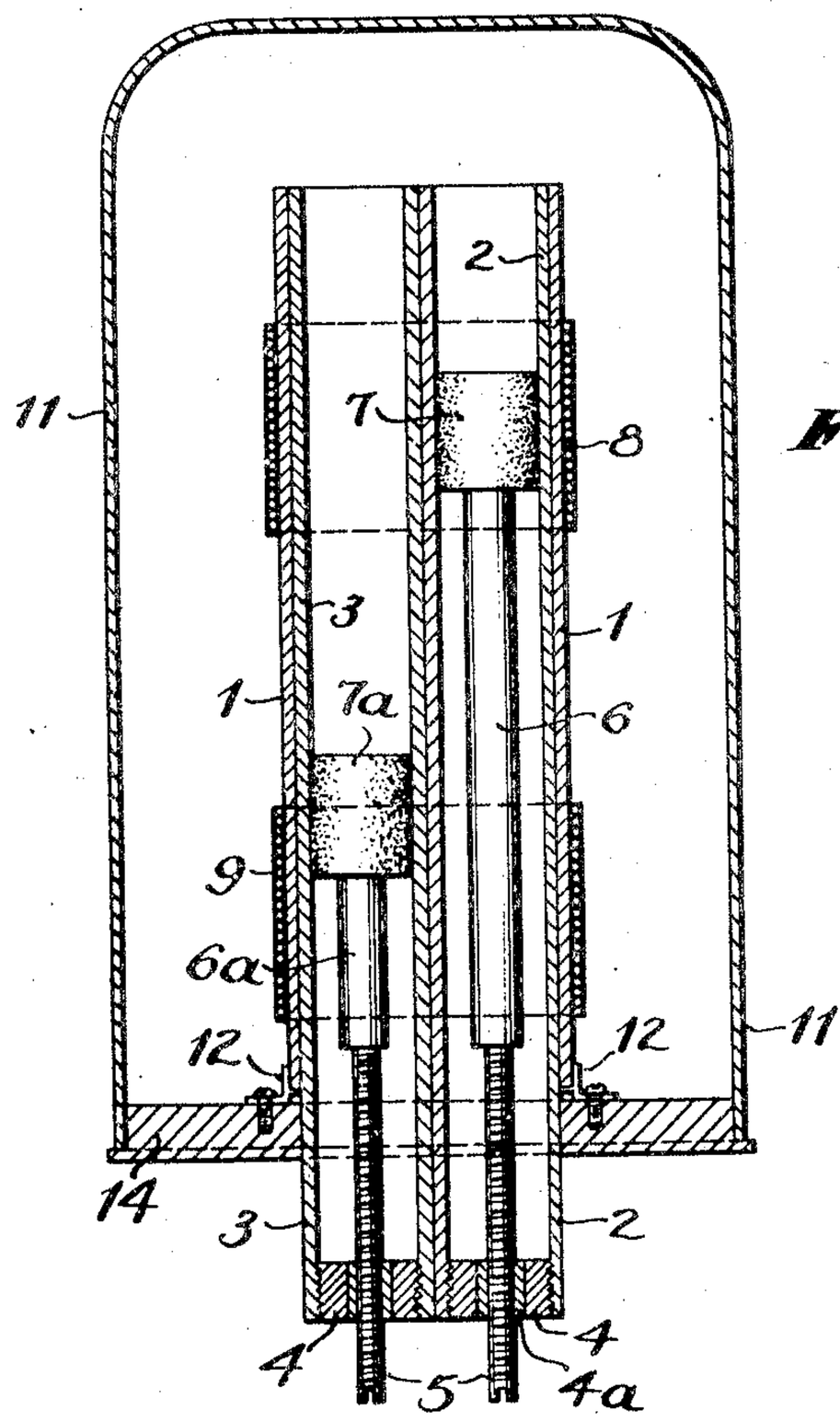


Fig. 1.

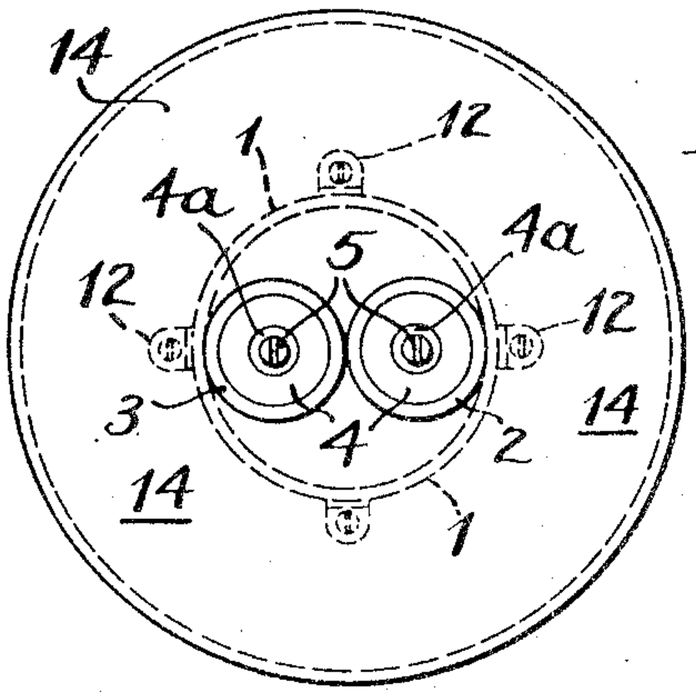


Fig. 2.

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## PERMEABILITY TUNED HIGH-FREQUENCY COUPLING DEVICE

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5 Claims. (Cl. 171—119)

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This invention relates to permeability tuned high frequency (HF) coupling units which may be employed for example in the intermediate frequency (IF) stages of radio receivers of the superheterodyne type.

Conventional permeability tuned HF coupling units of the type referred to usually comprise primary and secondary windings mutually coupled together each winding being provided with an adjustable core for the purpose of tuning it to the desired operating intermediate frequency.

The cores consist of extremely finely divided or comminuted magnetic material such as iron dust held together with a suitable insulating binder and compressed into solid form.

In a conventional permeability tuned transformer the primary and secondary windings are usually coaxially mounted and axially spaced from each other and the cores are arranged to work at the opposite ends of the associated windings. With this arrangement the tuning cores have to be adjusted individually from opposite ends of the assembly.

It is frequently desired that tuning of the primary and secondary circuits of the transformer or coupling device may be effected independently and from the same end of the assembly.

The present invention provides a novel means for effecting independent adjustment of the cores of a coupling transformer from the same end of the assembly.

Broadly, a coupling unit according to the present invention may comprise at least two separate windings disposed in axially spaced relation, at least one tuning core being associated with each of said windings and mounted for axial adjustment within the latter, and means for effecting adjustment of all of said cores from one end of said unit, the arrangement and transverse dimensions of the cores being such that each core may be axially adjusted into and out of the cooperating winding without traversing a path common also to a core associated with the next adjacent one of said windings.

In one embodiment of the present invention a permeability tuned HF coupling device comprises primary and secondary windings coaxially wound and axially spaced in fixed relationship on a common insulating former which is provided with a pair of internal guide tubes, each tube defining a separate path through both of said windings there being an adjustable core of magnetic material associated with said primary winding in one of said guide tubes and an adjustable core of magnetic material associated with said secondary

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winding in the other of said guide tubes, and means for independently adjusting the position of said cores from the same end of the assembly.

For a more complete understanding of the invention and the manner in which it is to be carried out attention is now directed to the following description in connection with the accompanying drawing which illustrates one practical arrangement for performing said invention.

In the drawings:

Figure 1 is a vertical sectional view of a transformer unit according to the present invention, and

Figure 2 is an underside plan view of Figure 1.

In the illustrated example the primary and secondary windings **8** and **9** respectively are coaxially wound in any convenient manner and axially spaced in fixed relationship on a common insulating former **1**. The insulating former **1** is provided with internal guide tubes **2**, **3** and mounted on a base plate **14** in concentric relationship with an outer shielding member **11**. In the present example the shielding member **11** is supported by a peripheral flange on the base **14** while the insulating coil former **1** is mounted on said base plate, in the required position, by means of small brass feet **12**.

The guide tubes **2**, **3** which are of insulating material are of such diameter that they fit neatly into the coil former **1** where they are fixedly supported in any desired manner. The tubes **2**, **3** preferably, but not necessarily, are extended through suitable apertures in the base plate **14** to project any required distance on the opposite side thereof.

Moulded cores **7**, **7***a* of powdered magnetic material are slidably mounted within the bores of guide tubes **2** and **3** respectively. The core **7** is insulatingly supported for axial movement within the field of the primary winding **8** by means of the rod **6**, the latter being attached to the core **7** at one end and to an adjusting screw **5** at the other end. If desired the adjusting screw **5** may be provided by cutting a suitable thread in the rod **6**.

The adjusting screw **5** passes, in screw threaded engagement, through a bushing **4***a* provided in a closure member **4** at the end of the guide tube **2**. The closure member **4** is secured in place in any convenient manner.

The core **7***a* is supported in like manner within the field of the secondary winding **9** by means of the connecting rod **6***a*, and is provided with an individual adjusting screw **5** which passes through

a threaded bushing in the associated closure member 4.

The outer diameter of the cores 7, 7a is such as to permit free axial movement of said cores within their respective guide tubes 2 and 3.

Individual axial movement of the cores within their guide tubes may be effected by varying the adjustment of the particular adjusting screw to which they are attached. By this means the self inductance and consequently the resonant point of the tuned circuit associated with the individual windings 8, 9 may be conveniently and independently varied from one end of the assembly.

It will be readily appreciated that permeability tuned coupling devices constructed in accordance with the present invention provide other desirable advantages apart from that already described.

For example the circuit losses may be reduced by the use of coils of bigger diameter and the "Q" of the tuned circuit thereby considerably increased. This results in higher gain and greater selectivity per amplifier stage.

To keep the "Q" as high as possible this invention provides an arrangement whereby all metal parts which would introduce losses into the circuit are reduced to a minimum.

Although in the illustrated example an arrangement has been described which permits independent adjustment of either tuning core from one particular end of the assembly it will be readily appreciated that the invention is not restricted to the precise arrangement described. By a simple mechanical rearrangement the adjusting screws may be caused to project from the top of the assembly rather than from the bottom as shown in the present example. Furthermore the addition of a further pair of adjusting screws to the other ends of the cores would permit the axial position of the cores to be independently adjusted from which ever end of the assembly that was most convenient.

What we claim is:

1. A permeability tuned high frequency coupling device comprising a pair of separate windings wound in axially spaced relation about a common former, a pair of guide tubes secured side by side within said former and extending longitudinally through said former, a tuning core mounted for longitudinal adjustment within each of said guide tubes, each of said cores being associated with a different one of said windings, and tuning means at the same longitudinal end of each core for axially adjusting said cores independently, in relation to said windings, from one end of said device.



2. A coupling device according to claim 1 and wherein the tuning means includes a screw threaded rod extending from each of said cores, each of said rods having screw threaded engagement with a member that is anchored against axial movement relative to said windings.

3. A permeability tuned high frequency coupling device comprising a pair of coils wound on a tubular coil form and spaced from each other in an axial direction, a pair of guide tubes fixedly supported within said coil form and disposed in parallel relation with each other and with the coil form, a tuning core mounted for separate axial adjustment within each of said guide tubes, each core being associated with a different one of the coils, and tuning means extending in the same direction from each core for selective axial adjustment thereof from the same end of the coil form.

4. A permeability tuned high frequency coupling device as defined in claim 3 wherein the coil form and guide tubes are in the form of elongated cylindrical tubes.

5. In a tunable high frequency coupling device: an elongated hollow support; at least two coupled windings wound around the support and held in longitudinally spaced position by the support; separate tuning members for each of said two windings; said tuning members being inductance varying elements movably held within the support for independent longitudinal movement to penetrate into its associated winding to the desired extent and thereby control the winding inductance; and guide structure secured within said support for guiding the respective tuning members along separate transversely displaced longitudinal paths; each of said tuning members including adjusting means on an end portion nearest the same end of the support, for selective manipulation from this end.

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## REFERENCES CITED

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

### UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 2,346,584 | Jacob | Apr. 11, 1944 |
| 2,433,004 | Tillman | Dec. 23, 1947 |