March 16, 1937. V. D. LANDON ET AL 2,073,940

COIL MOUNTING SYSTEM FOR HIGH FREQUENCY CIRCUITS

Filed Jan. 31, 1936

FIG. 1.

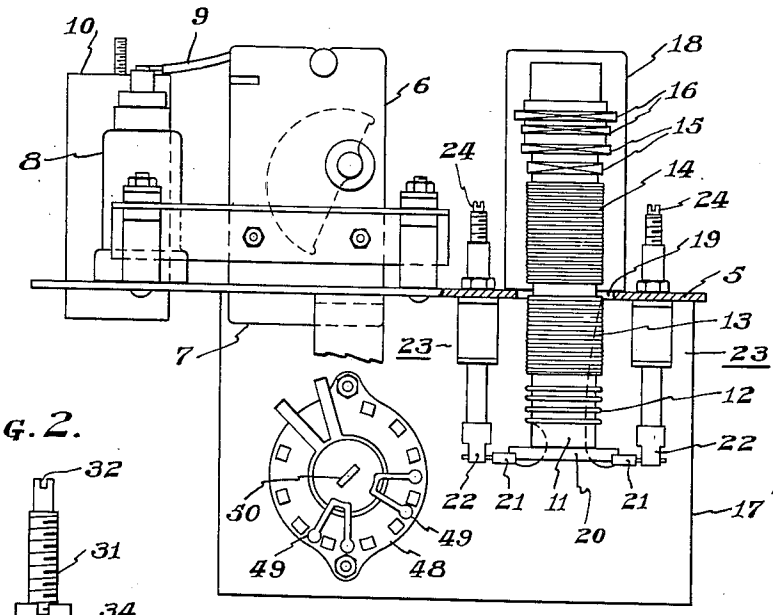


FIG. 2.

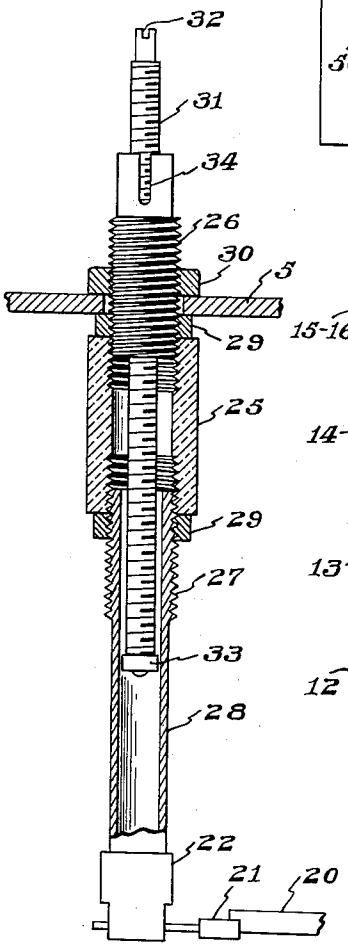


FIG. 4.

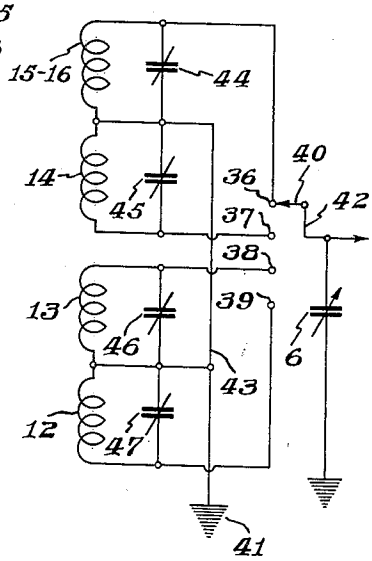
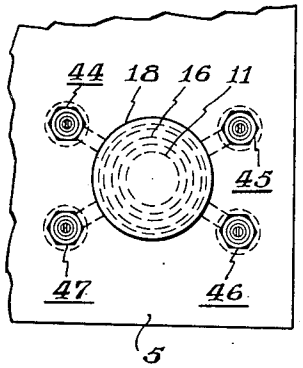


FIG. 3.



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COIL MOUNTING SYSTEM FOR HIGH FREQUENCY CIRCUITS

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14 Claims. (Cl. 250—40)

The present invention relates to coil mounting systems, high frequency circuits and particularly for multiwave band radio receivers and the like, and has for its primary object, to provide an improved coil system and mounting arrangement therefor, whereby the major circuit elements including the coils, of a high frequency tuning system, are compactly and effectively mounted for efficient operation, and easy assembly and adjustment.

Coil systems generally used in radio receivers and like apparatus are provided with tuning capacitors for adjusting the initial frequency response, or trimmer capacitors preferably located adjacent to the coils in order to provide short lead connections therewith.

It is, therefore, a further object of the present invention, to provide an improved coil mounting system wherein the trimmer capacitors are utilized as supporting means for the coil system and, therefore, may be connected directly thereto by short lead connections.

It is also a further object of the present invention, to provide a coil mounting and trimmer capacitor assembly, particularly adapted for use in connection with a metal chassis on which the remainder of the high frequency apparatus is mounted.

It may also be considered to be an object of the present invention to provide an improved arrangement of, and mounting means for, the component parts of tuned high frequency circuits including coil windings and tuning capacitors therefor, in conjunction with metal tubes.

The invention will, however, be better understood from the following description, when considered with reference to the accompanying drawing, and its scope will be pointed out in the appended claims.

In the drawing, Fig. 1 is a front view or elevation, partly in section, of a high frequency tuning unit and coil system therefor, embodying the invention;

Fig. 2 is a detail sectional view, on an enlarged scale, of a trimmer capacitor supporting means for the coil system of Fig. 1;

Fig. 3 is a top plan view of a portion of the coil system of Fig. 1 and on the same scale, showing further details of construction, and

Fig. 4 is a schematic circuit diagram of the coil system of Fig. 1, showing the various elements thereof in circuit.

Referring to Figs. 1, 2, and 3, 5 is the chassis or a chassis element of a radio receiver or like high frequency apparatus, on which is mounted a variable gang tuning capacitor 6 with the stator mounted on its side and projecting through the chassis as indicated at 7 to reduce the height of the parts above the chassis, substantially to that of the metal tubes mounted thereon, one of which is indicated at 8. Connection leads may then be made directly from the tuning capacitor to the top terminal of the tubes as indicated by the lead 9. Other apparatus represented by a choke coil 10, may be mounted on the chassis to stand above the chassis level substantially at the level of the top of the tube 8.

At the opposite side of the tuning capacitor 6, are mounted a row of coils or transformer units standing vertically with respect to the chassis, and extending above and below, as shown, to maintain the top thereof substantially at the level of the tuning capacitor and tubes thereon, whereby the arrangement is made more compact and is more readily mounted in a relatively small space.

Further in accordance with this system, a plurality of the windings are arranged in spaced relation to each other along a common axis, preferably being mounted on one elongated core 11, the axis of which stands vertically with respect to the chassis. The core carries a number of coils, indicated at 12, 13, 14, 15, and 16, forming substantially a continuous winding and providing for electro-magnetic coupling between adjacent coils or sections of the winding. This winding unit may constitute a coupling transformer for the same circuits over a plurality of wave bands.

The lower portion of the coil unit extends below the chassis and, therefore, is within the shielding confines of the chassis, and is further shielded by a plate 17 between coils. The upper portion of the coil unit is enclosed in a metallic shield can 18 seated in the chassis opening 19, through which the coil system extends. The high frequency windings are placed in the lower end of the coil system within the chassis, while the lower frequency windings 14, 15, and 16 extend above the chassis and within the shield can 18. By this arrangement, the shield can and chassis are electrically connected, and any stray interference external to the chassis is prevented from reaching the coil system.

The coil form 11 is provided with a base plate indicated at 20, having radially projecting lugs 21 which engage with the lower ends 22 of elongated tubular adjustable capacitors 23, each of which is provided with an adjusting screw 24 above the chassis and adjacent to the coil system, as shown in Figs. 1 and 3. The capacitors

are made in the form of elongated tubular elements in order that they may extend below the chassis to support the lugs 21 and the coil system, and at the same time may extend above the chassis for convenient operation and adjustment in use from above the chassis. This provides for convenient adjustment of the trimmer capacitors which are utilized in connection with the windings of the particular transformer or coil system about which they are grouped as will hereinafter appear.

In the present example, four capacitors are provided, one for each of the four coils provided on the form 11, coils 15 and 16 being part of one winding and being relatively adjustable, one over the other, that is the coils 15 may be moved with respect to the coils 16 to provide for adjusting the overall inductance.

The trimmer capacitors are shown more in detail in Fig. 2, to which attention is now particularly directed. It will be seen that the capacitor comprises an internally threaded tube 25 of insulating material, such as Isolantite, into the opposite ends of which are screwed externally threaded metal tubes 26 and 27, the latter having an elongated unthreaded tubular lower end 28, to which is connected the metallic terminal end 22 for engaging and supporting the lug 21 and the coil base 20. The tubes 26 and 27 are provided with lock nuts 29, bearing against the ends of the tube 25 and the upper tube 26 extends through an opening in the chassis 5 and is secured thereto by a second lock nut 30 above the chassis.

The upper tube 26 of the trimmer capacitor is internally threaded to receive an elongated screw threaded rod 31 having a screw driver slot 32 at the upper end and carrying a guide disc or tip 33 of insulating material, at the opposite end, whereby said end is prevented from contacting with the interior walls of the tube 27. With this arrangement, it will be seen that the capacitor is provided by the tube 27 as one electrode thereof and the rod 31 as the opposite electrode carried by the tube 26 and directly grounded to the chassis. Therefore, screw driver contact with the rod electrode 31 in adjusting the value of the capacitor will have no capacity effect upon the circuits connected therewith for the reason that the electrode is grounded to the chassis by means of the mounting connection. The tube 26 is split or slotted as indicated at 34, whereby it grips the threaded rod electrode 31 to retain it in any position of adjustment. It has been found that a trimmer capacitor of this type may provide a relatively wide capacity range of adjustment, for example, of from .5 micro-micro-farads to 16 micro-micro-farads, although any suitable capacity range may be provided by suitably changing the dimensions of the two electrodes of the capacitor.

Referring now to Fig. 4 along with the preceding figures, a coil system is shown in which the coils 12, 13, 14, and 15—16 are provided with a switch comprising contacts 36, 37, 38, and 39 and contact means 40 therefor, whereby each of the coils may be selected for connection between ground 41 and a lead 42 forming the output connections therefrom. In this arrangement, each pair of coils is connected through a lead 43 with the ground 41, which may be the chassis of the apparatus, while the remaining terminal is connected to one of the taps or contacts 36 to 39 inclusive for selection by the contact 40.

Each coil is provided with a shunt trimmer capacitor represented at 44, 45, 46, and 47. These capacitors may be located as indicated in Fig. 3, by the same reference numerals. As will be seen by again referring to Fig. 1, the tap switch 40 may be mounted on the chassis, preferably on the shield wall or plate 17, as indicated at 48, the switch preferably having contact elements 49 insulated from the shaft 50 and the chassis, whereby the coil terminals connected therewith may be isolated above ground while the opposite terminals may be grounded as shown in Figure 4.

With this arrangement, it will be seen that trimmer capacitors, for example 44 to 47 inclusive, are each connected at one side to ground. For this reason the trimmer capacitors as shown in Figs. 1, 2, and 3 are particularly adapted for this type of circuit since one side of each capacitor is grounded while the opposite side provides an insulated support and capacity member for the coil winding to which it is directly connected, the connection providing the support.

From the foregoing description, it will be seen that in a tuning system for radio receiving apparatus and the like, a coil element or unit may be arranged as a continuous winding and may be mounted vertically with respect to the chassis element, partly within and partly without the chassis enclosure, and may further be provided with a metallic shield joining the chassis and surrounding the projecting end of the coil unit above the chassis. Below the chassis the coil unit is provided with mounting means whereby it is connected to elongated tubular trimmer capacitors by electrical connections which serve as mechanical supporting means, whereby the coil unit is suspended from and supported by said capacitors. By having the one electrode of the capacitor connected to the chassis and providing adjusting means therefor projecting above the chassis, the capacitors are readily adapted for adjustment in use without undesirably affecting the circuit connections therewith.

The transformer or coupling coil unit for one circuit in a multi-range high frequency tuning apparatus is suspended from the chassis through the intermediary of one or more circuit elements forming the suspension means in connection with the chassis, and being in the form of capacitors provided for insulating the terminals of the coil system from the chassis, while at the same time, direct connection between the terminals of the coil system and the trimmer capacitors is effected by short leads.

The arrangement in connection with the tuning capacitor and the tubes in the circuit is such that the level of the apparatus above the chassis is maintained relatively low.

We claim:

1. In a high frequency circuit tuning system, the combination of a chassis element, a tubular coupling coil unit comprising a plurality of coaxial coils, and a plurality of tubular circuit elements for tuning said coils extending in axially parallel relation to said coil unit providing suspension means for said unit in connection with said chassis.

2. In a high frequency circuit tuning system, the combination of a chassis element, a tubular coupling coil unit comprising a plurality of coaxial coils and a plurality of tubular circuit elements for tuning said coils extending in axially

parallel relation to said coil unit providing suspension means for said unit in connection with said chassis and direct electrical connection with said unit.

3. In a high frequency circuit tuning system, the combination of a metallic chassis, a coupling coil unit extending therethrough, and a plurality of circuit tuning elements providing mechanical and electrical connection at opposite ends with said unit and chassis to provide suspension and circuit connection elements for said unit.

4. In a high frequency circuit tuning system, the combination of a metallic chassis, a coupling coil unit extending therethrough, and a plurality of circuit tuning elements mounted on said chassis and connected with said unit to provide combined mechanical suspension and electrical connection for said unit.

5. In a high frequency circuit tuning system, the combination of means providing an electrical shield wall, an elongated coil unit extending through said wall, and means for suspending said unit at one end from said wall, comprising a plurality of capacitor elements having electrode terminals connected directly with the coil unit at said end, and said capacitor elements extending therefrom into connection with said wall adjacent to said unit.

6. In a high frequency circuit tuning system, the combination of means providing an electrical shield wall, an elongated coil unit extending through said wall, means for suspending said unit at one end from said wall, comprising a plurality of capacitor elements having electrode terminals connected directly with the coil unit at said end, said capacitor elements extending therefrom into connection with said wall adjacent to said unit, and means for adjusting said capacitor elements connected with said wall and extending therethrough.

7. In a high frequency tuning system, a metallic chassis element having an opening therein, a coil system including a single elongated unit extending through said opening to a limited degree on one side of said chassis element, a metallic shield member closing said opening and surrounding said projecting end of said unit, means providing coil terminals at the opposite end of said unit on the opposite side of said chassis, and adjustable capacitor means providing insulated circuit connections with said terminals and supporting means for said coil system in connection with said chassis element.

8. In a high frequency tuning system, a metallic chassis element having an opening therein, a coil system including a single elongated unit extending through said opening to a limited degree on one side of said chassis element, a metallic shield member closing said opening and surrounding said projecting end of said unit, means providing coil terminals at the opposite end of said unit on the opposite side of said chassis, and circuit tuning elements having direct electrical connection with said terminals providing supporting means for said unit in connection with the chassis element.

9. In a high frequency tuning system, a metallic chassis element having an opening therein, a coil system including a single elongated unit extending through said opening to a limited degree on one side of said chassis element, a metallic shield member closing said opening and surrounding said projecting end of said unit, means providing coil terminals at the opposite end of said unit on the opposite side of said chassis, and means providing insulated circuit connections with said terminals and supporting means for said coil system in connection with said chassis, said last named means comprising trimmer capacitors for said coil system having adjustable electrodes connected with the chassis and fixed insulated electrodes connected with the coil terminals to provide electrical and mechanical connection with said unit.

10. High frequency tuning apparatus including, in combination, a metallic chassis element having an opening therethrough, transformer means including a winding located in said opening and extending through the chassis in one direction to a limited degree, a shield casing surrounding said projecting end of said winding, a plurality of trimmer capacitors arranged about said opening and having insulated electrode elements projecting from said chassis in the opposite direction, and means providing a combined electrical and mechanical connection between said electrode elements and the adjacent end of said winding, whereby said capacitors provide combined adjusting and supporting means for said winding.

11. In a high frequency tuning system, the combination with a plurality of electrical windings tunable each to respond to a differing range of high frequency oscillations, of a common supporting element therefor, a metallic chassis element, and a combined suspension and trimmer capacitor means for said windings mounted on the chassis and connected with one end of said supporting element.

12. In a radio receiving system, the combination with a plurality of high frequency windings, of means for supporting and adjusting said windings, said last named means comprising a supporting chassis having an opening therein, a supporting form for said windings lying in said opening and extending therethrough in opposite directions, and a plurality of elongated capacitors having one electrode connected with the chassis and having an insulated electrode connected with said winding form, whereby the form is insulated from and supported by said chassis.

13. In combination, a metallic chassis having an opening therethrough, an adjustable capacitor having an adjustable electrode mounted on said chassis adjacent to said opening and having an insulated electrode spaced therefrom and from the chassis, and a coil system comprising an elongated winding extending through said opening in the chassis and being connected at one end electrically and mechanically with said insulated electrode whereby said winding element is suspended from and supported by said chassis through the intermediary of said adjustable capacitor, and electrically directly connected therewith.

14. A high frequency tuning system in accordance with claim 6, further characterized by the fact that the capacitor elements are provided with an insulating body portion between said electrode terminals and said connection with the wall, whereby said coil unit is insulated from the shield wall thereby.

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