

March 15, 1938.

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2,111,490

INTERMEDIATE FREQUENCY COUPLING UNIT

Filed Aug. 6, 1935

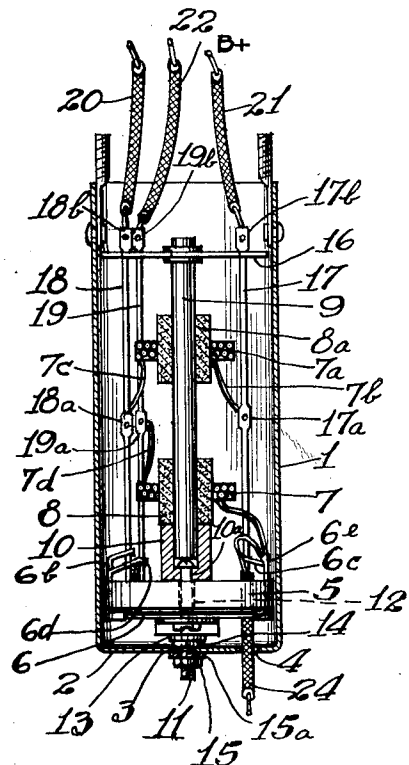


Fig. 1.

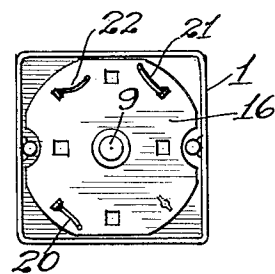


Fig. 2.

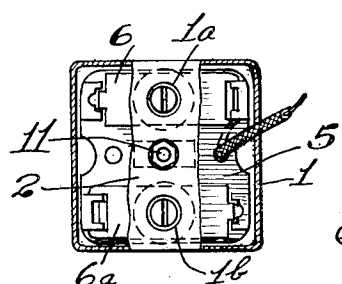


Fig. 3.

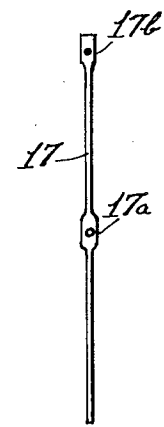


Fig. 5.

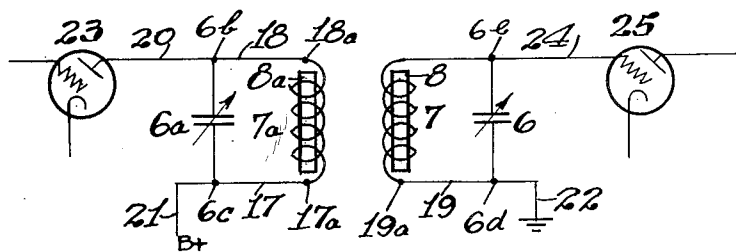


Fig. 4.

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2,111,490

INTERMEDIATE-FREQUENCY COUPLING
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Application August 6, 1935, Serial No. 34,959

14 Claims. (Cl. 250-16)

The invention relates to high frequency coupling units such as may be employed in high-frequency radio receivers, although it desirably may be used in other apparatus.

Heretofore, a coupling unit of this type has been mounted on a shielded insulating support of Bakelite, or other material, which carried the coils and the cores of the inductances, as well as their associated insulated leads, and fixedly held these leads in their operative positions, to thereby avoid alterations of their mutual inductances. It is an object of this invention to produce a coupling unit without using such a support, and to utilize uninsulated conductors which are so fixedly related as to maintain their capacitative effects constant.

In manufacturing these coupling units, it has been customary to extend the natural leads to the terminal lugs of the respective tuning condensers, to then attach the heavy 22-gauge insulated conductors to the lugs, and finally to extend said conductors through the shield of the unit where they are connected with extraneous elements of the radio circuits.

A disadvantage encountered in utilizing this conventional form of construction, has been that, due to vibrations or shocks, elements of the assembly, such as the natural or the hook-up leads of the coils, have not at all times stayed in fixed relation to each other.

One of the objects of my invention, is to provide a high-frequency-coupling unit having very short natural coil leads which are disposed within the shield of said unit, so as to minimize capacity and entirely avoid the undesirable effects of capacity alterations which would otherwise ensue.

In this, my new construction, there are within the shield uninsulated conductive bus bars, each having a hole at its upper end and one in the middle, which holes serve as anchorages for the coil leads as well as anchorages for the extraneous hook-up leads or insulated conductors.

As will be noted, these bus bars, on account of their rigidity, are always maintained in spaced relations to each other, and require no insulation which, if present, would produce such dielectric losses as occur when insulated conductors are employed.

Each bus bar not only acts as an anchorage, a conductor and a spacer of other elements of the coupling unit, but also aids in maintaining all of the elements in fixed positions.

Furthermore, in this device it is possible to make a pre-assembly of the cores, so that by

winding the coils simultaneously on a winding machine, the space between the two inductances is kept constant, thereby avoiding the necessity of later adjusting the coupling between the inductors, thus decreasing the cost of manufacture.

The invention will best be understood if reference be had to the accompanying drawing, in which—

Figure 1 is a vertical sectional view showing the intermediate-frequency coupling unit in a shield;

Figure 2 is a view of the device, as seen from above;

Figure 3 is a view of the device, as seen from below;

Figure 4 is a view diagrammatically showing the conductors and coils which constitute operative elements of the device, and

Figure 5 is a view of one of the bus bars in elevation.

Referring to the drawing, 1 is a shield which is open at its top and is provided with a closed bottom 2 having a central opening 3 and a side opening 4.

Within the lower end of said shield 1, is disposed a ceramic base 5, carrying on its underside adjustable condensers 6, 6a. The condensers, respectively, are in circuit with conductor coils 7, 7a, which respectively are provided with annular cores 8, 8a. The bottom of the shield 1, is provided with holes 1a, 1b, which give access to the adjusting means of said condensers, as shown in Fig. 3.

A non-conductive rod 9, extending through said annular cores 8, 8a, affords a support for said cores and their inductance coils 7, 7a. The lower end of this rod 9 is enclosed by an internally-flanged non-conductive annulus 10 which spaces said ceramic base 5 from the lower core 8.

The rod 9 rests on a headed bolt 11 which extends downward through a hole 10a in said annulus 10, through a hole 12 in said ceramic base 5, and also through the central opening 3 in the bottom 2 of said shield 1. The bolt 11 carries near its lower end a washer 13 which is forced against the under surface of said ceramic base 5 by a nut 14 that engages the screw-threads of the bolt 11. A further nut 15 and its washer 15a, carried by said bolt 11 and disposed below the bottom 2 of said shield 1, holds said bolt 11 in place within said shield.

The upper end of said rod 9 is suitably secured to a thin spacing and supporting element 16 made of Bakelite or other non-conducting substance, and through this element 16 extend conductive bus bars 17, 18 and 19 which are fixedly secured

to said element 16 and to said ceramic base 5, thereby constituting struts for holding these two elements and other parts of the device in their proper positions.

5 These conductive bus bars 17, 18, 19, are each provided with a perforated flattened portion 17a, 18a, or 19a, disposed at a point substantially mid-way its length, and are each provided at its free end with a perforated flattened portion 17b, 18b or 19b.

10 One terminal 7b of the inductance coil 7a, is threaded through the perforation in the intermediate flattened portion 17a of the bus bar 17, and is there soldered in place, while the other terminal 7c of said inductance coil 7a is threaded through the perforation in the intermediate flattened portion 18a of the bus bar 18, in which it is soldered.

Through the flattened perforated upper end 18b of the bus bar 18 is threaded the end of an insulated conductor 20 which is disposed outside of the shield 1. An insulated conductor 21, leading from a B-supply, also disposed outside of said shield 1, is threaded through the flattened perforated upper end 17b, of the bus bar 17, to which bus bar it is soldered.

The circuit formed by the lower portion of the bus bar 17, the coil 7a and the lower portion of the bus bar 18, is shunted by the condenser 6a, one plate of which carries a lug 6b, to which the proximate end of said bus bar 18 is soldered, the other plate of said condenser being conductively connected to the bus bar 17 by a lug 6c. The insulated conductor 20 terminates at the plate of a thermionic tube 23, as shown.

30 The coil 7 has one of its leads 7d threaded through the aperture 19a of the intermediate flattened portion of the bus bar 19, a conductive path being formed from this point 19a, through upper portion of the bus bar 19, through the insulated conductor 22, and thence to ground.

The other lead of the inductance coil 7 is connected to a lug 6e of the condenser 6, and also to the conductor 24 which, in turn, is connected to the grid of a thermionic tube 25. The other lug 6d of the condenser 6 is connected with the bus bar 19.

Having thus described my invention, what I claim is:

50 1. In an inductance unit for radio receivers, the combination of a rod of non-conducting material, inductively related high-frequency coils supported on said rod for use in inductively coupled circuits, a head of insulating material at each end of and secured to said rod, and a plurality of metal rods spaced from said supporting rod and from each other and extending between said heads, whereby said heads are held in desired relation to each other and said metal rods are held in fixed position relatively to each other and to said supporting rod and have fixed capacitive coupling with said coils, said metal rods being spaced from said coils and constituting bus bars electrically connected with said coils in inductively coupled circuits and comprising connection terminals of said unit.

2. In an inductance unit for radio receivers, the combination of a rod of non-conducting material, inductively related high-frequency coils supported on said rod for use in inductively coupled circuits, a head of insulating material at each end of and secured to said rod, and a plurality of metal rods spaced from said supporting rod and from each other and extending between said heads, whereby said heads are held in desired relation to each other and said metal rods are held in fixed position relatively to each other and to said supporting rod and have fixed capacitive coupling with said coils, said metal rods being spaced from said coils and constituting bus bars electrically connected with said coils in inductively coupled circuits and comprising connection terminals of said unit.

lation to each other and said metal rods are held in fixed position relatively to each other and to said supporting rod and have fixed capacitive coupling with said coils, said metal rods being spaced from said coils and constituting bus bars electrically connected with said coils in inductively coupled circuits and comprising connection terminals of said unit, said metal rods having flattened and perforated mid-portions to facilitate making electrical connections with them.

3. In an inductance unit for radio receivers, the combination of a rod of non-conducting material, inductively related high-frequency coils supported on said rod for use in inductively coupled circuits, a head of insulating material at each end of and secured to said rod, a plurality of metal rods spaced from said supporting rod and from each other and extending between said heads, whereby said heads are held in desired relation to each other and said metal rods are held in fixed position relatively to each other and to said supporting rod and have fixed capacitive coupling with said coils, said metal rods being spaced from said coils and constituting bus bars electrically connected with said coils in inductively coupled circuits and comprising connection terminals of said unit, and condensers mounted on one of said heads and electrically connected with said metal rods in resonant circuits.

4. In a coupling unit for radio receivers, the combination of a first head of insulating material, condensers mounted on said head and having spaced connection lugs, a rod of insulating material secured to and extending from the central portion of said head, a second head of insulating material spaced from said first head and having its central portion secured to said rod, high-frequency inductance coils mounted on said rod between said heads and in inductive relation to each other, metal rods connected with said condenser lugs and extending to and engaging said second head and constituting struts between said heads, said coils being electrically connected with said metal rods to constitute coupled resonant circuits, whereby said metal rods comprise bus bar connectors of said unit, said metal rods being sufficiently rigid to maintain their relationship to each other and to said coils, thereby maintaining substantially constant the capacitive coupling effects of the wiring connections of said unit.

5. In a coupling unit for radio receivers, the combination of two members of insulating material in substantially parallel relation, an element of non-conducting material extending between and attached to said members and holding the latter in spaced relation, inductively related high-frequency coils supported by said element between said members for use in inductively coupled circuits, and spaced and relatively rigid metal rods extending between said members near said coils and electrically connected respectively adjacent said coils with the terminals of said coils, whereby said metal rods have fixed capacitive coupling with the coils with which they are not connected and constitute bus bar connectors of said unit.

6. In a coupling unit for radio receivers, the combination of two members of insulating material in substantially parallel relation, an element of non-conducting material extending between and attached to said members and holding the latter in spaced relation, inductively related high-frequency coils supported by said element between said members for use in inductively

coupled circuits, spaced and relatively rigid metal rods extending between said members near said coils and electrically connected respectively adjacent said coils with the terminals of said coils, whereby said metal rods have fixed capacitative coupling with the coils with which they are not connected and constitute bus bar connectors of said unit, and condensers carried by one of said members and having their terminals connected respectively with first end portions of said metal rods connected with said coils to constitute coupled resonant circuits, said metal rods comprising terminal connectors of said coupling unit.

7. In a tuned coupling unit for radio receivers, the combination of two members of insulating material spaced from each other and in substantially parallel relation, an element of non-conducting material supported between said members, inductively related high-frequency inductance coils supported by said element between said members, cores of magnetic material for said coils, relatively rigid metal rods extending between said members near said coils, said rods being spaced from each other and from said coils and electrically connected respectively with terminals of said coils, and tuning condensers carried by one of said members and having terminals electrically connected respectively with said metal rods connected with the coils to be tuned by said condensers to form coupled resonant circuits, whereby said metal rods comprise electrical bus bars connecting said coils and condensers and have fixed capacitative coupling with the coils with which they are not connected.

8. In a tuned coupling unit for radio receivers, the combination of two members of insulating material spaced from each other and in substantially parallel relation, an element of non-conducting material supported between said members, inductively related high-frequency inductance coils supported by said element between said members, cores of magnetic material for said coils, relatively rigid metal rods extending between said members near said coils, said rods being spaced from each other and from said coils and electrically connected respectively with terminals of said coils, and tuning condensers carried by one of said members and having terminals electrically connected respectively with said metal rods connected with the coils to be tuned by said condensers to form coupled resonant circuits, whereby said metal rods comprise electrical bus bars connecting said coils and condensers and have fixed capacitative coupling with the coils with which they are not connected, said condensers having connection terminals connected directly with said metal rods respectively.

9. In a tuned coupling unit for radio receivers, the combination of two members of insulating material spaced from each other and in substantially parallel relation, an element of non-conducting material supported between said members, inductively related high-frequency inductance coils supported by said element between said members, cores of magnetic material for said coils, relatively rigid metal rods extending between said members near said coils, said rods being spaced from each other and from said coils and electrically connected respectively with terminals of said coils, and tuning condensers carried by one of said members and having terminals electrically connected respectively with said metal rods connected with the coils to be tuned by said condensers to form coupled reso-

nant circuits, whereby said metal rods comprise electrical bus bars connecting said coils and condensers and have fixed capacitative coupling with the coils with which they are not connected, said metal rods comprising connection terminals of the tuned coupling unit.

10. In a tuned coupling unit for radio receivers, the combination of two heads of insulating material spaced from each other and in substantially parallel relation, a supporting rod of non-conducting material connecting and secured to central portions of said heads, annular cores of magnetic material on and secured to said supporting rod, high-frequency inductance coils around said cores, the relation of said cores inductively relating said coils, relatively rigid metal rods spaced from each other and from said coils and connected with said heads, said metal rods being substantially parallel with each other and with said supporting rod and electrically connected respectively with terminals of said coils, and tuning condensers carried by one of said heads and having terminals electrically connected respectively with said metal rods connected with the coils to be tuned by said condensers to form coupled resonant circuits, whereby said metal rods comprise struts between said heads and electrical bus bars connecting said coils and condensers and have fixed capacitative coupling with the coils with which they are not connected.

11. In a tuned coupling unit for radio receivers, the combination of two heads of insulating material spaced from each other and in substantially parallel relation, a supporting rod of non-conducting material connecting and secured to central portions of said heads, annular cores of magnetic material on and secured to said supporting rod, high-frequency inductance coils around said cores, the relation of said cores inductively relating said coils, relatively rigid metal rods spaced from each other and from said coils and connected with said heads, said metal rods being substantially parallel with each other and with said supporting rod and electrically connected respectively with terminals of said coils, and tuning condensers carried by one of said heads and having terminals electrically connected respectively with said metal rods connected with the coils to be tuned by said condensers to form coupled resonant circuits, whereby said metal rods comprise struts between said heads and electrical bus bars connecting said coils and condensers and have fixed capacitative coupling with the coils with which they are not connected, said condensers having connection lugs connected directly with said metal rods respectively.

12. In a tuned coupling unit for radio receivers, the combination of two heads of insulating material spaced from each other and in substantially parallel relation, a supporting rod of non-conducting material connecting and secured to central portions of said heads, annular cores of magnetic material on and secured to said supporting rod, high-frequency inductance coils around said cores, the relation of said cores inductively relating said coils, relatively rigid metal rods spaced from each other and from said coils and connected with said heads, said metal rods being substantially parallel with each other and with said supporting rod and electrically connected respectively with terminals of said coils, and tuning condensers carried by one of said heads and having terminals electrically connected respectively with said metal rods connected with the coils to be tuned by said condensers to form coupled reso-

- nant circuits, whereby said metal rods comprise struts between said heads and electrical bus bars connecting said coils and condensers and have fixed capacitative coupling with the coils with
- 5 which they are not connected, said metal rods extending through said head remote from said condensers and comprising connection terminals of the tuned coupling unit.
13. In a high-frequency resonant coupling unit
- 10 for radio receivers, the combination of an insulating support, inductance coils mounted in inductive relation to each other on said support, adjustable condensers having fixed relation to said support for tuning said coils, said condensers
- 15 having connection terminals, and rigid conductor rods having fixed relation to said support near said coils and connecting the terminals of said coils with the connection terminals of said condensers respectively, thereby establishing fixed
- 20 capacitative effects between said conductor rods and the other parts of said coupling unit, where-

by the resonant circuits of duplicate coupling units have substantially the same degree of coupling.

14. In a high-frequency resonant coupling unit for radio receivers, the combination of a supporting rod of non-magnetic material, annular magnetic cores mounted in fixed position on said rod, inductive windings around said cores, a base of insulating material secured to one end of said rod, adjustable condensers mounted on said base
- 10 for tuning said windings, and rigid metal rods spaced from said windings and held substantially parallel with said supporting rod and with each other and connecting the terminals of said condensers respectively with the terminals of said
- 15 windings to form coupled resonant circuits, thereby establishing fixed capacitative effects between said metal rods and the other parts of said coupling unit, whereby duplicate coupling units have substantially the same degree of coupling.
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