Dec. 6, 1932. L. A. GEBHARD 1,890,034

ELECTRICAL COUPLING SYSTEM

Filed June 12, 1928

Fig. 1

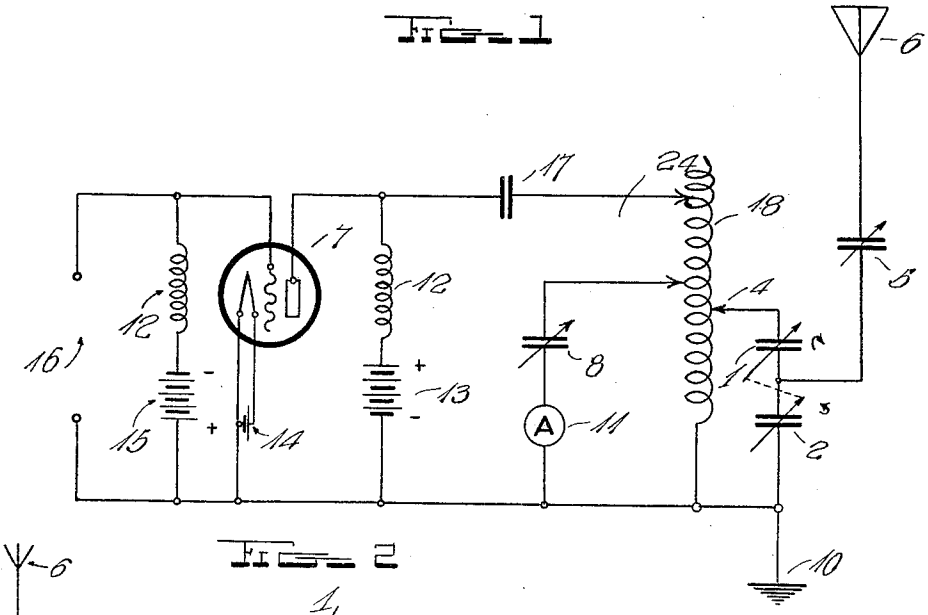


Fig. 2

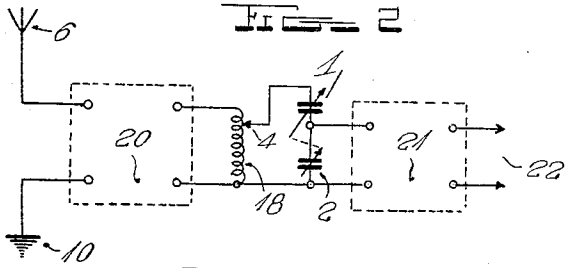
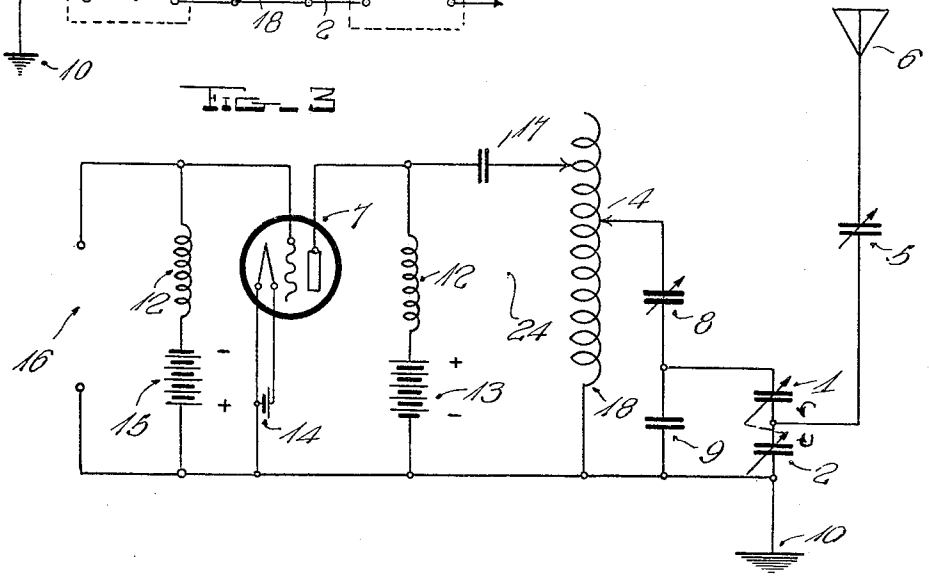


Fig. 3



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UNITED STATES PATENT OFFICE

LOUIS A. GEBHARD, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WIRED RADIO, INC., OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

ELECTRICAL COUPLING SYSTEM

Application filed June 12, 1928. Serial No. 284,754.

My invention relates to transmission and reception systems applicable to space radio and wired radio signaling.

My invention relates further to coupling systems in general and more specifically to systems for coupling a local circuit to a load circuit.

An object of my invention is to provide an improvement in systems for inter-coupling a plurality of circuits.

Another object of my invention is to provide an adjustable coupling system whereby the coupling between a plurality of circuits may be varied without varying the frequency characteristics of either of the circuits so coupled.

Other and further objects of my invention will be shown in the specification which follows and by reference to the accompanying drawing, in which:

Figure 1 is a diagrammatic illustration of a circuit embodying my invention.

Fig. 2 is a diagrammatic illustration of my invention employed for intercoupling a plurality of circuits.

Fig. 3 is a diagrammatic illustration of a circuit embodying a modification of my invention.

In the circuit arrangement shown in Fig. 1, a thermionic vacuum tube 7 is connected as an amplifier having an input circuit 16, choke coil 12, negative grid battery 15, plate potential source 13, blocking condenser 17, inductance 18, capacities 1, 2, 5 and 8, ammeter 11 and load circuit 6, 10. In the circuit arrangement shown in Fig. 2 the reference characters designate the same apparatus as illustrated in Fig. 1. In Figs. 1, 2 and 3, connection 4 is adjustable on inductance 18. In Fig. 2 an amplifier circuit 20 is shown connected to a second amplifier 21 by means of my invention. Amplifiers 20 and 21 may be radio frequency amplifiers of radio receiving apparatus, or in a transmitter, power amplifiers, or 21 could be an exciter circuit coupled to a power amplifier circuit 20. Additional circuits may be employed interconnected with 21 as shown at 22. The coupling circuit arrangement could be the same as is illustrated for intercoupling 20 and 21, or the arrangement could include the condenser as shown in the coupling circuit illustrated in Fig. 3.

It is sometimes difficult to obtain an accurate adjustment of coupling in high frequency transmitters and receivers, particularly so when the coupling is of the inductive nature. This is because of the small value of the inductive reactance in the coupling circuits. Fig. 1 shows a method of obtaining a uniform variation of coupling. A conventional tube output circuit is shown with the condensers 1 and 2 connected in series across a number of turns of the inductance coil 18. This connection across the inductance is adjustable by movable contact 4. The common connection between 1 and 2 is connected to the antenna 6 or other output circuit 22 as shown in Fig. 2. Variable condenser 5 tunes the antenna circuit to the desired frequency. Condenser 8 is for the purpose of tuning the output circuit of thermionic vacuum tube 7.

If condenser 2 is decreased in capacity and simultaneously condenser 1 is increased in capacity, the result will be an increase in the coupling between tube output circuit 24 and the antenna circuit 6, 10. If condenser 2 is increased in capacity and simultaneously condenser 1 is decreased in capacity, the coupling between tube output circuit 24 and the antenna circuit 6, 10 will be decreased. When the capacity of one condenser is changed, the capacity of the other condenser must be changed to compensate, otherwise the reaction on the tube output circuit 24 will be such as to change the frequency. Instead of changing 1 or 2 to compensate for the change in adjustment of either one, condenser 8 may be changed. 1 and 2 may be mounted on the same shaft and so arranged that the capacity of one increases and that of the other decreases in such ratio that the output circuit 24 of tube 7 will always remain in tune with the antenna circuit 6, 10, the resultant capacity across 1 and 2 in series remaining the same. Fig. 3 shows the coupling circuit as applied to bridging a condenser 9 in series with the resonant output circuit 24 of the tube 7. This method has the advantage of pure capacity coupling to the output circuit of the tube. Other advantages are obvious

and Fig. 2 proposes to illustrate many possible applications of my invention. My coupling system is applicable to many circuit arrangements not described in the foregoing specification or illustrated in the accompanying drawing and it is obvious that such circuit arrangements would not depart from the spirit of my invention as defined in the following claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A coupling system comprising in combination two variable capacities connected in series and the resultant series capacity connected across an output circuit, a load circuit connected to the series connection between said series connected capacities and to one terminal of said output circuit, and means for simultaneously adjusting said series connected capacities in opposite sense for varying the energy transfer between said output circuit and said load circuit without varying the frequency characteristics of said circuits.

2. A coupling system comprising in combination two series connected capacities the resultant capacity of which is connected across an output circuit, a load circuit connected to the series connection of said series connected capacities and to one terminal of said output circuit and means for increasing one of said series capacities and simultaneously decreasing the other of said series capacities whereby the coupling between said circuits is varied without varying the frequency characteristics of said circuits.

3. In a coupling system wherein the inductive reactance is small, a plurality of series connected capacities, means for connecting the resultant capacity of said series connected capacities across one circuit and means for connecting a second circuit to a series connection of said series connected capacities and one terminal of said first mentioned circuit, and means for simultaneously increasing one of said series connected capacities while simultaneously decreasing another of said series connected capacities whereby the coupling is varied without varying the frequency of said circuits.

4. In combination, a source of radio frequency oscillations, an antenna coupled thereto, and a coupling circuit comprising a plurality of condensers connected in series across said source, said antenna being connected across one only of said condensers and means for simultaneously varying that condenser in one direction while varying another of said series condensers in the opposite direction, whereby the total series reactance of all the condensers remains constant.

5. In combination, a source of waves, an inductance and an associated capacity tunable to said source, a load circuit adapted to absorb appreciable energy from said source and means for adjustably coupling said load circuit to said source without varying the frequency response of said inductance and capacity, said means comprising a plurality of series connected condensers the capacity of one of which is adjustably increased when the capacity of the other is decreased.

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