

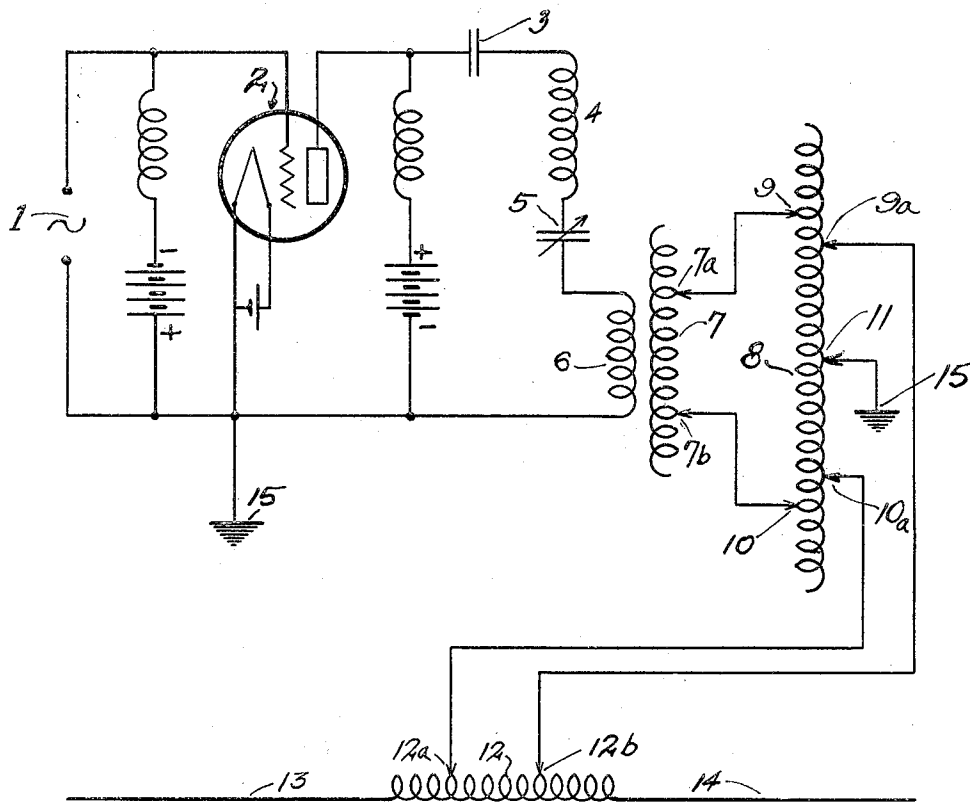
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COUPLING CIRCUIT ARRANGEMENT

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COUPLING CIRCUIT ARRANGEMENT

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My invention relates to coupling systems in general and more specifically to coupling systems employed in signaling systems.

An object of my invention is to provide a coupling system wherein the circuit arrangement is such as to efficiently transfer electrical energy between circuits having different symmetrical characteristics.

Another object of my invention is to provide a coupling system whereby high frequency energy may be supplied to a symmetrical circuit from an unsymmetrical thermionic tube circuit.

Still another object of my invention is to provide a coupling system especially suitable for transferring high frequency energy from an unsymmetrical tube circuit to a symmetrical load circuit.

A better understanding of the coupling system of my invention can be had by referring to the specification following and to the accompanying drawing which shows a schematic circuit arrangement of the coupling system of my invention.

Because of the electrostatic coupling of certain inductance and coil systems difficulty is encountered in the transferring of energy between unsymmetrical and symmetrical circuits. One of the more common examples of unsymmetrical circuits is that encountered when thermionic tubes are employed. In such systems it has been the practice to employ balanced circuit arrangements. Such a balanced circuit arrangement has been obtained by the provision of a circuit which is a substantial duplicate of the thermionic tube, by proportioning of the circuit characteristics and thereby balancing the thermionic tube circuit. Such an arrangement is familiar to those skilled in the art as a push-pull circuit. The employment of such a circuit arrangement necessitates the use of an additional thermionic tube and associated energy supply circuits. To obtain efficient operation of such a circuit arrangement it is necessary to have the respective input and output circuits of the thermionic tube electrically balanced. It is often desirable to employ a single thermionic tube as an amplifier or as a generator of electrical energy instead of a push-pull

circuit arrangement. When a single thermionic tube is employed in the last stage of the amplifier the output circuit is unsymmetrical. The energy is efficiently transferred to a circuit of symmetrical characteristics by employing the coupling circuit arrangement of my invention as hereinafter described.

The coupling circuit arrangement of my invention is schematically illustrated in the accompanying drawing. A thermionic tube 2 is employed in an amplifier circuit arrangement. The input circuit of thermionic tube 2 is excited by a source of signaling energy 1 whereby the energy in the output circuit is amplified in value. The amplifier circuit arrangement illustrated herein and referred to in the specification following relates to the amplification and transfer of high frequency electrical energy from an unsymmetrical circuit to a symmetrical circuit. However, it is obvious that the circuit arrangement would operate in an efficient manner for the purpose intended when audio frequencies are employed. The output circuit of thermionic tube 2, wherein amplified high frequency energy is present, comprises capacity 3, inductance 4, capacity 5 and inductance 6. Such an arrangement is of the series type and modified to especially illustrate the coupling circuit arrangement of my invention. The circuit including capacity 3, inductance 4, capacity 5 and inductance 6 may be a simple output circuit comprising only capacity 3 and inductance 6. Either of the above arrangements result in an unsymmetrical circuit arrangement. The cathode of thermionic tube 2 is usually connected to ground 15 and the cathode end of inductance 6 is at ground potential. The anode end of inductance 6 alternates through the positive and negative values while the ground potential end remains substantially constant.

The coupling circuit arrangement of my invention includes an inductance 7 inductively related to inductance 6 and the former connected in parallel with inductance 8 by means of adjustable contacts 7a, 7b, 9 and 10. The electrical center of inductance 8 is electrically connected to ground 15 by means of adjustable contact member 11. Adjustable con-

tact members 9a and 10a are electrically connected to inductance 12 by means of adjustable contact members 12a and 12b. Inductance 12, herein illustrated as lumped inductance, may comprise a straight portion of a radiating system and not necessarily a coil as shown. Two radiators 13 and 14 are connected with inductance 12 and being of equal length or having like frequency characteristics cause the circuit to be symmetrical or balanced. The radiating system 13, 14 is commonly referred to as a doublet. The electrostatic coupling is reduced to a minimum by connecting the electrical center of inductance 8 to ground 15, thereby establishing a node at this point. Adjustable contact members 9a and 10a may be positioned on inductance 8 on opposite sides of the center tap 11 when the connections 12a and 12b are correspondingly positioned on opposite sides of the center of inductance 12. When contact members 12a and 12b are not positioned symmetrically with respect to the energy distribution in the circuit 13, 14, contact members 9a and 10a may be adjusted accordingly along inductance 8. Inductance 8 may have aperiodic frequency characteristics or may have such characteristics as to respond to a wide band of frequencies.

While I have described my invention as applied to the coupling circuit between the output of the final stage of power amplification in a transmitter and a doublet radiating system, it will be understood that the coupling system of my invention is generally applicable for transferring electrical energy between an unsymmetrical circuit and a symmetrical circuit. By the terms "symmetrical" and "unsymmetrical" I have intended to include those circuits having a predetermined potential distribution in the circuit with respect to ground potential.

I realize that many modifications of the coupling circuit arrangement of my invention are possible and it is to be understood that my invention is not to be limited by the foregoing specification or by the accompanying drawing but only as defined in the appended claims.

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

1. In a signaling system, a symmetrical antenna circuit, an inductance connected in series with said antenna circuit, an unsymmetrical circuit, an inductance in said unsymmetrical circuit, signaling apparatus connected with said unsymmetrical circuit, a coupling circuit disposed between said inductances, said coupling circuit including a pair of parallel connected inductances, one of said parallel connected inductances being coupled with the inductance in said antenna circuit and the other of said parallel connected inductances being conductively con-

nected through adjustable taps with the inductance in said unsymmetrical circuit, and a path to ground from the electrical center of the inductance in said antenna circuit.

2. A coupling circuit for a high frequency transmitter including a doublet, an inductance connected in series between parts of the doublet, a high frequency transmitter circuit terminating in a coupling inductance and a coupling circuit extending between the series connected inductance in said doublet and the inductance in said transmitter circuit comprising a pair of inductance coils connected in parallel through variable tap connections, one of said inductances being inductively coupled with the output circuit of said transmitter and the other of said inductances being conductively connected by a circuit including variable tap connections in parallel with the series connected inductance in said doublet and means for establishing a nodal point in said last mentioned circuit.

3. In a high frequency transmission system, a doublet, an inductance connected in series between parts of said doublet, a high frequency transmitter terminating in a coupling inductance and a coupling circuit disposed between the inductance in said doublet and said coupling inductance comprising a pair of parallel connected inductances, one of said parallel connected inductances being inductively related to the coupling inductance in said transmitter and the other of said parallel connected inductances being variably connected in common through variable taps with the aforesaid parallel connected inductance on the one hand and being variably connected through taps with the inductance in said doublet on the other hand and a connection to ground from said common inductance.

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