

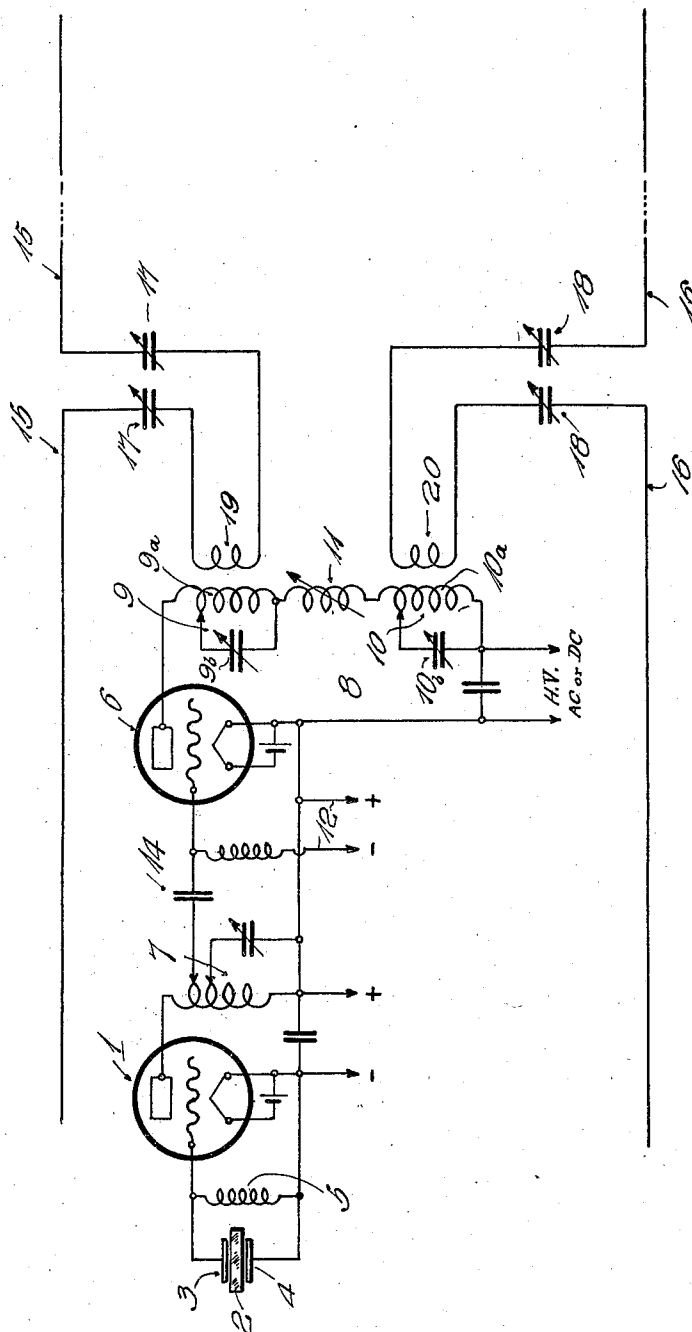
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RADIO TRANSMISSION SYSTEM

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RADIO TRANSMISSION SYSTEM

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My invention relates broadly to high frequency signal transmission systems and more particularly to a multiwave piezo electric crystal controlled high frequency transmitter.

One of the objects of my invention is to provide a circuit arrangement for a piezo electric crystal controlled transmitter by which a plurality of signaling frequencies may be transmitted simultaneously from the same transmission apparatus.

Another object of my invention is to provide a circuit arrangement for piezo electric crystal controlled transmitter circuits in which a plurality of predetermined frequencies are sustained by a piezo electric crystal element and simultaneously transmitted.

Another object of my invention is to provide a transmission system in which a high frequency piezo electric crystal controlled oscillator is arranged to excite a power amplifier or frequency multiplier in such manner that more than one frequency may be derived each related to the frequency of the piezo electric crystal element for the simultaneous transmission of signals at the plurality of separate frequencies.

Still another object of my invention is to provide a high frequency signal transmission circuit including a piezo electric crystal controlled oscillator with a plurality of separate antennae systems each arranged to be excited at different frequencies derived from the piezo electric crystal controlled oscillator circuit.

My invention will be more clearly understood from the following specification by reference to the accompanying drawing which diagrammatically illustrates the application of the circuit arrangement of my invention to a high frequency piezo electric crystal controlled transmission system.

Referring to the drawing in more detail reference character 1 designates an electron tube having its input and output circuits arranged in such manner that the tube functions as an oscillator for sustaining high frequency oscillations at the frequency of piezo electric crystal element 2, the piezo electric crystal

element 2 being positioned between conductive plates 3 and 4 and disposed in shunt with the high frequency choke coil 5. An electron tube 6 is provided having its input circuit coupled with the oscillator circuit through the tuned circuit 7 and connected in such manner that the tube functions as a high frequency power amplifier or in such manner that the tube functions simultaneously as a high frequency power amplifier and frequency multiplier.

The output circuit of the tube system 6 is designated at 8 as including a pair of independently tuned sections 9 and 10 separated by a variable inductance 11. Tuned circuit 9 is constituted by inductance 9^a shunted by variable condenser 9^b. Tuned circuit 10 includes inductance 10^a shunted by variable tuning condenser 10^b. The tuned circuit 9 is adjusted to one selected frequency while the tuned circuit 10 is adjusted to a different selected frequency. By supplying a high negative biasing voltage across the leads 12 the tube 6 operates as a frequency multiplier circuit. Tube 6 is supplied with high frequency excitation through condenser 14 which connects with the output circuit 7 of tube 1 at the frequency F_1 of the piezo electric crystal element 2. The tuned circuit 9 may be adjusted to a harmonic frequency F_2 by changing the position of variable condenser 9^b. The tuned circuit 10 may be adjusted to the harmonic frequency F_3 by changing the position of tuned condenser 10^b.

The plate circuit energy may be transferred through any type of coupling with the transmission circuit. I have illustrated separate antennae or radiating systems at 15 and 16 each independently tuned as represented at 17 and 18 and including inductances 19 and 20. Inductance 19 is electromagnetically coupled with inductance 9^a. Inductance 20 is electromagnetically coupled with inductance 10^a.

The relative amounts of energy of the two different frequencies F_2 and F_3 , which may be any desired harmonic of the frequency F_1 of the piezo electric crystal device 2 but which are usually the second and third harmonics, respectively, can be controlled by slight ad-

justments of condensers 9^b and 10^b and by the adjustment of the inductance 11 which is located between the tuned circuits 9 and 10.

Modulation of the transmitter may be effected by suitable circuits associated with the biasing circuit represented at 12. Instead of exciting circuit antennæ systems the power amplifier may deliver energy to the same antennæ systems at different frequencies. The simultaneous transmission at separate frequencies largely reduces the loss of signals arising by reason of the phenomena of fading. The antennæ 15 and 16 may possess different characteristics for the propagation of energy at the separated frequencies in such manner that fading at the different frequencies is compensated at a distant receiver.

Other and further modifications of the circuit arrangement of my invention may be made and no limitations upon my invention are intended other than are imposed by the scope of the appended claim.

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

A high frequency transmission system comprising a piezo electric crystal element, an electron tube oscillator circuit for sustaining oscillations developed by said piezo electric crystal element, an electron tube having input and output circuits with the input circuit thereof connected with said electron tube oscillator circuit, a pair of independently tuned circuits connected in series in said output circuit, a tuning device located between said pair of independently tuned circuits and separate antennæ systems independently coupled to each of said tuned circuits one of said antennæ systems being arranged to radiate signaling energy at a frequency which is a harmonic of the frequency of said piezo electric crystal device and the other of said antennæ circuits being arranged to radiate signalling energy which is a different harmonic of the frequency of said piezo electric crystal device, said tuning device operating to regulate the relative amount of energy supplied to said antennæ at said different frequencies, said signaling energy being maintained in predetermined frequency displacement by operation of said piezo electric crystal device.

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