Aug. 18, 1931. W. KUMMERER 1,819,469

RADIO SYSTEM

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Fig. 1

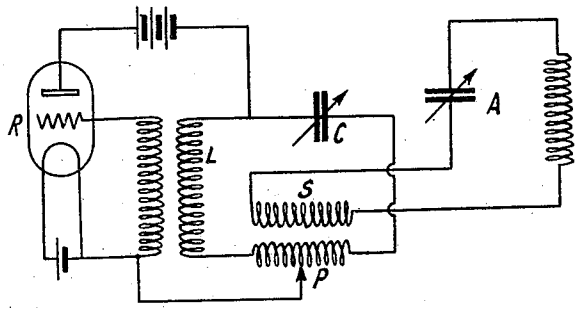
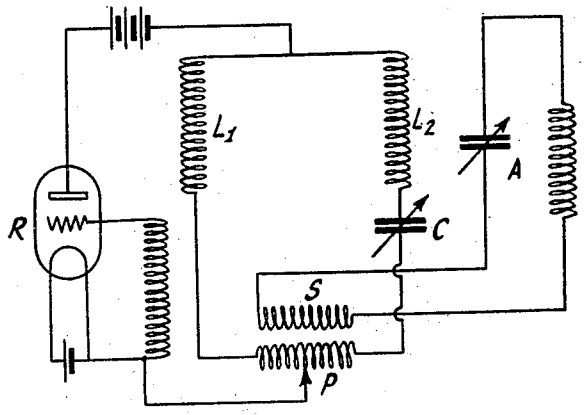


Fig. 2



INVENTOR
WILHELM KUMMERER
BY Ira J. Adams
ATTORNEY

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WILHELM KUMMERER, OF BERLIN, GERMANY, ASSIGNOR TO GESELLSCHAFT FÜR DRAHTLOSE TELEGRAPHIE M. B. H., OF BERLIN, GERMANY, A CORPORATION OF GERMANY

RADIO SYSTEM

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The present invention relates to means adapted to avoid changes in the natural frequency of tuning circuits in transmitters and receivers by the change of coupling of tuned systems which are coupled with the circuits first mentioned. This scheme is particularly important and valuable in connection with tube transmitters and tube receiving arrangements in which the useful or load circuits are connected to the tuning circuits.

The invention is based upon the idea that the coupling of load circuits, or of another oscillation circuit, with the tuning circuit which is coupled to the generator by a branch coupling, must be accomplished in such a way that by the coupling there is caused an equal change in the ohmic resistance of both the inductive as well as the capacitive branch of the tuning circuit. With this purpose in view, the circuit branch is connected with a separate coil inserted in the tuning circuit, the useful or load circuit being inductively coupled with said coil. The number of the turns, and the position of the primary and of the secondary coils are so chosen that the values of the resistance transferred become equally large in the inductive as well as in the capacitive branches of the tuning circuit. Of course, the coupling to the tuning circuit need not necessarily be inductive in nature, indeed, it may be effected also by the aid of coupling condensers or by resistances. The invention is predicated upon that the united circuits are tuned to the frequency of the tuning circuits, inasmuch as the end aimed at is attained only when by the coupling there is affected solely a change in the ohmic resistance in the branches of the tuning circuits.

A clearer understanding will be had from a consideration of the accompanying drawings in which:—

Fig. 1 shows a circuit diagram embodying this invention.

Fig. 2 shows a modified circuit.

In a circuit arrangement in accordance with the invention as illustrated in Fig. 1, R is an electron tube which is back-coupled to produce oscillations, L—C the working circuit which ordinarily contains only a self-inductance L and a capacity C. There is inserted in addition an induction coil P, the supply lead being taken off, at the middle of the same, and this coil is so disposed that it will not be in coupled relationship with coil L. A load circuit A (or an aerial) according to the invention is so coupled with coil P by means of the coil S. and the mutual inductance of coils P and S is so set, that equal resistances are transferred to both branches of the working circuit.

A further development of the invention consists in inserting in the capacitive branch of the working circuit a further self-inductance coil in series with the condenser, the value or size of said coil being equal to the self-inductance of the inductive branch which is not used for the coupling with the load circuit. In this scheme, so far as the fundamental frequency is concerned, no change is produced comparatively with the arrangement first described, but an advantage is obtained as regards overtones or harmonics, seeing that the impedance offered by the condenser to overtones is very small, with the result that the two branches of the working circuit contain nearly the same impedances for the overtones. The currents of the overtones in these two branches therefore, as regards their value, are nearly alike, but opposite in direction, with the result that overtones are precluded from the load circuit which must be coupled with the working circuit in a way as hereinbefore described.

An arrangement built in conformity with what has been outlined is shown in Fig. 2. The working circuit accordingly consists of the two equal self-inductance coils L_1 and L_2, and the coil P to which in turn the working circuit A is coupled by the aid of coil S in a way as hereinbefore described.

The practical advantages offered by the invention in the case of a transmitter and a receiver, to the tuning circuit of which the antenna is connected, consist consequently in eliminating changes in the frequencies of the tuning circuits in the presence of different degrees or factors of coupling. For transmitter arrangements with self-excitation at the frequency of the working circuit, it must be noted, the coupling between this circuit

and the antenna must, of course, be extremely loose in order that no wave decomposition may be produced. The relations as stated of course presuppose the existance of impressed oscillations.

Having thus described my invention, what I claim is:—

1. In a radio frequency system, a source of oscillations having a fundamental and harmonics existing therein, said source including a circuit tuned to the fundamental frequency having inductive and capacitive branches connected in parallel and connected to said source of oscillations, said inductive branch consisting of a coil and a portion of a coupling inductance connected in series, said capacitive branch consisting of a coil, a condenser and a second portion of a coupling inductance connected in series and a load circuit coupled to each of said coupling portions whereby the introduction of harmonic frequencies in said load circuit is substantially suppressed.

2. In combination an oscillation generator having an output circuit comprising capacitive and inductive branches arranged in parallel, a coupling impedance, portions of which are connected in each of said branches, and a self inductance coil connected in and forming a part of said capacitive branch, an intermediate tuned oscillating circuit coupled to said coupling impedance and means for coupling a utilization circuit to said intermediate circuit.

3. In combination, an oscillation generator having an output circuit comprising capacitive and inductive branches arranged in parallel and a coupling impedance portions of which are connected in each of said branches, an intermediate tuned oscillatory circuit coupled to said coupling impedance, a self inductance coil connected in said capacitive branch the self inductance of which is approximately equal to the self inductance of said inductive branch not utilized for coupling said intermediate circuit and means for coupling a utilization circuit to said intermediate circuit.

WILH. KUMMERER.