PATENT SPECIFICATION

Application Date: June 27, 1923. No. 16,737/23.
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PROVISIONAL SPECIFICATION.

Improvements in Radio Transmitting Systems.

I. Thomas Lydwell, Eckersley, of "Weatheroak", Danbury, Essex, British subject, do hereby declare the nature of this invention to be as follows:

Filter circuits, chains of inductances and capacitances have been extensively used in receiving and telephone circuits for the purpose of eliminating undesired frequencies, but have not yet been successfully applied in transmitting valve circuits to cut out the undesirable harmonics which are radiated when the set is working efficiently.

This failure is due to the fact that when the filter is placed between the valve set and the aerial in the feed circuit of the former oscillations of the natural period of the filter circuit are set up owing to the presence of capacity reaction in the valves and other spurious reaction which cannot usually be eliminated.

Even when it is possible by careful balancing to eliminate these spurious oscillations the arrangement is inefficient on account of the high impedance of the feed circuit to the high frequency harmonics.

According to this invention these difficulties are obviated by the use between the anode feed circuit and the filter circuit of a closed oscillatory circuit tuned to the fundamental frequency. The filter circuit is shunted across a suitable fraction of the inductance of the closed circuit and its end terminals are connected across a few turns of the aerial tuning inductance.

The tuned circuit acts as a filter for any oscillations in the filter circuit the frequency of which differs from that of the tuned circuit and therefore the potentials applied by these oscillations to the plate of the valve and by capacity reaction to the grid are relatively small and the tendency to self oscillations is reduced to a minimum.

Keying with such an arrangement is preferably effected by arranging a resistance in parallel with the aerial tuning inductance and alternately connecting one of the end terminals of the filter circuit to the resistance and to the inductance. By suitably adjusting the value of the resistance the load on the valve may thus be kept constant.

Dated the 27th day of June, 1923.

CARPMAELS, RANSFORD & NEWTON,

Agents for Applicant,


COMPLETE SPECIFICATION.

Improvements in Radio Transmitting Systems.

I. Thomas Lydwell, Eckersley, of "Weatheroak", Danbury, Essex, British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

Filter circuits have been extensively used in receiving and telephone circuits for the purpose of eliminating undesired
frequencies, but have not yet been successfully applied in transmitting valve circuits to cut out the undesirable harmonics which are generated when the set is working efficiently.

This failure is due to the fact that when the filter is placed between the valve set and the aerial in the feed circuit of the former, oscillations of the natural period of the filter circuit are set up, owing to the presence of capacity reaction in the valves and other spurious reaction which cannot usually be eliminated.

Even when it is possible by careful balancing to eliminate these spurious oscillations, the arrangement is inefficient on account of the high impedance of the feed circuit to the high frequency harmonics.

According to this invention I couple the filter circuit to the anode feed circuit through a closed oscillatory circuit which is tuned to the fundamental frequency and is not connected to the anode circuit. The filter circuit may either be shunted across the suitable fraction of the inductance of the closed circuit, or be coupled thereto, and its end terminals may be connected across a portion of the aerial tuning inductance, or it may be coupled thereto.

The tuned circuit acts as a filter for any oscillations in the filter circuit, the frequency of which differs from that of the tuned circuit, and therefore the potentials applied by these oscillations to the plate of the valve and by capacity reaction to the grid are relatively small and the tendency to self-oscillation is reduced to a minimum.

Keying with such an arrangement may be effected by arranging a resistance in parallel with the aerial tuning inductance and alternatively connecting one of the end terminals of the filter circuit to the resistance and to the inductance. By suitably adjusting the value of the resistance, the load on the valve may thus be kept constant.

My invention is illustrated by the accompanying drawing, in which 1 is the main oscillating valve and 2 is the inductance in the anode circuit thereof.

L1 C1 is the closed circuit tuned to the transmitting wave length. This circuit is closely coupled to the inductance 2, and also to an inductance 3 across one end of a filter circuit, the other end of which is formed of an inductance 4 coupled to the aerial 5.

The filter circuit illustrated, consists of a series of inductances 6 and shunt condensers 7. The first and last of the inductances 6 are of a value half that of the intermediate inductances.

The conditions which determine the value of each of the intermediate inductances and of the condensers, are that

\[ p^2 LC = 2 \]

where \( p = 2\pi \) frequency, and that the ratio of the voltage across the filter to current through the filter should be equal to \( \frac{p^2}{2} \). This choice of constants ensures that (1) the amplitude of the fundamental frequency \( n \) is unchanged in transmission along the filter, and (2) all harmonics are reduced to a small amplitude which depends on the number of stages of the filter.

The coils 3 and 4 should be provided with a large number of adjustable tappings. The tapping on the coil 4 should be such that the impedance of the filter should be as above stated. The tapping on the coil 3 determines the ratio of the current in the circuit \( L1 C1 \) to that in the aerial. This ratio should not be made too small, otherwise the difficulty of avoiding the natural oscillations of the filter circuit will reappear.

Other forms of filter circuit may obviously be employed. Thus the end inductances 6 may be omitted and each of the end condensers may have a capacity twice that of each of the intermediate condensers. Or the intermediate inductances may be arranged in the two sides of the filter circuit alternately, instead of being all on the one side, as shown in the figure.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A radio transmitting system, in which a filter circuit is coupled to a valve generator through a closed oscillatory circuit tuned to the fundamental frequency and not connected to the generator, substantially as described.

2. A radio transmitting system, substantially as described with reference to the drawing.

Dated this 26th day of March, 1924.

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