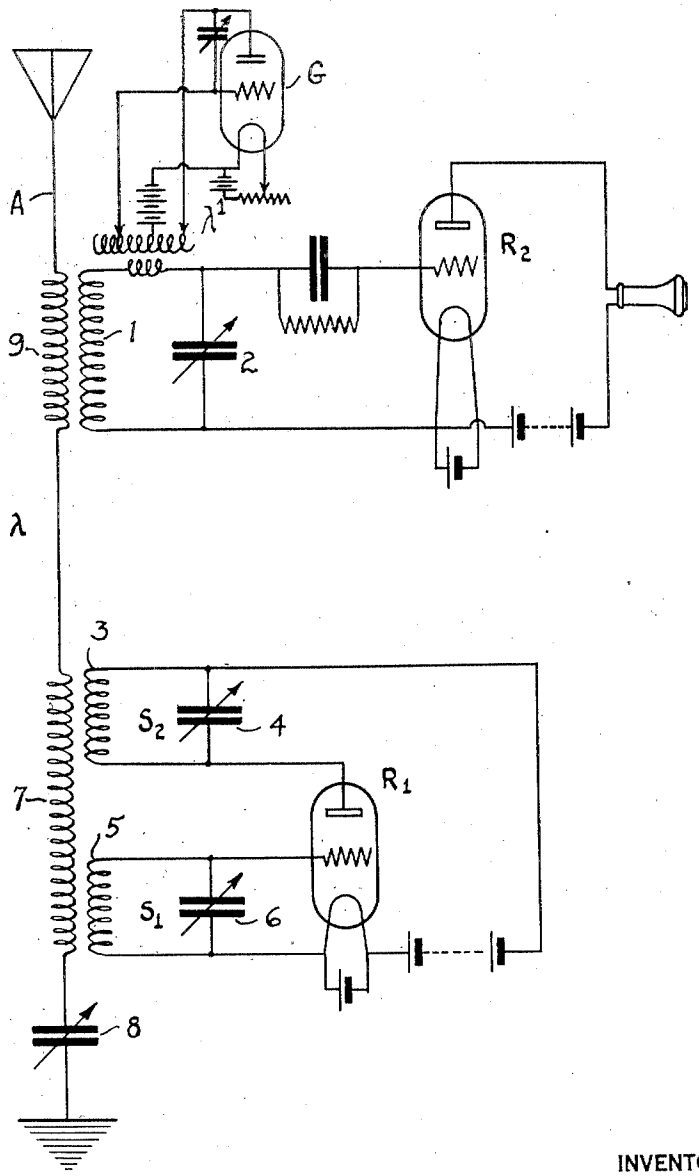
Aug. 6, 1929. G. VON ARCO 1,723,451

RADIO RECEIVING SYSTEM

Filed April 9, 1925



INVENTOR
GEORG VON ARCO
BY Ira J. Adams
ATTORNEY

Patented Aug. 6, 1929. 1,723,451

UNITED STATES PATENT OFFICE.

GEORG VON ARCO, OF BERLIN, GERMANY, ASSIGNOR TO GESELLSCHAFT FÜR DRAHTLOSE TELEGRAPHIE M. B. H., OF BERLIN, GERMANY, A CORPORATION OF GERMANY.

RADIO RECEIVING SYSTEM.

Application filed April 9, 1925, Serial No. 21,781, and in Germany April 10, 1924.

My invention relates broadly to radio receiving systems in which signalling energy is picked up from the ether by suitable means and made to operate a suitable indicator.

More specifically my invention relates to radio telephony and to an arrangement whereby the troublesome effects of static is lessened.

An object of the invention is to provide an arrangement of this kind which will eliminate, or greatly lessen, the effects of the type of static which sets the receiving circuits into oscillation at their natural frequencies.

Other objects will be apparent from the following description and claims when considered with the accompanying drawing in which the single figure represents one of the embodiments of my invention.

It is well known that by the transmission of the carrier wave of the sending station to the receiving apparatus, atmospheric disturbances, i. e., the impact-excited oscillations of the oscillatory receiving circuits, are considerably amplified in the latter. This fact becomes most clearly noticeable when it is observed how suddenly these disturbances vanish when a transmitter non-modulated by speech, to which the receiving apparatus is tuned, is being disconnected.

The subject matter of the present invention aims at eliminating these shock-excited oscillatory phenomena in receiving apparatus by connecting with the receiving aerial a cathode tube by what is known as negative regenerative coupling. If the receiving antenna is tuned to the carrier frequency, and if a certain amount of negative regenerative coupling is provided and inserted, the atmospheric disturbances suddenly disappear.

It is known that the transmission active in telephony takes place on side bands which result by addition and subtraction of the various acoustic frequencies from the fundamental carrier frequency.

The receiving apparatus conforming with the present invention therefore, apart from the tuned antenna provided with negative regenerative coupling, is furnished with a secondary circuit characterized by low losses and in loose coupling relationship with the aerial, said secondary circuit being tuned, not to the carrier frequency, but rather to a convenient value inside one of the two side-band frequencies. These side frequencies, since they depart from the tuning, produce in the receiving aerial impressed oscillations of a phase differing from the one due to the shock-excited resonance oscillation. For this different frequency, the negative regenerative coupling therefore need no longer be negative; in fact, it may be practically of zero value, or may even become positive in nature.

Now, in order to obtain the full intensity of transmission, the carrier frequency, at a suitable place, is again supplied to the receiving apparatus by means of a local generator in well-known manner, this being done in such a way that thereby as favorable an acoustic reproduction as possible is realized. For instance, in case of a transmitter which does not work perfectly proportional for all acoustic frequencies, the low acoustic frequencies may be especially amplified.

Making reference to the drawing which forms a part of my disclosure, A represents an antenna circuit which is tuned by means of condenser 8 to the carrier frequency λ of the received wave. Closely coupled with the antenna circuit A are the oscillatory circuits S_1 and S_2 which are so connected as to give a reversed feed back to the antenna. The oscillatory circuits S_1, S_2 are tuned to the carrier frequency by means of tuning condensers 6 and 4 respectively and are connected through an electron tube R_1 and are inductively and closely coupled with the antenna circuit at 7, as above stated through coils 5 and 3. The nature of the coupling is so selected that with the antenna circuit tuned to the carrier frequency, the oscillatory circuits work to increase damping rather than to decrease it at the carrier frequency.

The true receiver for the system is the tube R_2. The receiving circuit for the tube R_2 is a low loss circuit coupled to the antenna circuit A at 9 through coil 1 and is tuned to the frequency of one of the side bands, λ' for example, of the carrier frequency by means of tuning condenser 2. By accurate tuning of the antenna circuit A and oscillatory circuits S_1 and S_2 of the tube circuit R_1 increased damping of the tube is eliminated or even somewhat of a phase displacement ensues so that a reduction in damping occurs for the wave λ'.

The local carrier frequency generator above referred to is shown by the oscillator tube G coupled to the input side of tube R_2 whereby oscillations are impressed upon said tube. It

is therefore evident from the above arrangement that the locally generated carrier frequency together with the side band above referred to will be impressed in the tube R_2. While only a single embodiment has here been shown it will be evident that numerous other modifications of the broad idea will occur to persons skilled in the art without departing from the spirit of the invention as recited in the appended claims.

Having described my invention, I claim:

1. In a signalling system wherein signals are transmitted by means of a modulated high frequency wave, energy transferring means tuned to the carrier wave, carrier frequency damping means coupled thereto and an indicating circuit coupled to said energy transferring means and tuned approximately to the frequency of one of the side bands accompanying said carrier frequency.

2. In a signalling system wherein signals are transmitted by means of a modulated high frequency carrier wave, energy transferring means tuned to the carrier frequency, a negative regeneratively coupled tube circuit coupled thereto and tuned to said carrier frequency and an indicating circuit loosely coupled to said energy transferring means and tuned approximately to the frequency of one of the side bands accompanying said carrier frequency and an oscillation generator coupled to said indicator circuit.

3. In a receiving device for a signalling system wherein signals are transmitted by means of a modulated high frequency wave, energy transferring means tuned to the carrier frequency, a negative regeneratively coupled tube circuit coupled thereto and tuned to said carrier frequency, an indicating circuit coupled to said energy transferring means and tuned approximately to the frequency of one of the side bands accompanying said carrier frequency, and a local oscillator for supplying said indicating circuit with oscillations approximately equal in frequency to the carrier wave frequency.

4. In a signalling system wherein signals are transmitted by means of a modulated high frequency wave, energy transferring means tuned to the carrier wave, carrier frequency damping means comprising a reversed feed back circuit closely coupled with said energy transferring means, and a radio frequency receiving circuit coupled to said energy transferring means and tuned approximately to the frequency of one of the side bands accompanying said carrier frequency and means for impressing thereon oscillations of approximately the same frequency as the carrier wave frequency.

5. In a signalling system wherein signals are transmitted by means of a modulated high frequency wave, energy transferring means tuned to the carrier frequency of the transmitting station from which signals are received, a reversed feed back circuit closely coupled with said energy transferring means, said feed back coupling being adapted to selectively damp the carrier frequency, a low loss intermediate circuit loosely coupled with said energy transferring means, said low loss intermediate circuit being tuned to the frequency of one of the side bands accompanying said carrier frequency, and means associated with said intermediate circuit for reimpressing the carrier frequency upon the same, said intermediate circuit being adapted to receive a signal substantially the same as originally transmitted and free from static disturbances.

6. In a signalling system wherein signals are transmitted by means of a modulated high frequency wave, energy transferring means tuned to the carrier wave, carrier frequency damping means coupled thereto, an indicating circuit coupled to said energy transferring means and tuned approximately to the frequency of one of the side bands accompanying said carrier frequency, and a local oscillator coupled to said indicating circuit.

7. In a signalling system wherein signals are transmitted by means of a modulated high frequency wave, energy transferring means tuned to the carrier wave, carrier frequency damping means including a reverse feed back circuit coupled to said transferring means, and an indicating circuit coupled to said energy transferring means and tuned approximately to the frequency of one of the side bands accompanying said carrier frequency.

8. In a signalling system wherein signals are transmitted by means of a modulated high frequency wave, energy transferring means tuned to the carrier wave, carrier frequency damping means coupled thereto, and a low loss indicating circuit coupled to said energy transferring means and tuned approximately to the frequency of one of the side bands accompanying said carrier frequency.

9. A method of eliminating static disturbances during radio reception which consists in collecting modulated signal energy of a predetermined carrier frequency, damping said carrier frequency with local oscillations having a frequency equal to the carrier frequency, and simultaneously detecting one of the side bands of said carrier frequency for reception.

GEORG VON ARCO.