

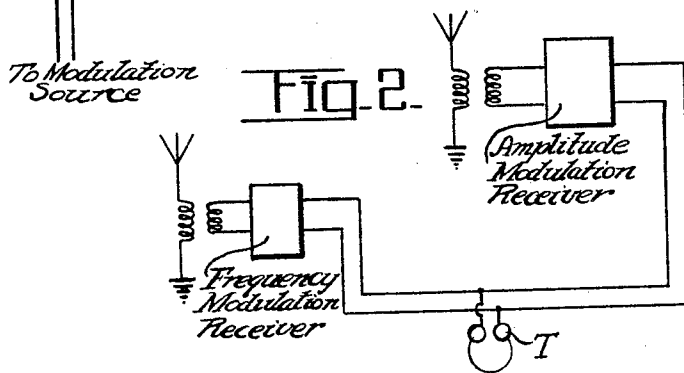
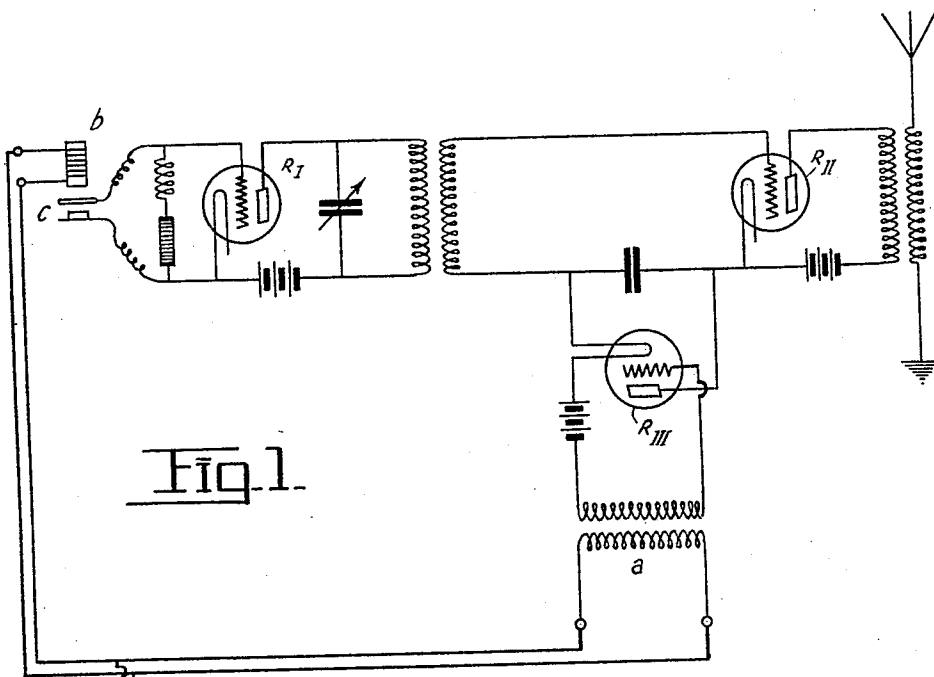
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SIGNALING

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SIGNALING

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To overcome fading phenomena in wireless telegraphy, a great number of suggestions have been made in the prior art. One of these suggestions consists in subjecting the frequency of the transmitter to constant periodic fluctuations known as "wobbling", in order that the time of operation within the fading range of the radio frequency spectrum may be rendered as transient and as brief as possible. A similar suggestion consists in using frequency modulation instead of the usual amplitude modulation of the transmitter, in which the "miss" in frequency owing to fading, referred to audio frequency, and thus the impairment of the quality of intelligence transmission is considerably lower than in amplitude modulation of the transmitter.

The present invention offers a further degree of safety by insuring the unimpaired condition of the entire frequency complex or range of the communication. It consists of a combination of amplitude and frequency modulation as hereinafter to be explained by reference to the drawing. As an example of amplitude modulation there shall be used here the well-known grid d. c. telephone modulation scheme, while for frequency modulation there is provided an electromagnetically controlled diaphragm condenser used as the crystal setting of a crystal-controlled tube transmitter.

The present invention is diagrammatically illustrated in the accompanying drawing wherein,

Figure 1 illustrates a transmitter transmitting carrier energy frequency modulated and amplitude modulated with the same signal, and,

Figure 2 illustrates a receiving system for separately demodulating the frequency and amplitude components of the transmitted signal and having means for combining and translating the demodulated energy.

Referring to the drawing, RI is the crystal-controlled oscillator tube, RII the transmitter tube and RIII the modulator tube. *a* is the modulating transformer, *b* the electromagnet acting upon the diaphragm *c*. According to the invention, the communica-

tion to be transmitted, whether telephony, picture telegraphy, television, acoustic (voice) telegraphy or the like, is simultaneously supplied to the transmitter at points *a* and *b*. To each one of the frequencies to be transmitted, there then corresponds a pair of side bands owing to amplitude modulation; while, owing to frequency modulation, there is produced a variation of the carrier wave frequency at the rhythm of the modulating frequency.

Reception according to the invention takes place as shown in Fig. 2 by the aid of two simultaneously working demodulators, an amplitude demodulator (detector, audion), and a frequency demodulator (filter circuit), which in the present case are suitably combined with the same reproducer apparatus T. The invention also covers the case where each demodulator has its own receiver as well as the case where both demodulators are served from the same receiver. If, then, due to fading actions, both of the two modulating transmissions should happen to be partly destroyed en route to the receiving station, there will nevertheless be a great likelihood of undisturbed or unutilated reproduction and reception by the co-action of the two modulating means of the desired communication. It is also possible to use separate reproducer apparatus for both demodulators, and in that case the former are caused to co-act.

During periods when no disturbances owing to fading occur or in cases where the effects of fading actions are overcome by other ways and means, the invention allows of simultaneous transmission of two communications on one and the same way in a manner free from cross-talk by that for one thereof, amplitude modulation is used, and for the other one frequency modulation. If the former is employed, for instance, for telephony, then frequency modulation may be used for some other purpose such as telegraphy, telephony, picture telegraphy, television or the like, without the communication transmitted by amplitude modulation being caused to undergo any loss in energy. For both kinds of modulation, fundamental-

ly speaking, any desired method may be resorted to, with this restriction, however, that for amplitude modulation, suitably a method based upon a mean antenna value is used in order that for frequency modulation there may constantly be available a mean value of the amplitude.

In case that different communications are used for both kinds of modulation, the two demodulators most suitably are made to work upon different reproducing apparatus.

Both kinds of modulation could be multiply (severally) utilized by frequency graduations, either for different communications or else by one and the same communication whenever greater safety against fading is to be insured.

I claim as my invention:

1. In apparatus for the reduction of fading, the combination of an oscillation generator, means for varying the frequency of oscillations generated in accordance with a desired signal, means for amplitude modulating the frequency modulated oscillations with the same desired signal, a single antenna for radiating the amplitude and frequency modulated oscillations, and, a receiving system for receiving frequency and amplitude modulated oscillations, said receiving system having means for separately demodulating the amplitude and frequency components of the received oscillations, means for combining the demodulated oscillations and a single device for translating the combined demodulated oscillations.

2. In apparatus for the reduction of fading of signals, a thermionic oscillation generator, a source of signals, means interposed between said source of signals and said generator for varying the frequency of the wave generated in accordance with the signals from said source, a utilization circuit connected with said generator, said circuit being responsive to the frequency modulated carrier, and means interposed between said signal source and said utilization circuit for modulating in amplitude the carrier energy in said utilization circuit at signal frequency.

3. Apparatus for the reduction of fading of signals including thermionic means for producing a carrier wave, means connected with said carrier producing means for modulating in frequency the carrier energy produced thereby in accordance with the desired signal, a thermionic relay having input electrodes and output electrodes, means for impressing said frequency modulated carrier energy on the input electrodes of said tube, means for modulating the amplitude of said frequency modulated carrier energy in accordance with the same desired signal, and a work circuit connected with the output electrodes of said last thermionic relay.

4. Apparatus for the reduction of fading of signals including thermionic means for producing carrier energy, means connected with said carrier energy producing means for modulating in frequency the carrier energy produced therein in accordance with the desired signal, thermionic means for modulating in amplitude the frequency modulated carrier energy in accordance with the same desired signal, means for transmitting the amplitude and frequency modulated energy, a receiving system for receiving frequency and amplitude modulated signals, said receiving system including separate absorption members, separate demodulating receivers, and a single translating device.

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