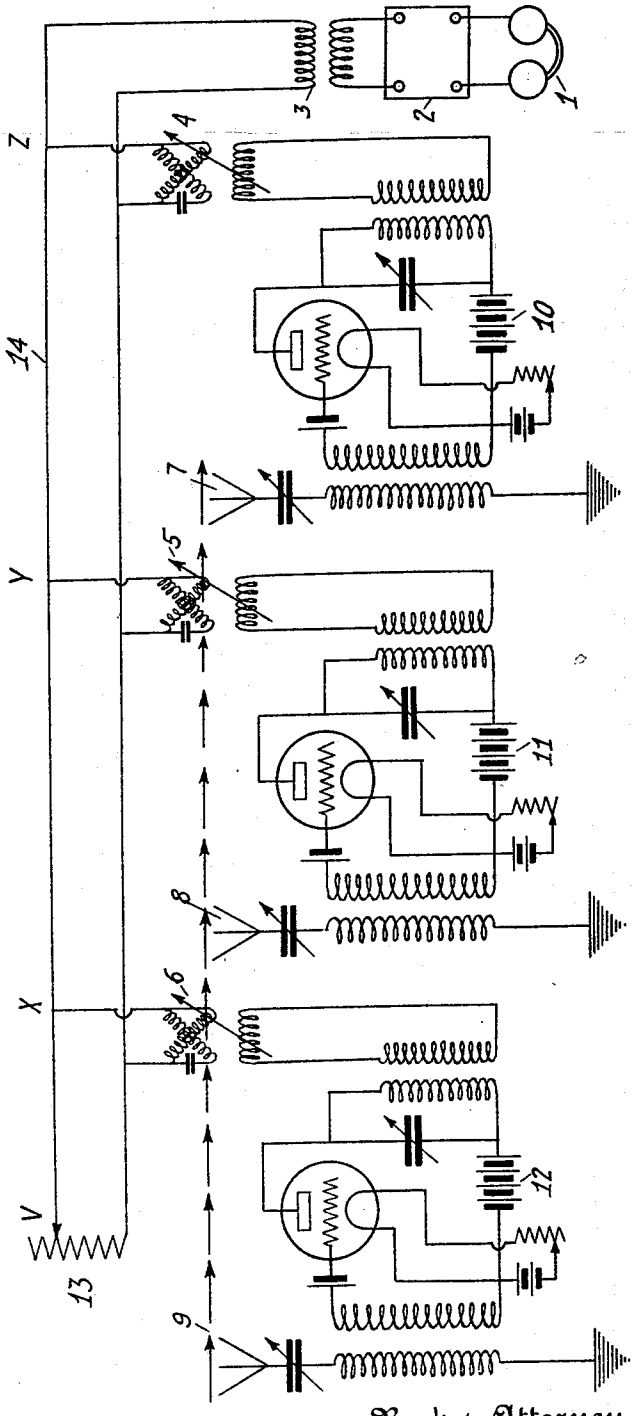
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SHORT WAVE RECEPTION

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SHORT-WAVE RECEPTION

Application filed June 19, 1925. Serial No. 38,166.

The object of this invention is to aid in the reception of signals and intelligence by means of wireless or Hertzian waves. In particular it operates to eliminate the effects of fading, static and other interfering disturbances.

These objects are obtained by the use of a receiving system which has directional characteristics and in addition, uses a series of stations at which oscillations may be intercepted.

Another advantage obtained is that with a multiple antenna system greater reliability and less interference is occasioned. This is true because interference or absence of signal at any one of the antenna stations is alleviated by the constancy of reception of possibly an increase in the others.

Other objects and advantages will appear in connection with the annexed specification, claims, and drawing, the single figure of which shows schematically my arrangement.

1 is a pair of receivers or other equivalent apparatus, possibly relays, repeaters, etc. 2 is a receiving apparatus which detects the incoming signal wave coupled to a transmission line at 3.

This receiving system is so arranged that it is responsive to a signal wave which is comparatively short. This signal wave must be modulated at another frequency of greater wave length. This modulated carrier wave affects the several antennæ 7, 8, 9, etc., simultaneously. It is detected by the detectors 10, 11, 12, etc., thereby resulting in the longer wave length modulating wave in their output coils, which is fed through the phase adjusters 4, 5, 6, etc., connected to the transmission line in any convenient manner.

13 is an impedance located at the free end of the line of such a value as to prevent surges or undesirable standing waves at the end of the line.

With this system the advantages of directivity and "diversity factor" are both obtained. If we assume that the short wave high frequency carrier is modulated at a frequency of 20,000 cycles (corresponding to a wave length of 15,000 meters) then the short wave receivers may be placed along this line at about the same spacing as the modulating wave length, that is, 15,000 meters, in which case they will receive these waves simultaneously. The output of each receiver into the transmission line will be the 20,000 cycle modulation of the transmitted short wave signal. This is fed into the transmission line in the proper phase relation by means of the local phase adjuster. In order to prevent reflections of these signals, the transmission line is terminated at the end opposite the central station in a so-called "surge impedance".

The signal from the desired direction arrives first at X, next at Y and then at Z. The 20,000 cycle wave sent on to the line when the space wave arrives at X travels to Y and toward the end V. The energy travelling toward V is counteracted or absorbed in a surge impedance Z of the proper value. The energy moving toward Y arrives there just in time to be in phase with the output of the high frequency receiver at Y. Similarly the current on the line arrives at Z just in time to be in phase with the output of the high frequency receiver at Z, etc., for any number of receivers along the line, so that the outputs of all of the individual receivers are cumulative for high frequency signals whose wave front travels from V toward the receiving central station. For signals moving in the direction away from the central station toward the end V, the outputs are not cumulative, and the resultant of them is anyway not reflected from the end V, and so does not reach the receiver 2. The functioning of this system, in respect to directivity, is similar to the operation of a long wave "wave antenna", the short waves being changed to long waves before being applied to the line, which is equivalent to a wave antenna.

The various short wave pick-ups should be

separated geographically, and preferably are separated more than one short wave length apart. With this arrangement, consequently, the effects of fading and static are, to a certain degree, obviated, and this feature is independent of the directive operation. In this respect the invention is somewhat similar to that disclosed in my application No. 38,165 filed June 19, 1925.

It is not intended to limit the above described apparatus or combinations of it beyond the scope indicated in the annexed claims.

I claim:

1. A method of receiving signals which includes detecting oscillations, which are intercepted intermittently along the line of propagation, to obtain the modulation, retransmitting and adjusting the relative phase of the detected oscillations to combine in phase with the similarly detected modulation outputs at the other points, and preventing wave reflections from interfering with the detected outputs.

2. A method of receiving signals which includes intercepting oscillations intermittently along the line of propagation, detecting the oscillations to reduce their frequency, retransmitting and adjusting the relative phase of the detected oscillations to combine in phase with the similarly detected output oscillations at the other points, and preventing wave reflections during transmission.

3. In combination, a transmission system connected to a central receiving station, phase adjusters associated with the transmission system, detectors coupled to the phase adjusters, and an impedance on the free end of the transmission system of such a value as to prevent reflection of the signal waves.

4. In combination, a transmission system connected to a central receiving station, phase adjusters associated with the transmission system, detectors coupled to the phase adjusters, and an impedance on the free end of the transmission system of such a value as to prevent reflection of the signal waves, whereby the phase relation of the output of the detectors may be so adjusted as to add for signal waves from one direction and nullify for signal waves in another direction.

5. In combination, receiving antennæ and detectors located in a line and separated apart a greater distance than one wave length of the oscillations which are intended to be received and whose outputs are connected together through transmission means whose length is equal to the wave length of the oscillations detected.

6. In a short wave receiver, modulators, a transmission line connecting the modulators with a central station, the modulators sending into the transmission line waves of greater length than the received waves; the transmission lines being substantially the length of a wave of the transmitted frequency.

7. The method of receiving modulated high frequency signals which includes collecting the signals on a plurality of spaced antennæ, rectifying the signals at each antenna to reproduce the modulation energy feeding the modulation energies to a transmission line, adjusting the phase of the energies fed to the transmission line to add in phase with the resultant energy on the line travelling toward one of its ends, preventing wave reflection of energy traveling towards the other end of the line, and translating the signal energy at that end.

8. The method of directively receiving relatively high frequency energy on a relatively lower frequency wave antenna which includes collecting the high frequency energy on antennæ located along the wave antenna, changing the received energies to energies of relatively lower frequency, and feeding the energies of relatively lower frequency to the wave antenna in proper phase for directive reception in the desired direction.

9. The method of directively receiving relatively high frequency energy on a relatively lower frequency wave antenna which includes, at the transmitter, modulating the high frequency energy by a relatively lower frequency, and at the receiver, collecting the modulated high frequency energy on antennæ located along the wave antenna, rectifying the received energies to obtain energies of the lower frequency, and feeding the energies of relatively lower frequency to the wave antenna in proper phase for directive reception in the desired direction.

10. A receiving system for the reception of modulated high frequency energy comprising a plurality of spaced antennæ, a transmission line for associating the antennæ, translating means at one terminal of the line, a resistance equal to the surge impedance of the line at the other end of the line, rectifying means at each antenna, and phase adjusting means connecting the rectifying means to the line so that each rectified output is fed thereto in phase with the other rectified energy travelling towards the translating means.

11. A high frequency receiving system comprising a lower frequency wave antenna, a plurality of high frequency antennæ distributed along said wave antenna, means at said high frequency antennæ for changing the high frequency energy to lower frequency energy, and means to feed the lower frequency energy to the wave antenna.

12. A high frequency directive receiving system comprising a lower frequency wave antenna extending in the direction of desired reception, a plurality of high frequency antennæ distributed along said wave antenna, means at said high frequency antennæ to convert the high frequency energy to lower

frequency energy, and phase adjusting means for feeding the lower frequency energy to the wave antenna in proper phase for directive reception in the desired direction.

13. A high frequency directive receiving system comprising a lower frequency wave antenna extending in the direction of desired reception, a plurality of high frequency antennæ distributed along said wave antenna, rectifying means at said high frequency antennæ for obtaining energy of lower frequency, and phase adjusting means for feeding the lower frequency energy to the wave antenna in proper phase for directive reception in the desired direction.

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