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FADING ELIMINATION

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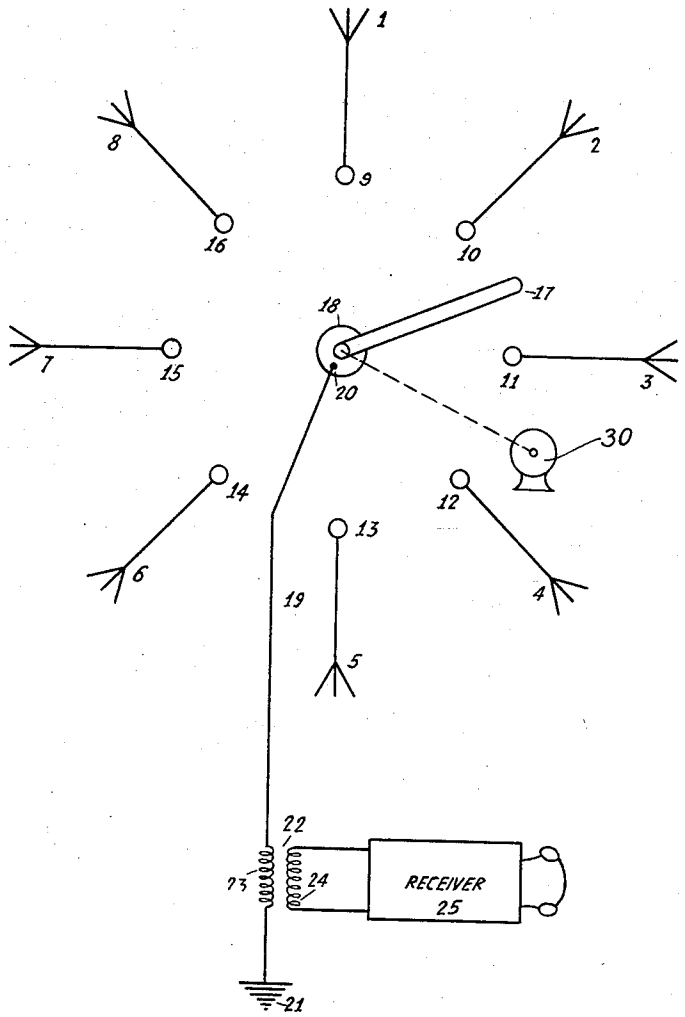

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FADING ELIMINATION

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The invention relates to the elimination of what has come to be known in radio signalling and speed transmission systems as fading. The invention is particularly useful in the reception and transmission of short wave signals and in locations where fading conditions are particularly troublesome, although, it is to be understood, that it is likewise capable of efficient use for all transmitting and receiving systems.

Careful study and research in the art of short wave radio transmission and reception discloses the fact that different locations have different fading characteristics and, therefore, it is conceivable that signals might be of a maximum intensity at one instant at an antenna located at one point and at the same instant be of a minimum intensity at an antenna located at a point more or less remote from said first point. It was first thought when considering the above facts that it would be possible to combine signals from various antennæ geographically spaced with respect to each other by directing their separate energies to a common receiver and making fixed adjustments for phase displacements relative to each other of the signal voltages from the separate antenna systems. However, this scheme had great limitations inasmuch as it was found that the phase relationship between the signal voltage received at one antenna and that received at another antenna changes from instant to instant.

It is, therefore, an object of our invention to provide a method and means of combining signals from various geographically separated antenna systems independent of the phase relationship between the signals received on the separate antenna systems. The broad idea of this scheme of combining signals has been disclosed in our copending application Serial No. 78,768, filed January 2, 1926, for which this application represents a modification and further development of the broad idea therein set forth. We have by the accompanying drawing illustrated one form which our invention may assume although, it is to be understood, that various modifications such as fall within its spirit and scope may be resorted to in so far as they fall within the scope of the invention as defined by the claims found at the end of this specification.

Referring now to the drawing, we have shown a receiving system, in which, for convenience of illustration, eight separate antenna systems, 1 to 8, inclusive, have been indicated and are each directing their energy to connections 9 to 16 inclusive. The connections, 9 to 16 inclusive, may be of regular contact type of connections or, as shown, may preferably constitute one plate of a condenser member, the other plate of which is formed by the arm 17.

The arm 17 is mounted, as shown, upon the shaft or other rotary member 18 and driven by a prime mover 30 at a rapid rate so that the end of the arm 17 will rapidly pass over the various connections 9 to 16 inclusive, so as to alternately make and break a circuit by means of forming a capacity connection since the energy received upon each of the separate antenna systems, 1 to 8, inclusive, is radio frequency energy, and the condenser offers little or no opposition to the flow of current from the antenna system into the arm 17 by way of the plates, 9 to 16 inclusive, which successively with the end of the arm 17 form a condenser unit.

Energy reaching the arm 17 from the various antenna systems, 1 to 8 inclusive, is carried through a conductor 19 from a contact member 20 upon the end of the arm 17 or, if desired, the end of the shaft 18, to ground at 21. Energy in the conductor 19 is directed into the primary winding 23 of a transformer 22 and is transferred to the secondary 24 from which it is directed to a receiving system 25.

It is thus seen that the energy from the separate antennæ systems, 1 to 8 inclusive, is thus fed into the receiving system at a periodically and constantly interrupted rate so that the signals received upon the various antennæ are all directed to the single receiving means. Since the arm 17 is driven at a high rate of speed the signal effects reaching any of the separate antenna systems are transferred at such a rate that several antenna systems are connected with the receiver for each signal

dot and there is very little chance or possibility of this dot being entirely lost by fading since the chances that fading will occur in each of these antennæ systems at the same instant is extremely remote. For this reason it can be seen that it is unnecessary in the case shown to have any regard for the phases of the signals reaching the separate antennæ systems, since at any instant only one antenna is connected with the receiver and consequently relative phases do not enter into the problem of combining energies. From the above it can be seen that the speed of rotation of the switching arm 17 forming the connecting link between the various antennæ. 1 to 8 inclusive, and the receiver 25 is a function of the speed of signalling and, therefore, the faster the arm 17 is rotated the faster the signalling can be carried on.

Having thus described our invention what we desire to claim and secure by Letters Patent is:

1. A system for reducing the effects of fading which includes, a plurality of geographically separated antennæ located at widely separated points, a single receiving system and mechanical means for periodically associating each of said antennæ, one at a time, with said receiving system whereby said receiving system, at periodic intervals, receivers signal energy from each of said spaced antennæ independently of the signals reaching other antennæ thereby substantially eliminating the effects of fading.

2. A system for eliminating the fading of signals in radio signalling apparatus which includes, a plurality of geographically spaced antenna systems located at widely separated points, a single receiving system for all of said antenna systems, and mechanical means for successively connecting electrically said receiving system with each of said antenna systems one at a time at a predetermined speed.

3. A system for eliminating the effects of fading in radio signalling apparatus which includes, a plurality of geographically spaced antenna systems located at widely separated points, a single receiving system for all of said antenna systems, means for transmitting the energy from said separated antenna systems to a common point and mechanical means located at said point and associated with said receiving means for successively switching said receiving means from one of said antennæ systems to another so that only one of said antenna systems is connected at one time with said receiving means.

4. A system for eliminating the effects of fading in radio signalling apparatus which includes, a plurality of geographically spaced antenna systems located at widely separated points, a single receiving system for all of said antenna systems, means for transmitting the energy from said separated antenna systems to a common point and mechanical means located at said point for successively capacitively switching said receiving system from one of said antenna systems to another so that only one of said antenna systems is connected at a time with said receiving system.

5. The method of radio reception for eliminating fading effects which includes collecting energy at a plurality of geographically separated points, and mechanically causing individual, successive and periodic transfer of the energy collected at each point to a receiver, whereby the output thereof is maintained at a substantially constant level.

6. In a system for reducing fading effects a plurality of geographically separated antennæ located at widely separated points, and a mechanically operable switch for coupling each of the antennæ successively and periodically one at a time to a receiver whereby the output thereof is maintained substantially constant and free from fading.

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