

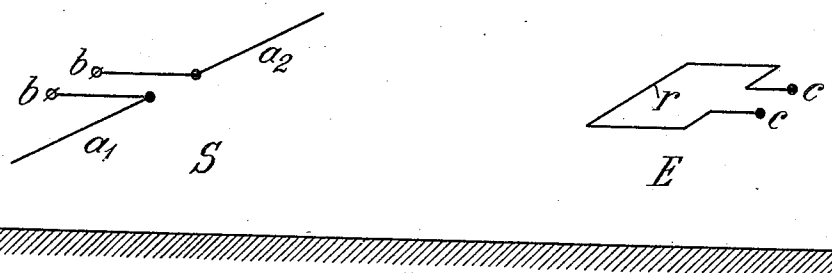
Sept. 15, 1931.

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1,823,794

WIRELESS TRANSMISSION SYSTEM

Filed Oct. 25, 1927



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WIRELESS TRANSMISSION SYSTEM

Application filed October 25, 1927, Serial No. 228,528, and in Germany October 29, 1926.

The present invention relates to radio transmission systems and has for its object the elimination of disturbances which operate between the transmitting and receiving stations to affect the energy radiated and is especially intended for the use of short waves.

As is well known, the reception of wireless waves is exposed to more or less pronounced disturbances such as atmospheric disturbances, as well as to fluctuations of intensity which are generally referred to as "fading", and also to disturbances produced by other transmitters etc. Means has already been suggested for the elimination of such disturbances, for instance the use of directional aerials, or of special reception connections employing trap or rejector circuits, etc.

The object of the present invention is to render the reception of wireless signals independent to the greatest possible extent of the influence of the above mentioned disturbances which may sometimes completely stop practical working, and the invention utilizes for the purpose a special property of wireless waves, namely, that their plane of polarization may change naturally or may be changed artificially, and that it is possible to construct transmitting or receiving apparatus adapted to radiate or to receive predominantly waves of a given polarization.

The invention consists in the reception of the waves, which always have a definite polarization whether intentionally given to them at the transmitting station or assumed during transmission through the intervening medium, by a receiving apparatus which responds chiefly to the same polarization as that of the incoming waves to be received, so that all waves otherwise polarized are for the most part eliminated, and only waves with the desired polarization, ensuring freedom from disturbances, become operative in the receiver.

The following method of carrying the invention into practical effect, which ensures great freedom from the so-called atmospheric disturbances, is given by way of example. It has been found that disturbances most usually appearing (that is to say, apart from the very temporary atmospheric disturbances which are chiefly due to storms) have for by far the greatest part a vertical polarization, that is to say the electrical vector is chiefly directed at right angles to the earth's surface. According to the invention such a disturbance may be overcome by the use of receiving apparatus adapted to receive chiefly horizontally polarized waves, such as, for instance, a horizontal di-pole or a horizontal frame, which accordingly presupposes that the working waves radiated by the transmitting station, arrive at the receiving station with horizontal polarization; this can be attained by the use of a transmitter radiating horizontally polarized waves, or in the event of rotation of the plane of polarization taking place during the transmission, by giving the waves at the transmitting station, by the use for instance, of a di-pole arranged at an angle, such a polarization that at the receiving station they impinge against the receiver with the desired horizontal polarization, so exercising the maximum effect on the receiver.

A further possibility of the invention lies in the provision of a new means of selective transmission. At the transmitting station two or more waves of the same wave length, but of different polarization, for instance one horizontally and the other vertically polarized or both horizontally polarized to different degrees, i. e., one strictly horizontal and the other at a small angle to the horizontal, or both at different small angles to the horizontal, might be used for the transmission of two different signals which are then received at the receiving station by apparatus which are particularly adapted respectively to receive waves of the corresponding polarization and to coordinate such waves.

Moreover, by changing the polarization during working, reception by third parties can be prevented and in that way secret operation ensured. To this end the horizontal plane of polarization at the transmitter or also at the receiver or at both may be variable, for instance by the use of a rotatable di-pole, frame or the like in order that constant adaptation to the most favourable adjustment or setting may be possible and waves pro-

duced and coordinately received which by their changing character will be difficult if not impossible of reception by third parties unfamiliar with the key or polarization changes.

For the purpose of the invention apparatus well known in itself and suitable for the selective radiation or reception of waves of given polarization may be employed such as open aerials (di-poles) and loops or any other aerial combination suitable for the purpose.

The accompanying drawing shows diagrammatically an example of co-operating aerials suitable for carrying out the invention. At the transmitting station S a transmitting aerial, for example a di-pole $a1$, $a2$ is arranged for the radiation of horizontally polarized waves, being preferably rotatably mounted whilst at the receiving station E a horizontal frame r , chiefly responding to horizontally polarized waves and rejecting to the greatest possible extent the normally vertically polarized atmospheric disturbances, is used. The terminals b are intended for connection of the transmitting apparatus and the terminals c for connection to the receiver. In place of the two aerial arrangements shown in the drawings, at S a loop could be used, or at E a di-pole or a loop, or a di-pole at each of the stations, or, as already stated, any aerial arrangement well known in itself and suitable for the radiation or the reception of waves of given polarization. If, during the transmission from S to E, there takes place a rotation of the plane of polarization, the waves radiated from S can be initially given, by turning the di-pole $a1$, $a2$, such a polarization that the change produced by the intervening medium will be balanced, and the waves will arrive at the receiving station E with the desired horizontal polarization producing the maximum excitation of the receiver.

It is, of course, to be understood that by waves of variable horizontal polarization, or waves of different angles of horizontal polarization, I mean waves which are strictly horizontal or waves which are "substantially" horizontal, i. e., waves which may vary within certain degrees from or lie at small angles to the horizontal, ordinarily from five degrees to ten degrees, or even more under some conditions; as an example, in a two-degree polarization change and reception action one of the waves may be strictly horizontal or vary but a few degrees therefrom, while the other may vary ten degrees or more from the horizontal, so long as a "substantially" horizontal wave polarization is preserved.

What I claim is:

1. The method of transmitting and receiving radio signals which consists in simultaneously transmitting separate signals by differently polarized waves of substantially

horizontal polarization and separately receiving and coordinating such waves.

2. The method of transmitting and receiving radio signals which consists in separately and simultaneously transmitting a plurality of signals of the same wave length by differently polarized waves of predetermined known substantially horizontal polarization and separately receiving and coordinating such waves.

3. The method of transmitting and receiving radio signals which consists in transmitting waves of substantially horizontal polarization and shifting the polarization according to a definite prearranged schedule and correspondingly shifting the receptive antenna to receive such waves.

4. The method of transmitting and receiving radio waves which consists in separately and simultaneously transmitting a plurality of signals on the same wave length by differently polarized waves of predetermined known polarization and shifting the polarization of any or all of said waves according to a previously arranged schedule and correspondingly shifting the receptive antennae to receive and coordinate such waves.

In testimony whereof I have affixed my signature.

ABRAHAM ESAU.