Feb. 16, 1943. E. GERHARD 2,311,435

DUPLEX RADIO COMMUNICATION

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Fig.1.

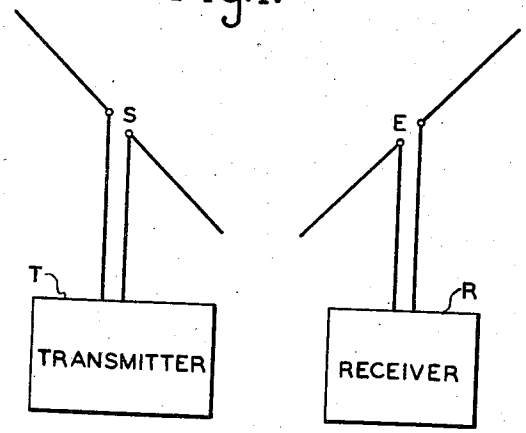
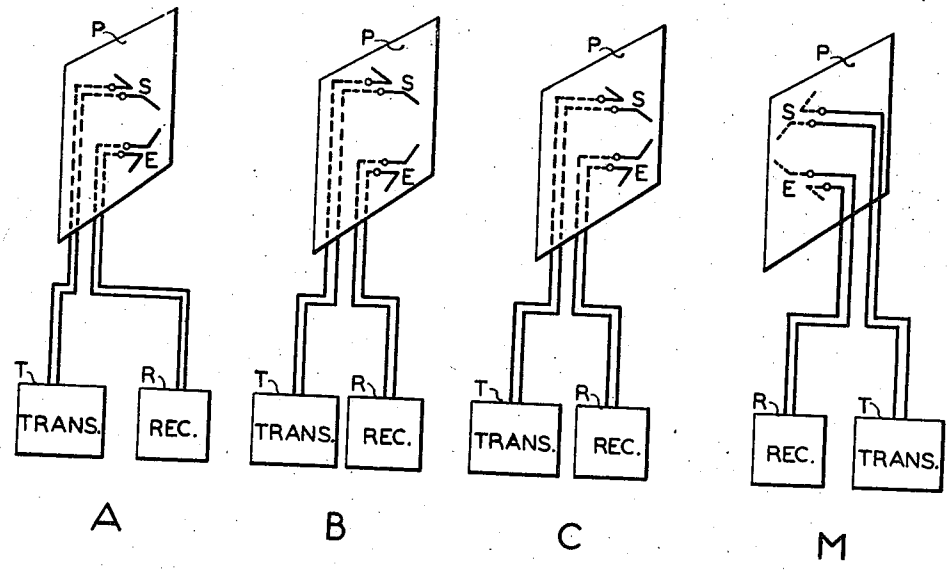



Fig.2.




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## DUPLEX RADIO COMMUNICATION

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Application May 31, 1941, Serial No. 395,928
In Germany December 23, 1939

2 Claims. (Cl. 250—6)

It is known in the art to de-couple a transmitter antenna and a receiver antenna by causing the directions of polarization thereof to be perpendicular to each other. If, for instance, the transmitted wave which is sent out is vertically polarized while the incoming wave is horizontally polarized, then duplex or two-way operation on the same wavelength is possible. The arrangements known in the prior art have the drawback that two groups or sets of apparatus are necessary, namely, the one whose output wave is, for instance, vertically polarized and that whose output wave is polarized at right angles thereto, in other words, horizontally polarized. Particularly where a large number of such apparatus is employed, this condition is undesirable since there is no chance for any of these devices to communicate with any other device.

Now, according to the invention arrangements are so made that the output wave presents a slant or slope of an angle of 45 degrees or of 135 degrees with respect to the horizontal as shown in Figure 1, while Figure 2 shows the relationship between adjacent stations.

Referring to Figure 1, S denotes a transmitter dipole connected to transmitter T and E a receiver dipole connected to receiver R.

The transmitter and receiver dipoles, it will be noted, are to be considered as lying mutually at right angles to one another in a single vertical plane; in this case, the plane of the drawing. Now, a plurality of stations as shown in Figure 1 may be arranged along a line as shown in Figure 2; stations A, B, C are satellite stations with their antennas in parallel planes, and of receiving antennas S parallel with each other and, also, of transmitting antennas E parallel with each other. A master station M, likewise, has these antennae, E and S, in a plane parallel to that of the satellite stations A, B and C but with the plane rotated through 180 degrees so that the transmitting dipole S is parallel to each of the receiving dipoles E at stations A, B and C and the receiving dipoles E at station M is parallel to each of the transmitting dipoles S at the stations A, B and C. At each of the stations the receiving antenna E is connected to a receiver R and the transmitting antenna S is connected to a transmitter T in the same way as shown in Figure 1. Now the master station M may simultaneously transmit to all of the satellite stations A, B and C and receive from each of the satellites in section. Also, the master station M may carry out duplex communication with any of the satellite stations A, B and C. The transmissions of any of the satellite stations will not be picked up by any of the other stations because their receiving antennae are at right angles to the transmitting antenna of the satellite station which is transmitting. However, if station B, for example, is to communicate directly with station A such communication may be carried out by station B rotating its antenna 180 degrees about a vertical axis. Then antenna S of each of stations A and B is parallel to the antenna E of the other and each may transmit to the other and be received by the other station. If desired, reflectors P may be provided at each station to enhance the directive effect whereby the radiation of each station is unable to cause interference with communications being carried on between another pair of stations of the system.

I claim:

1. A duplex radio system comprising a plurality of stations greater than two, each of said stations having a transmitting antenna adapted to radiate energy polarized at an angle of 45 degrees with respect to the horizontal and a receiving antenna responsive to energy polarized at right angles to energy transmitted by said transmitting antenna, said antennae being arranged in parallel planes, the antennae of adjacent stations being identically arranged in said planes for communication to and from all of the stations of said system, the arrangement being such that by rotation of the antennae at one of said stations 180 degrees about a vertical axis through said plane duplex communication with an adjacent station may be established.

2. A duplex radio communication system, including at least three stations, wherein each of the stations of the system includes transmitting and receiving antennae, the antennae of all the said stations being arranged in parallel vertical planes, the transmitting antenna of each station being adapted to radiate only to energy polarized at an angle of 45 degrees with respect to the horizontal and the receiving antenna of each station being responsive only to energy polarized at right angles to the energy transmitted by the transmitting antenna at the same station, the arrangement of said antennae and at all of said stations being identical in one position for communication to and from all of said stations, and the antennae at certain ones of said stations being reversible 180 degrees in said planes whereby any of said certain stations of said system may communicate with an adjacent station.

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