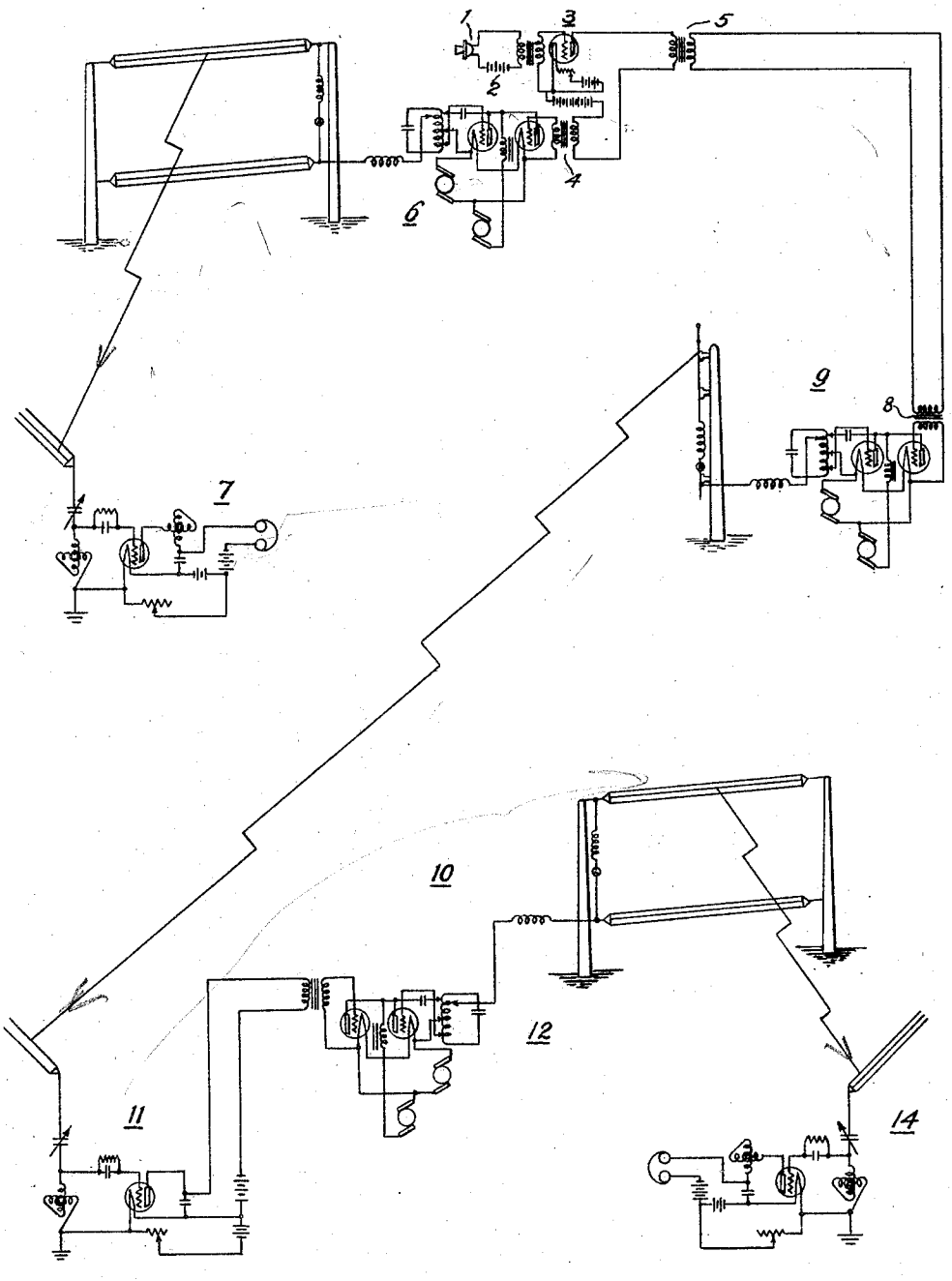
FIP8102 GB 1,654,322

Dec. 27, 1927. 1,654,322

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RADIO SENDING SYSTEM

Filed Jan. 27, 1925



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200. RADIANT ENERGY.
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Patented Dec. 27, 1927. 1,654,322

UNITED STATES PATENT OFFICE.

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RADIO SENDING SYSTEM.

Application filed January 27, 1925. Serial No. 5,050.

My invention relates to radio sending systems and particularly to radio broadcasting systems having means for distributing signals over a maximum area of territory with a minimum amount of power input.

An object of my invention is to provide a radio broadcasting system having means for broadcasting a single program event over a maximum area.

Another object of my invention is to provide a radio broadcasting system capable of covering a maximum area of territory with a minimum energy input.

Another object of my invention is to provide a radio broadcasting system in which two radio sending devices, generating different frequencies, are modulated from a single sound source.

Another object of my invention is to provide a radio broadcasting system in which a program event is broadcast simultaneously by direct modulation of a radio sending device and by relaying through a succession of radio devices.

In prior broadcasting of sound programs, it has been customary to place a microphone adjacent to the source of sound produced by a program event, and to take the electrical vibratory translation of the sounds from the microphone to a radio sending device which is modulated thereby to give radio signals corresponding to the sounds incident to the microphone.

It has also been customary to employ a microphone for each radio sending device, and to make the sending device sufficiently large and sufficiently powerful to cover directly the desired extent of territory, so that listeners within that territory could receive from the sending apparatus without unusually sensitive receiving apparatus. The limitations imposed by the difficulties of handling large powers in a telephonically modulated radio sending apparatus are such as to limit the territory which can be adequately covered by a single station. A larger territory could be covered directly by a single radio telephone station only by extensive development of telephonically modulated radio sending apparatus beyond its present stage of development.

My invention provides a combination of a plurality of telephonically modulated radio sending apparatus, one of which is adapted to send directly to a group of receiving stations in the adjacent territory, and the other of which is adapted to send preferably on a different wave length to a radio relaying system from which another group of receiving stations can be supplied, both radio sending devices being modulated from a single sound "pick-up", or from a single microphone device.

Other objects and structural details of my invention will be apparent from the following description when read in connection with the accompanying drawing, wherein:

The single figure is a diagrammatic representation of apparatus and circuits embodying a preferred form of my invention.

A microphone device 1 of any desired construction may be positioned by any convenient means adjacent to the source of a sound-producing program. The microphone 1 is supplied with energy by a battery 2 and is connected to an amplifier 3, which in turn supplies energy to the transformers 4 and 5. The transformer 4 supplies a radio sending apparatus 6 which is designed and adapted to generate radio frequency oscillations at a frequency within the usual broadcasting range which may be considered as from 250 to 500 meters and to modulate them in accordance with the electrical vibrations of the sound translation delivered from the microphone 1, through the transformer 4. Signals from station 6 may then be received by the customary broadcasting receiver 7 as indicated by the line connecting the respective antennæ.

The transformer 5 is connected through an additional transformer 8 to a second radio sending apparatus 9 which may preferably be designed and adapted to the generation of extremely short wave lengths such as those lying in the band between 50 and 100 meters in length. The sending device 9 is designed to cause the modulation of the short wave output therefrom by the vibratory currents transmited to it from the microphone 1 through transformers 5 and 8. The signals from station 9 may be received by a radio relaying means 10 which may suitably comprise a receiving device 11 adapted to receive the short waves of the sending device 9. The received and detected signals from the receiving means 11 may then be caused to modulate the output of a third radio sending device 12 which is designed to generate radio frequency waves at a fre-

quency within the customary broadcast range and to be modulated by the signals delivered thereto from receiver 11. The radio signals produced by the sending device 12 may then be received by a broadcast receiver 14 which may be in a different territorial zone from that in which broadcast receiver 7 is located.

Radio sending apparatus 6 and 9 may conveniently have substantially equal power outputs. Receiving apparatus 11 may conveniently be of maximum sensitivity, which permits it to be positioned at a point outside of the zone within which the ordinary broadcast receiver is conveniently operative. Radio sending apparatus 12 likewise, may conveniently be of substantially the same power as apparatus 6 and 9. By this means, the district between relaying station 10 and the limits of the zone surrounding station 6 is conveniently covered with sufficient signal strength to be readily receivable by the ordinary broadcast receiver, and the zone upon the farther side of relaying apparatus 10 from the station 6 which, otherwise, is entirely beyond the range of influence of station 6 is conveniently supplied with signal energy for reception by the ordinary broadcast receiver. By this means, the area conveniently covered by signal energy from a single microphone is more than doubled in one direction and is conveniently covered by only doubling the power employed, whereas to cover the same extent directly from station 6 would require more than four times the power output.

By this means I have produced a radio sending system which may be operated from a single modulating means, and which covers a much larger extent of territory with signal strength sufficient for the ordinary broadcast receiver, with a much smaller input of energy than has been possible with previous systems.

While I have shown but one embodiment of my invention in the accompanying drawing, it is capable of various changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or indicated in the appended claim.

I claim as my invention:

In combination, a radio sending system adjusted to a wave length within the tuning range of ordinary broadcast receivers, a second radio sending system adjusted to a wave length short enough to be outside said range, modulating means including a sound-responsive device common to both said radio sending systems, whereby the same signal is simultaneously broadcasted on a wave length available to ordinary broadcast receivers and on a wave length to which said receivers are unresponsive, a radio receiving device adapted to respond to said short wave length and of sufficient sensitiveness to respond to said second radio system at a distance greater than that at which said ordinary broadcast receivers will respond to said first-named radio sending system and a third radio sending system adjusted to a wave length within said range and controlled by said radio receiving device, said third radio sending system being sufficiently powerful to affect ordinary broadcast radio receivers located near it but too far from the first-named radio sending system to be affected thereby.

In testimony whereof, I have hereunto subscribed my name this 21st day of January, 1925.

FRANK CONRAD.