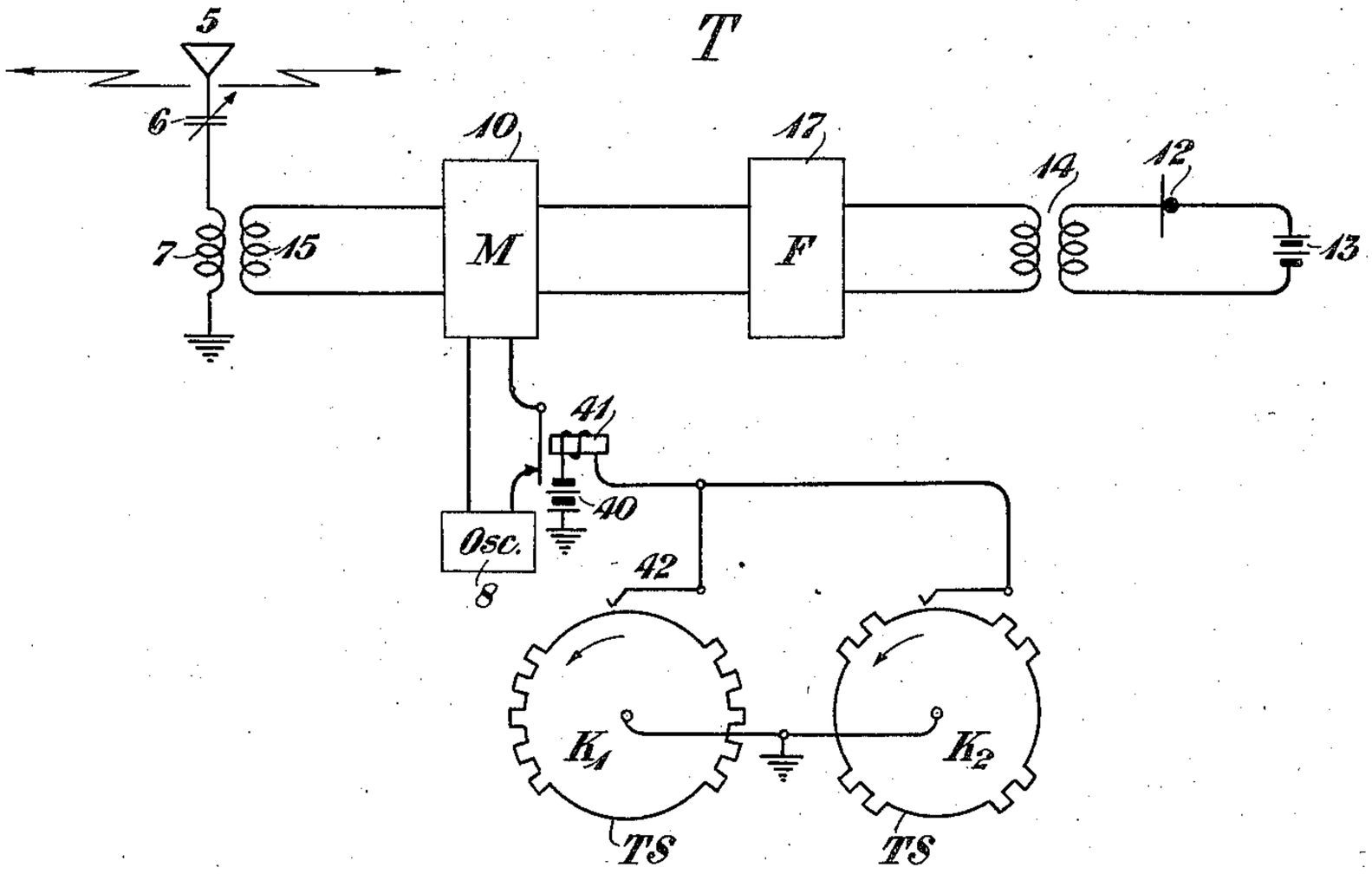
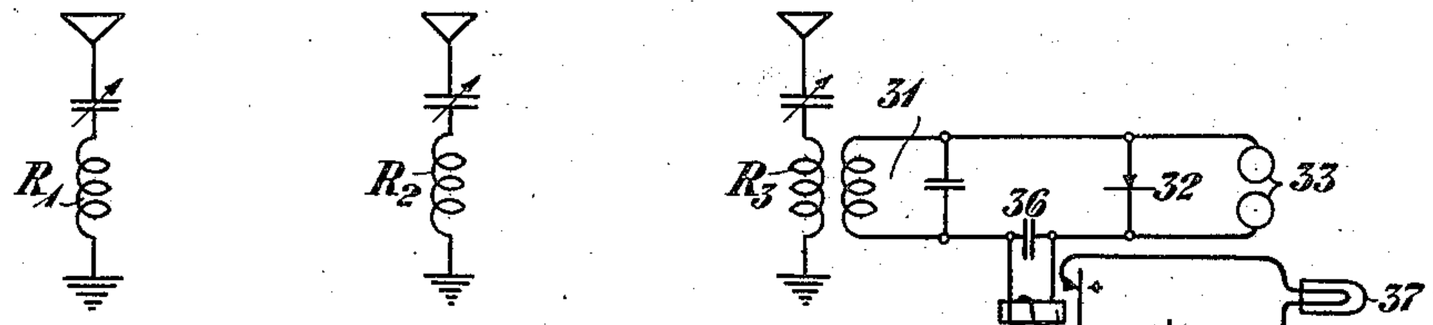
Jan. 13. 1925. 1,522,581

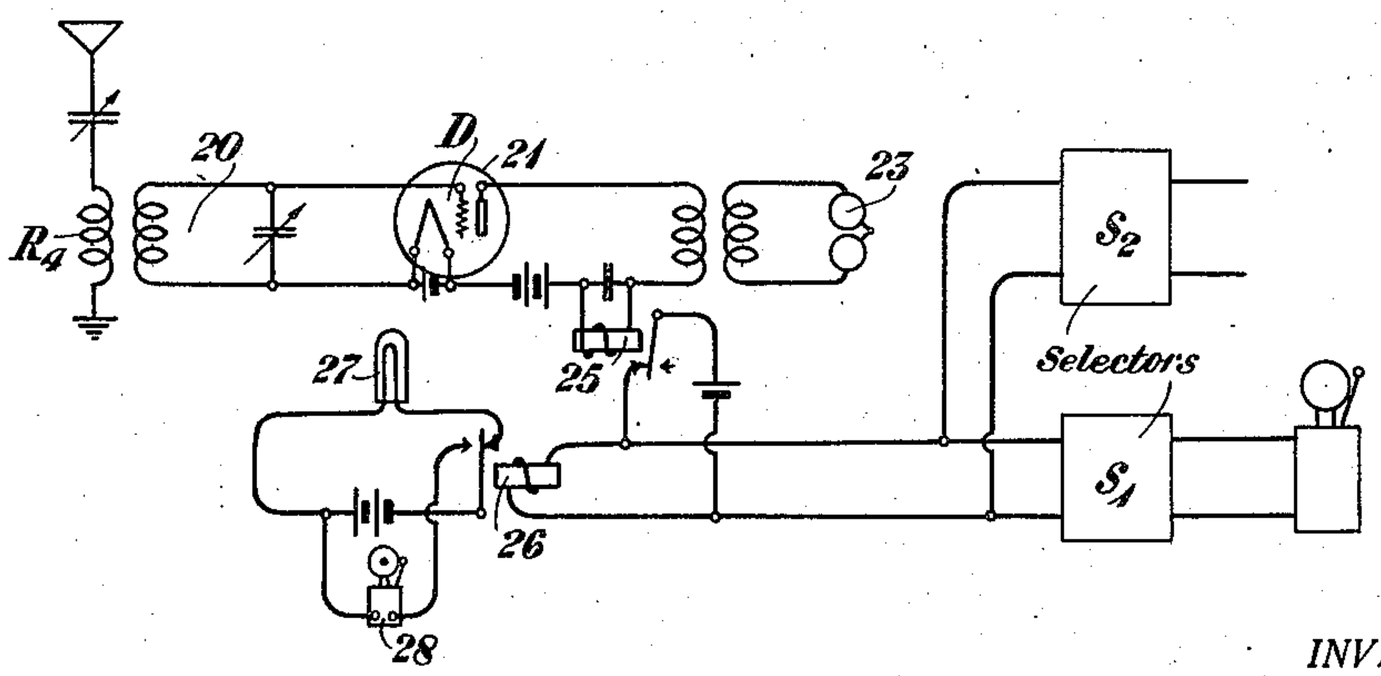
L. ESPENSCHIED

RADIO BROADCASTING SYSTEM

Filed Aug. 16, 1922







INVENTOR.
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UNITED STATES PATENT OFFICE.

LLOYD ESPENSCHIED, OF HOLLIS, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

RADIO BROADCASTING SYSTEM.

Application filed August 16, 1922. Serial No. 582,257.

To all whom it may concern:

Be it known that I, LLOYD ESPENSCHIED, residing at Hollis, in the county of Queens and State of New York, have invented certain Improvements in Radio Broadcasting Systems, of which the following is a specification.

This invention relates to a radio telephone broadcasting system in which the receiving stations are enabled to have a positive indication at all times, as to whether or not they are in connection with and ready to receive from the central broadcasting station.

The purpose of such an arrangement is to afford a broadcasting subscriber who may be sending out information of a business character or otherwise, a greater measure of assurance that the receiving stations to which he desires to transmit are actually receiving the information set out. A second purpose is to give the subscriber at the receiving station definite information as to the condition of receptivity of the radio transmission channel. A break in this transmission channel may be due to some defect in the receiving station itself or some defect in the transmitting station, but in any case, it is desirable that the receiving subscriber shall be notified as to the condition of the channel. Such assurance on the part of the broadcaster is especially needed in the case of emergency alarm services as, for example, when a broadcasting station may be employed to transmit fire alarms to a number of designated receiving stations, or where police information is broadcasted from a central station to a number of correlated "pick-up" points.

The invention briefly consists in sending out continuously carrier waves from the broadcasting station and employing these at each of the receiving stations to operate an indicator or alarm device; in other words, to normally establish channels between the broadcasting station and all the receiving stations involved and to operate these channels on the closed circuit basis, whereby the receiving station always definitely knows, as by the holding up of a signal, that it is in proper connection with the central station. The invention will be better understood by reference to the accompanying drawing, in which the figure shows a transmitting station adapted for broadcasting purposes, and a plurality of receiving stations adapted to cooperate with the broadcasting station. In the figure, 5 represents the transmitting antenna, including a variable condenser 6 and an inductance 7, with which latter is associated the local generating circuit. This circuit may take on a large variety of forms and the one shown is solely for illustrative purposes. As such, there is a generator 8 of high frequency oscillations connected through a normally closed circuit to a modulating device 10. A generator of speech signals to be transmitted and comprising a microphone 12, a battery 13 and a transformer 14 is also associated with the modulator 10. The output of this modulator may then be associated with the transmitting antenna in any well known manner, such as by means of the coil 15. If desired, a wave filter 17 may be inserted to eliminate such frequencies as are not desired. As thus described, the transmitting station is adapted to emit continuously high frequency oscillations even though no message may at the time be impressed from the microphone 12.

A plurality of receiving stations R_1, R_2, R_3 and R_4 are shown, each of these being designed to be receptive to the waves sent out from the transmitter. The details of these receiving stations may vary but all have the feature that an indicating means is present, which is responsive to the carrier frequency received whether this carrier frequency be modulated or not. One form which the apparatus at the receiving station may take is shown at the receiver R_4, in which a tuned circuit 20 supplies the received oscillations to a detector 21, preferably of the thermionic type, the detected message from the modulated wave of the transmitter being then received in some device such as the telephone 23. Such a device is responsive only to the modulations of the transmitted wave but I propose to supply in addition apparatus which is responsive to the received waves, whether they are modulated or not. To this end, I make use in the specific apparatus shown at R_4 of the peculiar characteristic of a thermionic vacuum tube detector. In such a detector, the average space current flowing from the plate to filament changes as the amplitude of the received high frequency oscillations changes. In general, the average value of the space current is raised on the receipt of

high frequency signals, although under certain conditions the reverse may occur, this depending mainly on the portion of the characteristic at which operation is maintained. In any case, the change in this average space current is indicated by a change in the current flowing through a relay 25 which is connected in series with the output circuit of detector 21. If a signal is being received the space current through the relay 25 is sufficient to draw up its armature which closes a local circuit containing an indicating device, such as a lamp. If a break in the receipt of signals occurs, however, this space current drops to a sufficiently low value so that the armature is no longer held up and consequently the lamp indicator 27 is extinguished. An alarm which will give a positive signal in case of non-receptivity is shown at 28, this being operated when the armature of relay 25 drops to its back contact. The operation of a detector with characteristics of this nature is more fully described in my application, Serial No. 500,034, filed September 12, 1921, and any of the modifications shown therein may obviously be applied in this invention.

A second form which the apparatus of the receiving station may take is indicated at the receiver R_3, in which the locally tuned receiving circuit 31 has bridged across its condenser a detector 32, such as a crystal detector, and across this or in some other suitable manner may be connected the telephones 33. In case no signals are being received, there is no current flowing through the detector 32. In case such signals are being received there is a rectified component of current present so that if a relay 35 is inserted in series with the detector and is shunted by the condenser 36 to give a free path for alternating current there will then flow through the relay 35 a steady current, the magnitude of which will depend on the amplitude of the received oscillations. This relay 35 is in turn adapted to maintain closed a circuit including an indicating device, such as the lamp 37. In case of failure to receive the high frequency oscillations, due to a defect at either the transmitting or receiving station, the local circuit will be opened and the light 37 will be extinguished.

The relay 25 at station R_4 and the relay 35 at R_3 are both slow acting relays, so that they will not be responsive to the rapid changes in the amplitude of the received oscillations which are present in case these received oscillations are modulated by a message to be transferred to telephone 23 or 33.

In case this system is to be used for such purposes as indicated aboove it may be desirable to have provision whereby the transmitting station may call any one or any group of the receiving stations or, on the other hand, to call all of such stations simultaneously. To this end, I propose to send out selecting current impulses from the transmitting station, making use of the carrier wave. At the transmitting station there is shown a code transmitter K_1, comprising, for example, a disc with a certain combination of teeth thereon, and upon rotation, adapted to close a circuit comprising battery 40, relay 41, contact 42 and disc K_1. Upon being energized, the relay 41 opens the circuit of the oscillator 8, thus interrupting the transmission of waves from the antenna in accordance with the code of the disc K_1. These breaks in the emission of the carrier wave produce corresponding interruptions in the circuit controlled, for example, by the relay 25 at station R_4 and thus may be used to control a selector S_1, which is responsive only to the code corresponding to the disc K_1. On operation, this selector S_1 may control any suitable indicating device, such as a bell. Only those stations which are fitted with a corresponding selector S_1 will respond to the call and obviously the various receiving stations may be grouped in any way desired, there being a corresponding disc for each group.

In case it is desirable to make provision by which all of the receiving stations may be called simultaneously, a second disc K_2, with a suitable code, may be connected with the transmitting station. At the receiver R_4 is shown a corresponding selective responsive device S_2. An identical selective device would, in this case, be provided at each of the receiving stations.

If desired, the relay 26 may be made sufficiently slow in its action so that the light 27 will not be responsive to the impulses coming from the discs K_1 or K_2, which follow each other in rapid succession. The light 27 will thus be extinguished only in case the conditions for non-receipt of signals persist for a comparatively large element of time.

Numerous modifications may be made in this system in its various parts without departing from the spirit of this invention. For example, while I have described a simple form of selector mechanism, any system which operates in a substantially equivalent manner would be equally effective. Reference may be made, for example, to my joint invention with Bown, disclosed in application Serial No. 460,869, filed April 13, 1921. Also the control of the emission of oscillations may obviously be at some other point of the circuit than in the leads from the oscillator 8

What is claimed is:

1. In a radio signaling system, a radiating station, means for transmitting carrier

waves therefrom continuously, means for impressing thereon the message to be transmitted, a receiving station and means thereat for detecting the message to be transmitted, and supplemental means responsive to the unmodulated component of the carrier wave to indicate suitable conditions for reception of the message impulses.

2. In a radio signaling system, a radiating station, means for transmitting carrier waves therefrom continuously, means for impressing thereon the message to be transmitted, a receiving station and means thereat for detecting the message to be transmitted, supplemental means responsive to the unmodulated component of the carrier wave to indicate suitable conditions for reception of the message impulses, and a calling device at the transmitting station adapted to send impulses on the carrier wave to call the receiving station.

3. In a radio signaling system, a radiating station, means for transmitting carrier waves therefrom continuously, means for impressing thereon the message to be transmitted, a receiving station and means thereat for detecting the message to be transmitted, supplemental means responsive to the unmodulated component of the carrier wave to indicate suitable conditions for reception of the message impulses, and a call responsive device at the receiving station controlled thereby.

4. In a radio signaling system, a radiating station, means for transmitting carrier waves continuously, means for impressing thereon the message to be transmitted, a plurality of receiving stations, each adapted to be continuously responsive to said transmitted waves, means at each receiving station to indicate its condition of receptiveness, and a calling mechanism associated with the transmitter for calling all the receiving stations simultaneously.

5. In a radio signaling system, a radiating station, means for transmitting carrier waves continuously, means for impressing thereon the message to be transmitted, a plurality of receiving stations, each adapted to be continuously responsive to said transmitted waves, means at each receiving station responsive to the unmodulated component of the carrier waves to indicate its condition of receptiveness, and a selective calling mechanism associated with the transmitter for calling certain receiving stations.

6. In a radio signaling system, a radiating station, means for transmitting carrier waves continuously, means for impressing thereon the message to be transmitted, a plurality of receiving stations, each adapted to be continuously responsive to said transmitted waves, means at each receiving station to indicate its condition of receptiveness, and a calling mechanism associated with the transmitter for selectively calling any group or for calling all of the receiving stations.

7. In a radio signaling system, a radiating station, means for transmitting carrier waves continuously, means for impressing thereon the message to be transmitted, a plurality of receiving stations, each adapted to be continuously responsive to said transmitted waves, means at each receiving station responsive to the unmodulated component of the carrier waves to indicate its condition of receptiveness, a selective calling mechanism associated with the transmitter for calling certain receiving stations, and a selective responsive device at the receiving station responsive to certain signals only.

8. In a radio signaling system, a radiating station, means for transmitting carrier waves continuously, means for impressing thereon the message to be transmitted, a plurality of receiving stations, each adapted to be continuously responsive to said transmitted waves, means at each receiving station for receiving a transmitted message and other means responsive to the unmodulated component of the carrier waves to indicate its condition of receptiveness, a selective calling mechanism associated with the transmitter for calling certain receiving stations.

In testimony whereof, I have signed my name to this specification this 14th day of August 1922.

LLOYD ESPENSCHIED.