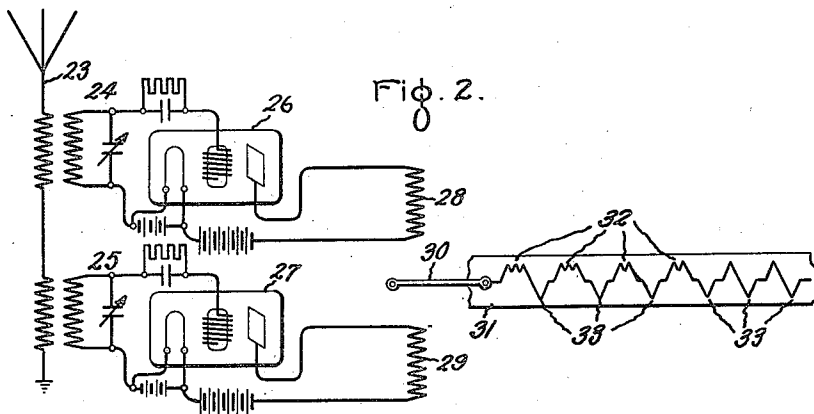
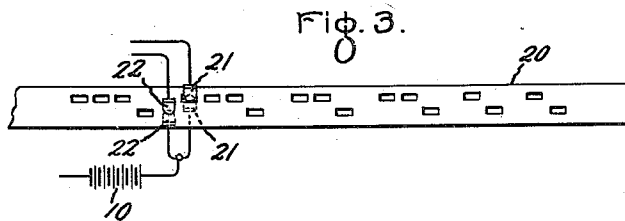
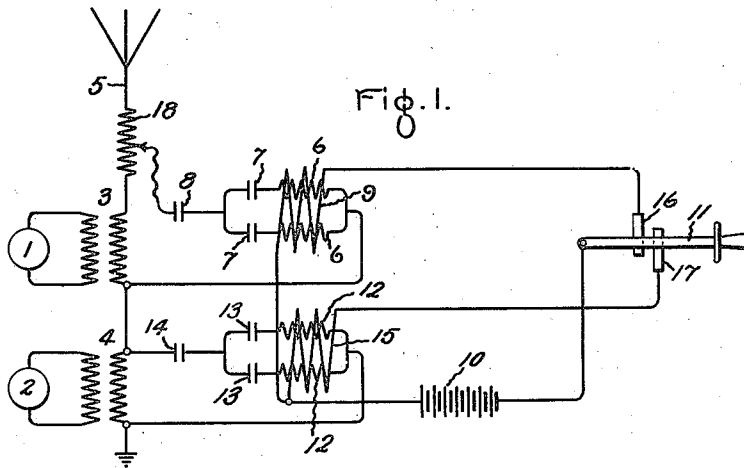


July 8, 1924.

1,500,785

E. F. W. ALEXANDERSON
HIGH FREQUENCY SIGNALING SYSTEM

Filed Aug. 29, 1921



Inventor:
Ernst F. W. Alexanderson,
by *Alfred J. Davis*
His Attorney.

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UNITED STATES PATENT OFFICE.

ERNST F. W. ALEXANDERSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

HIGH-FREQUENCY SIGNALING SYSTEM.

Application filed August 29, 1921. Serial No. 496,229.

To all whom it may concern:

Be it known that I, ERNST F. W. ALEXANDERSON, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in High-Frequency Signaling Systems, of which the following is a specification.

My present invention relates to high frequency signaling systems, and more particularly to telegraphic systems.

The object of my invention is to provide a simple and efficient method of and apparatus for transmitting telegraphic signals by means of high frequency alternating currents.

The usual telegraphic code employed for transmitting messages by means of electric currents is made up of two principal characters differing from one another only in their time interval, a dot representing a time interval about half that of a dash. It is evident, therefore, that by reason of this fact a longer time is required for the transmission of a message than would be the case if all characters were represented by the smaller time interval required for the transmission of a dot.

A more specific object of my invention is to provide a method of and apparatus for signaling which will permit of a reduction of the time required for transmission of a message by allowing for the same time interval for both dots and dashes. To accomplish this result I differentiate between dots and dashes by transmitting waves of different frequency.

In one embodiment of my invention I provide two sources of high frequency current, such for example, as two high frequency alternators of different frequency and connect both of these sources to the antenna. I also provide means for practically short circuiting at will either one of these sources so that the other source alone will supply energy to the antenna. In addition I provide controlling means which is arranged in such a way that when one of the sources is short circuited the tuning of the antenna is changed so that the antenna becomes resonant for the frequency of the other source which is supplying energy to the antenna at that instant.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation will best be understood by reference to the following description taken in connection with the accompanying drawing in which Fig. 1 shows diagrammatically the application of my invention to a radio transmitting system; Fig. 2 shows a receiving system for receiving and recording the message transmitted; and Fig. 3 shows a modification in the method of transmitting the message.

As shown in Fig. 1 of the drawing, I provide two sources of high frequency current 1 and 2 which are connected by means of transformers 3 and 4 to a transmitting circuit which in the present case is indicated as an antenna 5, altho it may equally well be a wire line if desired. In shunt to the secondary of the transformer 3, I provide a magnetic amplifier having high frequency windings 6 and the usual series condensers 7 and 8. Current for saturating the core of the magnetic amplifier is supplied to the saturation winding 9 from a source 10 of direct current by means of a key 11. The current supplied to the antenna 5 by the connections indicated will vary in inverse proportion to the amount of current supplied to the saturation winding 9. When no current is supplied to this saturation winding full current from the source 1 will be supplied to the antenna 5. When a current is supplied to the saturation winding 9, the impedance of the high frequency windings 6 of the magnetic amplifier will decrease and these windings will act more or less as a short circuit on the secondary of transformer 3, depending upon the value of the saturation current, and hence, the amount of current supplied to the antenna will decrease as the saturation current is increased. In shunt to the secondary of transformer 4 I provide a second similar magnetic amplifier having high frequency windings 12 and series condensers 13 and 14. Current for saturating the core of this magnetic amplifier is also supplied to the saturation winding from the source 10 through the key 11.

When the key 11 is in the position indicated, current is supplied to both of the

saturation windings and both sources of current are practically short circuited so that substantially no radiation takes place.

When the key is raised so that it makes contact only with segment 16, the current in saturation winding 15 is interrupted thereby removing the short circuit from source 2 and permitting radiation from that source to take place. When the key is depressed so that it makes contact only with segment 9, the current in saturation winding 9 is interrupted thereby removing the short circuit from source 1 and permitting radiation from that source to take place.

When source 1 is radiating, the tuning of the antenna will be determined chiefly by the loading coil 18, the inductance of the transformer 3 and the inductance of the high frequency windings 12 of the magnetic amplifier associated with source 2, the inductance of these windings at this time being small in comparison with the inductance of the transformer 4. In order to change the tuning of the antenna when source 2 is radiating, the high frequency windings of the amplifier associated with source 1 may be connected to an intermediate point 19 in the loading coil 18. The tuning of the antenna will then be determined by the portion of the loading coil above point 19, the inductance of windings 6 and the inductance of transformer 4. By proper adjustments, the two different tunings of the antenna obtained in this way may be made to correspond to the two frequencies supplied by the sources 1 and 2.

It will of course be understood that the showing of the key 11 is purely diagrammatic and that any suitable switching means desired may be employed to effect the transmission of the desired wave. In case automatic transmission is desired, this may be effected by the use of a perforated tape 20, as indicated in Fig. 3, having two rows of perforations thereon, one of these rows representing the dots and the other row representing the dashes of the message. The tape may, by any suitable means, be caused to pass between two pairs of contacts 21 and 22. The circuits of the saturation windings 9 and 15 which are supplied with current from the source 10 may be closed through the contacts 21 and 22 whenever a perforation in the tape passes under these contacts.

At the receiving station the current transmitted may be received upon an antenna 23 and supplied to the usual tuned receiving circuits 24 and 25 which are tuned respectively to the two frequencies of sources 1 and 2 and which are associated with detectors 26 and 27. In the plate circuits of these detectors may be inserted windings 28 and 29 of a relay having a movable armature 30, the movement of which is controlled

by either of the two windings. The armature 30 may carry a stylus or other device for making a mark upon a moving tape 31. When no signal is being transmitted and no energy is being radiated the marker will make a straight line somewhere near the middle of the tape. When energy is radiated from source 1, for example, which may be employed to transmit the dots of the message, the detector 26 will operate, the coil 28 will attract the armature 30, and the indications 32 on the tape representing dots will be made. On the other hand, when energy is radiated from source 2 the detector 27 will operate and coil 29 will attract the armature 30, making indications 33 representing dashes on the tape.

In addition to shortening the time required to transmit a message by making the time interval for a dash equal to the time interval for a dot, a further shortening of the time required for transmission may be effected by reducing the time interval between the successive characters of a letter. In the illustration I have indicated an interval between successive characters which is small in comparison with the time required to transmit a dot. This interval is so small that the armature 30 does not have time to return to its normal central position between successive characters of a letter. No difficulty will be experienced in reading the message recorded however, as the number of successive dots or dashes can readily be observed from the small waves in the record line or from the space interval occupied on the tape by the characters of a letter.

While I have shown diagrammatically and described only one embodiment of my invention, namely, its application to a radio signaling system, it will be apparent that it may equally well be employed for transmitting signals over wire lines and that many modifications in the circuit arrangement and apparatus used may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said circuit, connections for practically suppressing at will the current delivered from either of said sources without disconnecting the source from the circuit and means for changing the tuning of the transmitting circuit at the same time that one of the suppressing connections is made or removed.
2. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said cir-

cuit by means of transformers, connections for practically suppressing at will the potential of the secondary of either of said transformers without disconnecting the primary and means for changing the tuning of the transmitting circuit at the same time that one of the suppressing connections is made or removed.

3. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said circuit by means of transformers, an impedance in said transmitting circuit, and connections for practically suppressing at will the potential of the secondary of either of said transformers without disconnecting the primary, the connections for suppressing one of said secondaries including a portion of said impedance in the transmitting circuit.

4. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said circuit by means of transformers, and means associated with each transformer secondary for substantially short circuiting the same and at the same time changing the tuning of the transmitting circuit.

5. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said circuit by means of transformers, and magnetic amplifiers associated with each transformer secondary for substantially short circuiting the same and at the same time changing the tuning of the transmitting circuit.

6. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said circuit by means of transformers the secondaries of which are connected in series in the transmitting circuit, and means associated with each transformer secondary for substantially short circuiting the same and at the same time changing the tuning of the transmitting circuit.

7. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said circuit by means of transformers the secondaries of which are connected in series in the transmitting circuit, and magnetic amplifiers associated with each transformer secondary for substantially short circuiting the same and at the same time changing the tuning of the transmitting circuit.

8. The combination in a high frequency signaling system of a transmitting circuit, two sources of high frequency current of different frequencies connected to said circuit by means of transformers the secondaries of which are connected in series in the transmitting circuit, an impedance connected in series in the transmitting circuit, a magnetic amplifier connected in shunt to the secondary of one transformer and a second magnetic amplifier connected in shunt to the secondary of the second transformer and said impedance.

In witness whereof, I have hereunto set my hand this 26th day of August, 1921.

ERNST F. W. ALEXANDERSON.