Oct. 10, 1933. J. H. HAMMOND, JR 1,930,046

SYSTEM FOR THE TRANSMISSION AND RECEPTION OF RADIANT ENERGY

Filed Nov. 12, 1929

Fig. 1

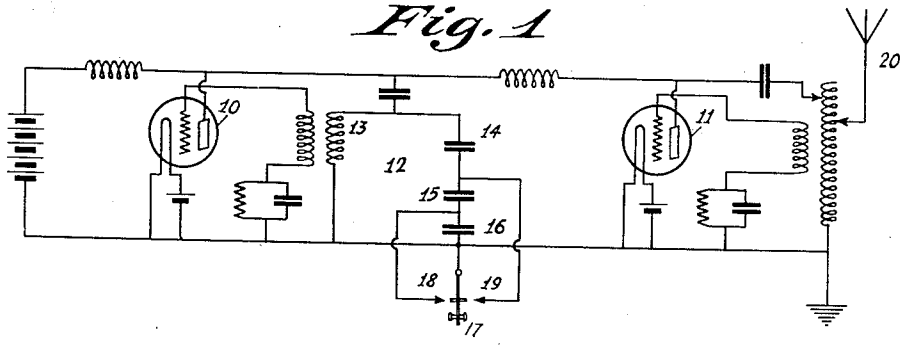


Fig. 2

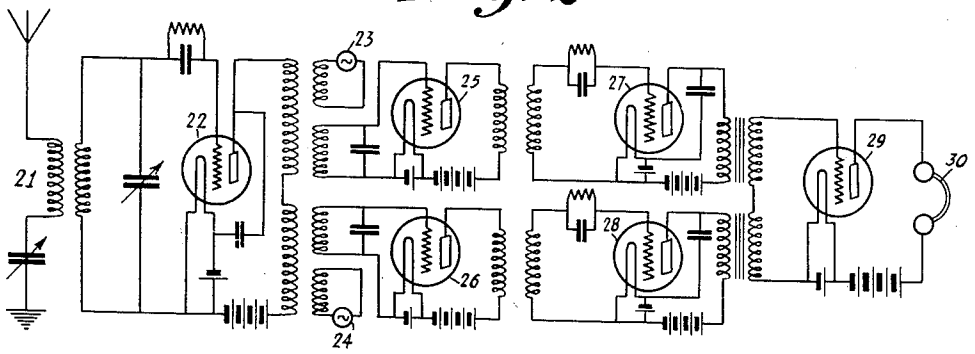
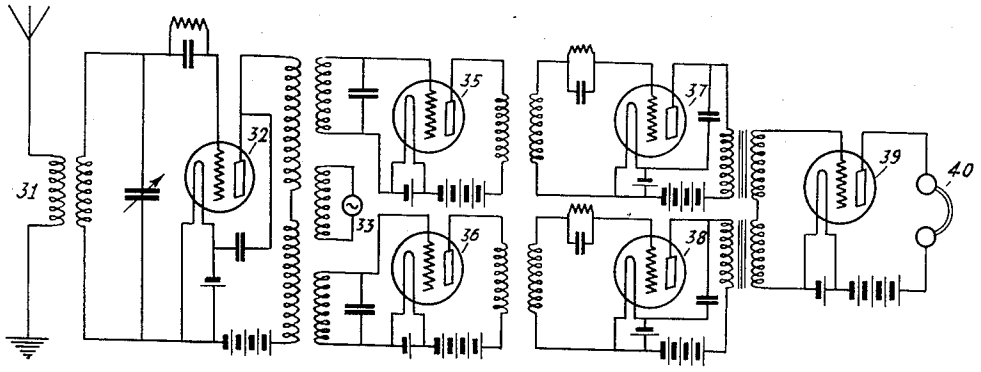


Fig. 3



INVENTOR
JOHN HAYS HAMMOND JR.
BY H. G. Grover
ATTORNEY

Patented Oct. 10, 1933

1,930,046

UNITED STATES PATENT OFFICE

1,930,046

SYSTEM FOR THE TRANSMISSION AND RECEPTION OF RADIANT ENERGY

John Hays Hammond, Jr., Gloucester, Mass.

Application November 12, 1929
Serial No. 406,566

5 Claims. (Cl. 250—8)

An object of this invention is to provide an improved system for the transmission and reception of radiant energy.

A further object of this invention is to provide an improved method for the transmission and reception of radiant energy.

A still further object of this system is to provide an improved system and method for the transmission and reception of radiant energy whereby a high degree of secrecy may be obtained.

Further objects of this invention will become apparent from the following specification taken in connection with the appended claims.

In carrying out the object of this invention, a high frequency carrier wave is modulated by a low supersonic secondary frequency, the frequency of which is altered to transmit the dots composing the elements of a message, and differently altered to transmit the dashes composing the elements of a message.

At the receiver, means are provided for heterodyning the incoming frequency and producing the same audio frequency regardless of whether the secondary frequency received is that representative of the dot or dash. The means for doing this comprise a heterodyne for cooperation with each of the two secondary frequencies present, which heterodynes will differ from each of the secondary frequencies by the same given audio frequency. It is obvious that a single heterodyne may be so chosen that it will differ from each of the secondary frequencies by the same amount and thereby produce the same audio frequency regardless of which secondary frequency is being received.

Having thus briefly described my invention, attention is invited to the accompanying figures wherein Fig. 1 represents the transmitter adapted to transmit high frequency energy modulated in accordance with my invention.

Fig. 2 represents a receiver for cooperation with the transmitter of Fig. 1 which receiver utilizes two heterodyne frequencies.

Fig. 3 represents an alternative receiver for cooperation with the transmitter of Fig. 1 which receiver utilizes a single heterodyne source.

Having thus briefly described the figures embodying my invention, particular attention is invited to Fig. 1, in which, 10 represents an intermediate frequency oscillator with its associated circuits, and 11 represents the high frequency oscillator and its associated circuits. The frequency of oscillator 11 is adapted to be modulated by the intermediate frequency produced by the oscillator 10.

The frequency determining circuit of the intermediate frequency oscillator 10 is represented generally by 12 and comprises a plate inductance 13 and the condensers 14, 15 and 16 connected in series. The double action key or "bug" 17 having contacts 18 and 19, is so connected that when in the left-hand position, such as for the transmission of dots, condenser 16 is short circuited while in the right-hand position, such as, for instance, for the transmission of dashes, both of the condensers 15 and 16 may be short circuited. It is obvious that various arrangements may be made for altering the secondary frequency variously for the transmission of dots and dashes, but each of these systems has the common feature that the secondary frequency is differently altered for the transmission of dots than for the transmission of dashes.

The high frequency energy produced by the oscillator 11 is thus modulated by the intermediate frequency and is transmitted in the usual manner through the antenna circuit generally indicated at 20.

Referring now more particularly to Fig. 2, 21 indicates generally the antenna system of the receiver, which is inductively coupled as shown in the input of the first detector 22. The output of the detector 22 is fed to the input of the two amplification circuits 25 and 26 which are tuned to the intermediate frequencies resulting from the transmission of the dots and dashes, respectively, transmitted by the transmitter of Fig. 1. The oscillators 23 and 24 are also fed in the input of the amplifier tubes 25 and 26, and the frequency produced by these oscillators is adapted to combine with the secondary frequency present in the input of the respective amplifiers.

For detecting the audio beats produced by said combining there are provided the second detectors 27 and 28 respectively, which are each adapted to produce the same audio frequency. The audio frequency thus produced is combined in the input of the amplifier 29. For utilizing the amplified audio frequency, there is provided the work circuit represented in this instance by the telephone receivers 30.

Referring now more particularly to Fig. 3, there is indicated generally at 31 the antenna circuit which is adapted to supply the first detector 32 in a similar manner to that previously described in connection with Fig. 2. The amplifiers 35 and 36 are supplied by the output of the first detector 32, and also by the local heterodyne 33, the frequency of which is so chosen as to differ from each of the frequencies used by the same amount. The outputs of the amplifiers 35 and 36 are fed to the second detectors 37 and 38 respectively, and upon the production of the audio frequency, it is fed into the amplifier 39 and utilized by the receivers 40 in the same manner as described in connection with Fig. 2.

I will now briefly describe the operation of my system. Suppose, for instance, that the os-

cillator 10 produces a frequency of 25 kilocycles with the key open, then it can be arranged to produce 22 kilocycles with the key to the left and the condenser 16 short-circuited for the transmission of a dot and to produce 20 kilocycles with the key to the right, and the condensers 15 and 16 short-circuited. Then at the receiver, the oscillators 23 and 24 could be set at 23 and 19 kilocycles respectively, which would give an audio beat of 1,000 cycles in the output of the second detectors 27 and 28 respectively, or as shown in Fig. 3, the oscillator 33 could be set at 21 kilocycles which would similarly give a beat frequency of 1,000 cycles in the output of the second detectors 37 and 38 respectively.

Thus, it can be seen, that, with respect to the listeners on the receiver 30 or 40 the same audio frequency is present, representative of a dot or a dash regardless of the fact that a different secondary frequency is being utilized for the transmission of said dot and said dash. This it can readily be seen is different from the operation of a receiver of the ordinary type in which but a single secondary frequency could be obtained and either the dots or the dashes would be entirely missing in the final output, thus producing secrecy of transmission which is one of the objects of the present invention.

Having thus described my invention, it is to be understood that the system shown and described is subject to numerous modifications all of which would have the common feature which I claim, and that I am therefore not to be limited by the specific form shown and described for the purpose of illustration only but by the actual scope of my invention as set forth in the appended claims.

What I claim is:

1. The method for the transmission and reception of radiant energy which comprises generating a current of high frequency, generating a current of intermediate frequency, altering said intermediate frequency to send a dot, differently altering said intermediate frequency to send a dash, modulating said high frequency current by said intermediate frequency current, transmitting the high frequency current thus modulated, receiving the modulated high frequency current, detecting said current to produce current of the intermediate modulation frequencies, locally producing a current of secondary frequency, selectively modulating the secondary modulation frequencies received with said locally produced current of secondary frequency to produce a constant audio frequency current regardless of the transmitted modulation frequency, detecting said audio frequency resulting from each of the intermediate frequencies and combining said audio frequencies to produce a signal.

2. Apparatus for the transmission and reception of radiant energy which comprises a source of high frequency energy, a source of intermediate frequency energy comprising means for altering the frequency of said energy including a double action key, a condenser adapted to be short circuited when the key is closed in one direction, a second condenser adapted to be short circuited when the key is closed in the opposite direction whereby the frequency of said intermediate frequency is varied in accordance with the position of said key, means for modulating said high frequency energy by said intermediate frequency energy as thus varied, means for transmitting the high frequency energy thus modulated, means for receiving the energy thus transmitted, means for detecting the secondary frequency components of said received energy, heterodyning means for producing a heterodyne frequency which when combined with each of the supersonic frequencies components of said received energy will produce the same audio frequency, means for combining said supersonic frequency components with said heterodyning frequencies, independent means for detecting each of the audio frequencies produced by said combining, means for combining and amplifying the audio frequency thus produced, and means for utilizing the audio frequencies thus combined and amplified.

3. Apparatus for the transmission of radiant energy which comprises a source of high frequency energy, a source of low supersonic frequency energy comprising means for altering frequency of said energy including a double action key, a condenser adapted to be short circuited when the key is closed in one direction, a second condenser adapted to be short circuited when the key is closed in the opposite direction whereby the frequency of said low supersonic frequency is varied in accordance with the position of said key, means for modulating said high frequency energy by said low supersonic frequency energy as thus varied, and means for transmitting the high frequency energy thus modulated.

4. Apparatus for transmitting and receiving radiant energy which comprises, a source of high frequency energy, means for generating intermediate frequency energy, means for altering the frequency of said last-named energy from one value to another value for sending different portions of a message, means for modulating said high frequency energy by said varied intermediate frequency energy, means for transmitting the high frequency energy thus modulated, means for receiving the energy thus transmitted, comprising a detecting system for detecting the intermediate frequency components of said received energy, heterodyning means for producing heterodyne frequencies of such values that when combined with each of the said detected intermediate frequency components there will result the same audio frequency, means for combining said intermediate frequency components with said heterodyning frequencies, means for detecting the resultant energy produced by said combining, and means for utilizing the resultant audio frequency.

5. Apparatus for transmitting and receiving radiant energy which comprises, a source of high frequency energy, means for generating intermediate frequency energy, means for altering the frequency of said last-named energy from one predetermined value to another for sending different portions of a message, means for modulating said high frequency energy by said varied intermediate frequency energy, means for transmitting the high frequency energy thus modulated, means for receiving the energy thus transmitted comprising a detecting system for detecting the intermediate frequency components of said received energy, a generator adapted to generate energy of a frequency intermediate the frequencies of the two values of said intermediate frequency energy, means for combining said intermediate frequency components with said heterodyning frequency, means for detecting the resultant energy produced thereby and means for utilizing the resultant detected energy.

JOHN HAYS HAMMOND, Jr.