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J. W. COX
SIGNALING SYSTEM

2,283,415

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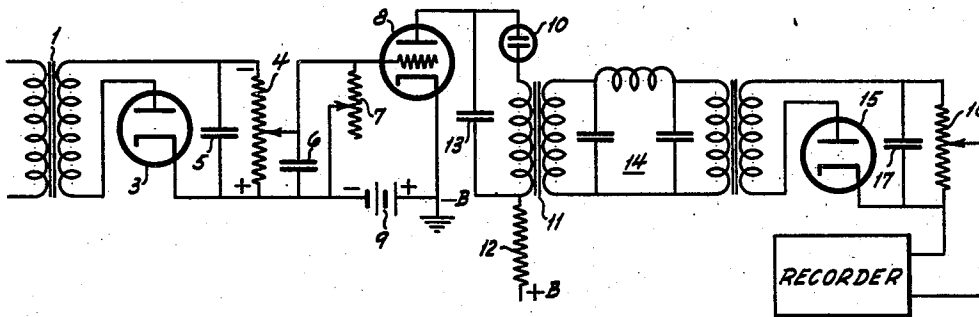


Fig. 1

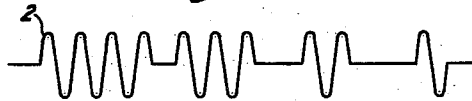


Fig. 2

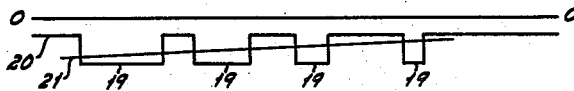


Fig. 3

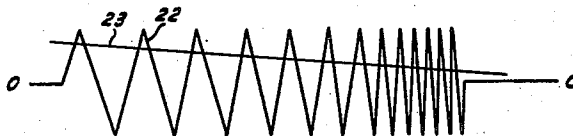


Fig. 4

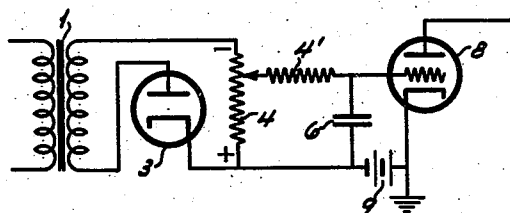


Fig. 5

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SIGNALING SYSTEM

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This invention relates to telegraph signaling systems and will be described in connection with constant frequency variable dot facsimile and picture transmission and reception.

Constant frequency variable dot facsimile, or CFVD, signaling has advantages, but the pictures recorded at the receiver from CFVD transmission have an objectionable screening effect at slow keying speeds, which at times are necessary in long distance radio transmission.

It is an object of this invention to receive CFVD signals and to convert such signals into varying frequency before recording them.

Another object is to change the CFVD signals at the receiver into varying frequency signals and then convert them into varying amplitude signals for recording.

Other objects of the invention will appear in the following description, reference being had to the drawing, in which:

Fig. 1 is a diagrammatic illustration of the receiving circuits embodying my invention.

Fig. 2 is a graph of the CFVD signals converted into tone signals.

Fig. 3 illustrates graphs of the potentials applied to the grid of the amplifier tube after the tone currents are rectified and filtered.

Fig. 4 illustrates graphs of the varying frequency signals and the rectified and filtered amplitude modulation derived therefrom.

Fig. 5 illustrates a modified circuit.

Referring to Fig. 1, the CFVD signals will be received and detected in a well-known way and usually will be converted into tone currents, especially if they are to be transmitted over long land lines from the receiving station to the local recording office. Apparatus for accomplishing all this is well known in the art and is not illustrated. Reference is made to the patent to Henry Shore and James N. Whitaker, No. 2,083,245, granted June 8, 1937, for such a prior art system.

It is assumed that the CFVD signals in the form of tone signals are received in the primary of transformer 1 at the recording office. These signals are of the form shown at 2 in Fig. 2. The distances between the centers of these signals are uniform and hence have a constant dot frequency. They, however, are of varying length.

The secondary of the transformer is connected through rectifier 3 to load resistance 4 and smoothing condenser 5. Condenser 6 is adjustably connected to resistance 4 and is shunted by a variable high resistance 7 to vary its time constant. The input circuit of tube 8 is connected

to condenser 6 and it may include a negative biasing source 9 to cause operation along the proper part of the grid voltage-plate current characteristic. The cathode is connected to ground, which is the negative terminal of the B or plate supply.

The plate of tube 8 is connected to the positive terminal of the B source through a neon tube 10 and the primary of transformer 11 in series relation. A resistance 12 is shown in this circuit for control purposes. A condenser 13 shunts the primary and the neon tube. The vacuum tube 8, neon tube 10 and condenser 13 constitute an oscillator, as will later be described.

The secondary of transformer 11 is connected to a frequency demodulator 14 consisting of a low-pass filter, though a high-pass or band-pass filter, or any other demodulator, could equally well be used. This filter shown consists of series inductance and shunt capacity.

The output of demodulator 14 is connected to rectifier 15 and load resistance 16, across which is connected a smoothing condenser 17, though this is not essential. A recorder 18 is adjustably connected across resistance 16. This may be any type of amplitude recorder; for example, a photo recorder producing a record from a lamp fed with the current of varying amplitude, which is a well-known type.

The operation of my improved system is as follows:

The CFVD signals arrive as tone frequency at transformer 1, in the form indicated at 2 in Fig. 2. The current is rectified and smoothed out to produce a negative potential in the input circuit of tube 8, as indicated at 19. This is added to whatever constant negative bias 20 is applied by the source 9.

The varying signal potential produced by the CFVD signals is integrated by condenser 6 and high resistance 7, so that a total average potential for the signals assumed, is produced as shown at 21. This produces a varying internal plate-cathode impedance in tube 8, which is in series with the charging circuit of condenser 13.

Condenser 13 charges and when the potential reaches the striking value of neon tube 10, the condenser discharges through that tube. It continually charges and discharges, thus producing a current having a frequency set by the variable impedance of tube 8. When the impedance of that tube is high, the condenser will charge more slowly and when it is low, it will charge more rapidly. Hence, the varying negative potential 21 produced by the CFVD signals will cause the

condenser and neon tube to oscillate at a varying frequency, as indicated at 22 in Fig. 4.

The voltage of varying frequency passes into filter demodulator 14 and the output after rectification, either smoothed or not, will be an amplitude variation, as indicated at 23. This amplitude variation produces the picture in the recorder 18 by producing a variable light, or other well-known means.

The frequency of the condenser-neon tube oscillator may be anything desired, but it is preferably sufficiently high to preclude its producing a screening effect. I have found 2,000 cycles per second to be a satisfactory frequency.

There is a further advantage in the use of my invention in that static clicks occurring in the spaces will not be recorded, because they are of too short duration to produce a noticeable change in the frequency of the oscillator.

A further advantage in my invention is that the filter demodulator can be warped in its frequency characteristic in any way desired and by proper design of inductance and capacity, detail in the near black portions of the picture can be readily obtained. Detail in this portion of the picture cannot be satisfactorily obtained by recording the CFVD signals directly.

In CFVD transmission, it has been found advisable to use 10% dots for white, which will not record as pure white. By using my invention, the 10% dots are too short to produce a frequency in the oscillator output that will pass the demodulator and hence pure white will be produced by the recorder. My improvement has like advantages when signals of other dot percentages are used.

If desired, the condenser-neon tube oscillator may be located at the receiving station and the variable frequency produced will then make it unnecessary to use tone frequency for the transmission to the recorder. This can be accomplished with a very narrow frequency band width.

In doing this, I have used a band that is only approximately 85 cycles in width from black to white. The standard CFVD system requires a much wider tone frequency band.

In the modification of Fig. 5, the condenser 5 of Fig. 2 has been omitted and an extra resistance 4' inserted in the grid conductor. This will produce the same results as Fig. 2.

It will be apparent that various modifications may be made in my invention without departing from the spirit of the invention.

Having described my invention, what I claim is:

1. In facsimile reception of current signals of constant frequency and variable time length, means for receiving said signals, means for converting the signals into alternating current having a frequency varying with the time length of the signals, means for converting the variable frequency current into current of varying amplitude, and means for recording the last-mentioned current.

2. In facsimile reception of current signals of constant frequency and variable time length, means for receiving said signals, means for converting the signals into alternating current having a frequency varying with the time length of the signals, means for converting the variable frequency current into alternating current of varying amplitude, means for rectifying said alternating current and means for recording said rectified current.

3. In facsimile reception of current signals of constant frequency and variable time length, means for receiving said signals, an oscillator, means for varying the frequency of said oscillator with the time length of the signals, a reactance circuit for passing said varying frequency with amplitudes varying with the frequency, a rectifier for said current of varying amplitude and means for recording the rectified current.

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