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TELEVISION SYSTEM
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Fig. 1.

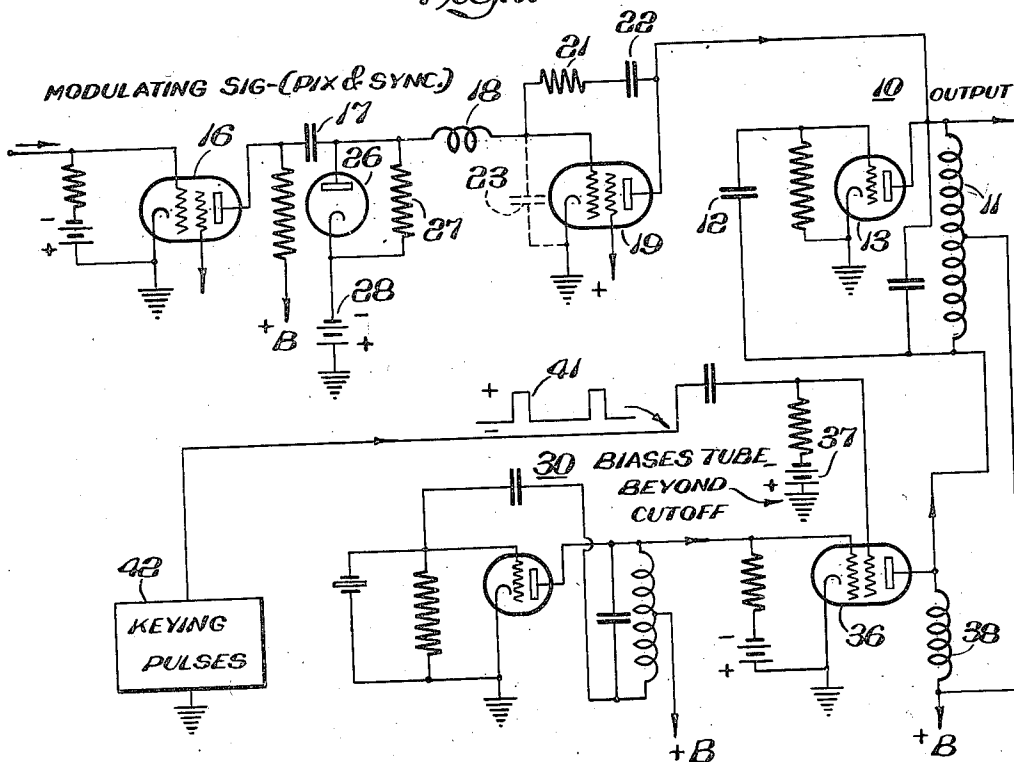
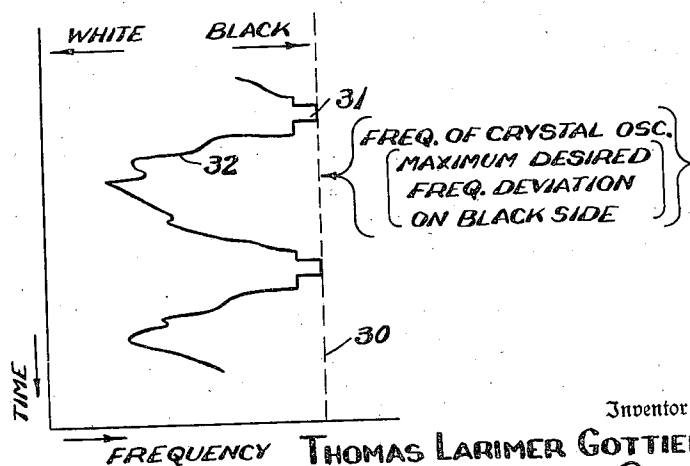


Fig. 2.



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TELEVISION SYSTEM

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5 Claims. (Cl. 178-7.1)

My invention relates to the art of frequency modulation, particularly as applied to television or other picture transmission systems.

In television systems employing amplitude modulation, it has been the usual practice to so modulate a carrier wave that the synchronizing pulses of the modulating signal modulate the carrier wave either to a predetermined maximum amplitude or to a predetermined minimum amplitude such as zero carrier, the two ways of modulating being referred to as negative and positive modulation, respectively. The modulating signal referred to is a mixture of synchronizing pulses and picture signal, the said pulses being in the direction of "black" in the picture.

An object of the present invention is to provide an improved frequency modulation system for a television or picture transmitter which retains the above-mentioned feature of having the synchronizing pulses always go to a predetermined modulation level. This predetermined level in a frequency modulation system is, of course, a predetermined frequency.

A further object of my invention is to provide a method of and means for holding the mean frequency of a frequency-modulated carrier wave substantially constant.

In one preferred embodiment of the invention, the peaks of the synchronizing pulses are held at the desired predetermined level or frequency by applying the output of a stable oscillator, such as a crystal oscillator, to the carrier wave oscillator during the occurrence of each synchronizing pulse. The crystal oscillator frequency is the frequency to which the synchronizing pulses in the modulating signal are supposed to deviate the carrier wave. Upon the occurrence of each synchronizing pulse, the crystal oscillator will pull the carrier wave oscillator to the said frequency if it has not already been modulated to the exact desired frequency.

The invention will be better understood from the following description taken in connection with the accompanying drawing in which

Figure 1 is a circuit diagram of a portion of a television transmitter embodying my invention, and

Figure 2 is a diagram which is referred to in explaining the operation of the invention.

Referring to Figure 1, there is shown a television transmitter comprising a carrier wave oscillator 10 which may be of a well-known type having a tuned circuit 11 and a condenser 12 connecting one end of the tuned circuit to the grid of the oscillator tube 13.

The output of oscillator 10 is frequency-modulated by the video input or television signal which is amplified by a video amplifier 16 and applied through a blocking condenser 17 and an inductance coil 18 to the grid of a reactance tube 19.

The function of the reactance 19 is to vary the effective reactance across the oscillator-tuned circuit 11 in accordance with the voltage amplitude variations on the grid of the reactance tube. Thus, a frequency-modulated carrier wave is obtained. In the particular example shown, the tube 19 is connected across the tuned circuit 11 by a connection from the plate of tube 19 to the plate of oscillator tube 13 and by a connection from the cathode of tube 19 to ground. A resistor 21 connected between the grid and plate of tube 19 through a blocking condenser 22 functions together with the grid-cathode capacity indicated at 23 to provide the necessary out-of-phase component for the reactance tube operation.

A diode 26 is provided to reinsert the direct current component of the video signal. The D. C. reinsertion circuit operation is well known and may be explained briefly as follows: The synchronizing pulses are of positive polarity at the plate of diode 26 and will cause a flow of diode current whenever they drive the diode plate positive with respect to its cathode. This puts a charge on coupling condenser 17. At the end of a pulse, the condenser 17 loses a small part of its charge through a resistor 27 whereby the D. C. voltage across condenser 17 may always have a value determined by the peaks of the synchronizing pulses as measured from the A. C. axis of the signal.

The biasing battery 28 sets the voltage level at which the diode 26 passes current. Battery 28 also applies a negative bias to the control grid of tube 19 so that the synchronizing pulses never drive the grid of tube 19 positive with respect to its cathode.

Inductance coil 18 is provided to separate the electrode capacities of tubes 19 and 26 for the purpose of holding up the high frequency response.

For holding the peaks of synchronizing pulses at a fixed frequency, a stable oscillator, such as a crystal oscillator 30, is provided which produces a voltage at a frequency equal to the said fixed frequency representing peaks of synchronizing pulses.

In Figure 2, the frequency of oscillator 30 is indicated by the vertical dotted line. This also

is the frequency at which the peaks of the synchronizing pulses are to be held. The synchronizing pulses and the picture signal which comprise, the modulating signal are indicated at 31 and 32, respectively.

The output of oscillator 30 is fed to the grid of an amplifier which, between synchronizing pulses, is biased beyond cut-off by a biasing battery 37.

The plate circuit of amplifier 36 is connected to a point on the tuned circuit 11 so that, during a synchronizing pulse, it presents to the carrier wave oscillator 10 a reactance that is either inductive or capacitive, depending upon the instantaneous phase difference of the two oscillator outputs. Plate voltage is supplied to amplifier 36 through a radio frequency choke coil 38.

The pulses which key the amplifier 36 to make it pass signal during the occurrence of each synchronizing pulse in the modulating signal are indicated at 41. They may be obtained from any suitable source indicated at 42 which produces pulses occurring simultaneously with the synchronizing pulses. The source 42 may be, and preferably is, the synchronizing pulse generator itself.

From the foregoing description, it will be apparent that, during each keying pulse 41, the crystal controlled oscillator 30 feeds signal at a fixed frequency to the tank circuit 11 of the carrier wave oscillator 10 whereby its frequency of oscillation during these periods is shifted to said fixed frequency if it happens to be above or below it as a result of frequency drift of oscillator 10, for example.

It will be understood that my invention holds the mean frequency of the oscillator 10 substantially constant in addition to making the oscillator output go to a predetermined frequency during each synchronizing pulse. The reason for this is that the synchronizing pulses, especially those occurring at line frequency, have such a short time interval between them that a well designed oscillator will drift in frequency a negligible amount between pulses.

Because of the above-described action, the invention may be applied to a sound transmitter for holding the mean frequency constant. In such a transmitter, special keying pulses must be supplied. They preferably are made to occur at a superaudible rate to avoid the necessity of filtering them from the sound output.

I claim as my invention:

1. A radio transmitter comprising a carrier wave oscillator, means for frequency modulating said oscillator in accordance with a modulating signal having a maximum amplitude represented by a maximum deviation of said oscillator frequency to a predetermined frequency, a stable oscillator which oscillates at said predetermined frequency, means for supplying recurring control pulses, and means for coupling said stable oscillator to said carrier wave oscillator during the occurrence of said control pulses only.

2. A picture transmitter comprising a carrier wave oscillator, means for frequency modulating said oscillator in accordance with a signal comprising picture signals and recurring synchronizing pulses whereby the peaks of said pulses are represented by a maximum deviation of said oscillator frequency to a predetermined frequency, a stable oscillator which oscillates at said predetermined frequency, and means for coupling said stable oscillator to said carrier wave oscillator during the occurrence of said synchronizing pulses only.

3. A picture transmitter comprising a carrier wave oscillator, means including a reactance tube for frequency modulating said oscillator in accordance with a signal comprising picture signals and recurring synchronizing pulses whereby the peaks of said pulses are represented by a certain maximum deviation of said oscillator frequency to a predetermined frequency, and means for causing the peaks of said pulses always to swing the output of said oscillator to said predetermined frequency, said last means comprising a stable oscillator which oscillates at said predetermined frequency, and means for coupling said stable oscillator to said carrier wave oscillator during and only during each of said synchronizing pulses.

4. A picture transmitter comprising a carrier wave oscillator, means for frequency modulating said oscillator in accordance with a signal comprising picture signals and recurring synchronizing pulses which go to a fixed voltage level whereby the peaks of said pulses are represented by a certain maximum deviation of said oscillator frequency to a predetermined frequency, and means for causing the peaks of said pulses always to swing the output of said oscillator to said predetermined frequency regardless of the tendency of said carrier wave oscillator to drift in frequency, said last means comprising a piezo-electric crystal oscillator, and means for feeding its output into said carrier wave oscillator during and only during the occurrence of each of said synchronizing pulses.

5. A frequency modulation transmitter comprising a carrier wave oscillator, means for producing a modulating signal containing periodically recurring pulses which go to a predetermined voltage level, means for varying the frequency of said oscillator in accordance with the instantaneous amplitude of said modulating signal, and means for limiting said frequency variation so that it does not exceed a certain frequency limit for the lower frequency components of said pulses, said last means comprising a stable oscillator which oscillates at said frequency limit and which is coupled to said carrier wave oscillator through an amplifier tube, and means for making said amplifier tube effective to transfer said stable oscillator output to said carrier wave oscillator during and only during the occurrence of said synchronizing pulses.

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