

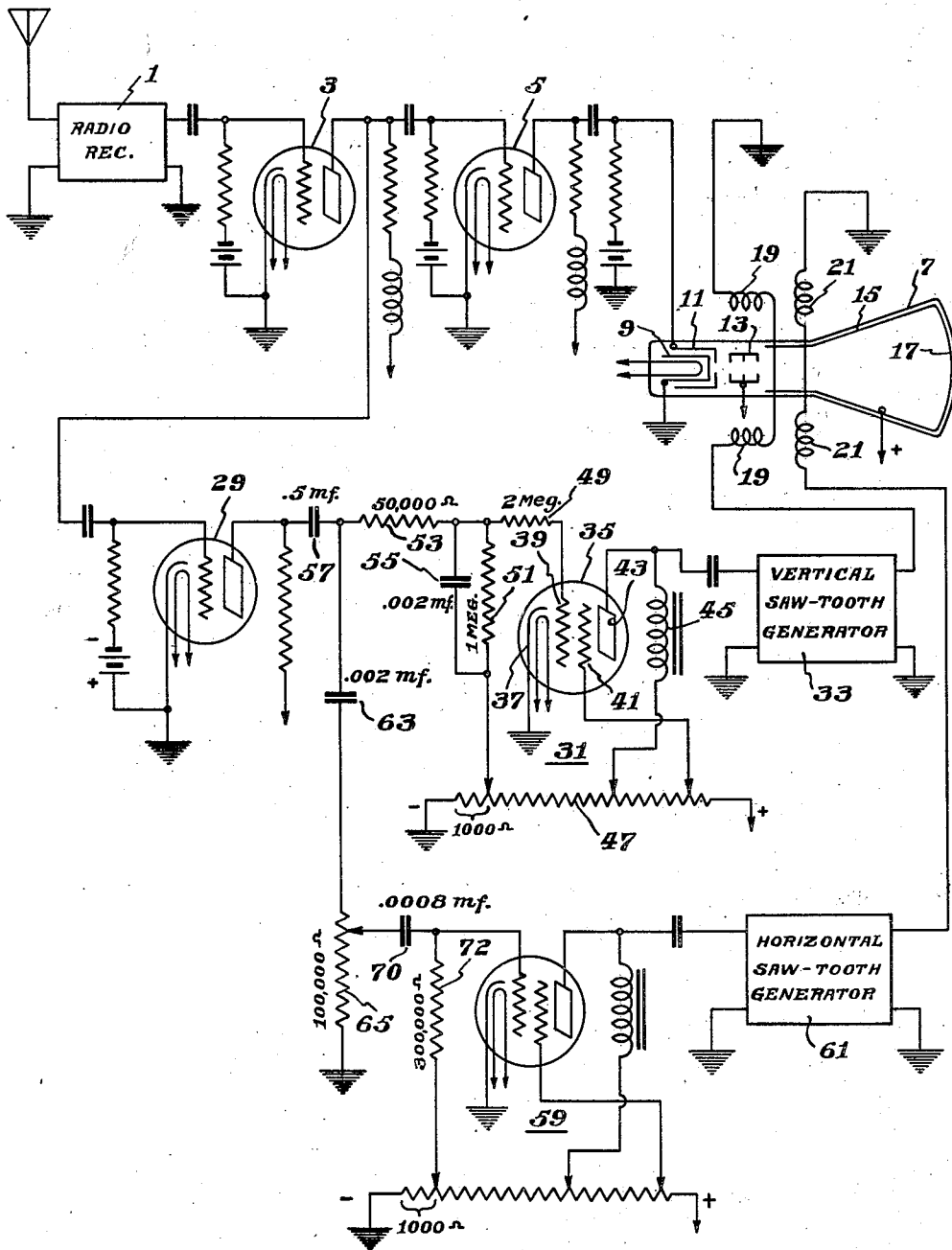
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TELEVISION APPARATUS

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TELEVISION APPARATUS

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My invention relates to the transmission and reception of pictures and particularly to a method of and means for obtaining proper synchronization between scanning at the transmitter and scanning at the receiver.

Specifically, my invention relates to a television system in which, at the transmitter, a horizontal synchronizing impulse is transmitted at the end of each scanning line and a vertical synchronizing or framing impulse is transmitted at the end of each picture frame, each framing impulse being of longer duration than a horizontal synchronizing impulse. A system of this general type is disclosed in French Patent No. 742,671, published March 14, 1933.

An object of my invention is to provide an improved method of and means for synchronizing the scanning at the transmitter and receiver of a television system.

A further object of my invention is to provide an improved receiver for use in a system of the above-mentioned type.

A still further object of my invention is to provide means for isolating, at the receiver, the horizontal synchronizing impulses and the framing impulses.

Other objects, features and advantages of my invention will appear from the following description taken in connection with the accompanying drawing, in which the single figure is a circuit diagram of a television receiver embodying my invention.

Referring to the drawing, the picture receiving apparatus comprises a radio receiver 1 which supplies picture and synchronizing signals through amplifiers 3 and 5 to a cathode ray receiver tube 7. The cathode-ray tube 7 is of well known construction and includes an electron gun comprising a cathode 9, a control grid 11, and a first anode 13. The tube is also provided with a second anode 15 and a fluorescent screen 17. Suitable deflecting devices, such as deflecting coils 19 and 21, are provided for deflecting the electron beam both vertically and horizontally for scanning the fluorescent screen 17.

It will be noted that both the picture signals and the synchronizing signals are impressed upon the control grid 11 of the cathode-ray tube. The presence of the synchronizing signals in the control grid circuit is not objectionable, and, in fact, is desirable, since by giving them a negative polarity they are made to block the electron beam during the return line periods.

The signals appearing in the output circuit of the amplifier tube 3 have been generated at the transmitter in accordance with the teachings of the above-mentioned French patent. An important characteristic of these signals is that the framing impulse is of considerably greater duration than the horizontal synchronizing impulses.

Also, the framing impulses are of substantially the same amplitude as and occur at a much lower frequency than the horizontal synchronizing impulses. For example, in the system for which the receiver shown in the drawing is designed, the framing impulses occur at the rate of 24 per second, while the horizontal synchronizing impulses occur at the rate of 2880 per second.

The above-described signals appearing in the output circuit of the amplifier 3 are impressed upon the input circuit of an electric discharge tube 29 which is so adjusted that it separates most of the picture signals from the framing and horizontal synchronizing impulses. In the circuit illustrated, this separation is accomplished by biasing the tube close to the cut-off point. Since the synchronizing impulses are impressed upon the input circuit of the separating tube 29 with a positive polarity, they appear in the tube output circuit while the more negative picture signals are not passed by the tube.

Referring now to the deflecting circuits which are to be controlled by the synchronizing impulses, the vertical deflecting circuit includes an oscillator 31 and a saw-tooth current generator 33. It will be understood that the oscillator 31 may be of any suitable type such as the dynatron illustrated. The oscillator 31 comprises an electric discharge tube 35 having a cathode 37, a control grid 39, a screen grid 41 and a plate 43. The plate 43 is supplied through a choke coil 45 with a suitable positive potential from a voltage divider 47. The screen grid 41 is supplied with a higher positive potential from the voltage divider 47. The control grid 39 is connected through two resistors 49 and 51 connected in series to a point on the voltage divider 47, which point is positive with respect to the cathode 37. It may be noted that so far as my invention is concerned, the control grid 39 of the dynatron may be at any bias potential which permits the dynatron to oscillate weakly enough to permit pulling it into synchronism. The theory of operation of a dynatron oscillator is well known and need not be explained here. The oscillator is adjusted to oscillate at a frequency slightly lower than the frequency of the framing impulses whereby the impulses may pull the oscillator into synchronism with the vertical deflection at the transmitter.

The impulses appearing in the output circuit of the dynatron oscillator 31 are impressed upon the input circuit of the saw-tooth current generator 33, while the output circuit of the generator 33 is connected across the vertical deflecting coils 19.

Only the framing impulses are impressed upon the dynatron oscillator 31, the horizontal synchronizing impulses being substantially eliminated by the circuit which is employed. This

circuit is a filter or integrating circuit which consists of a series resistor 53 and a shunt condenser 55. The output circuit of the separating tube 29 is coupled through a coupling condenser 57 and the series resistor 53 to the junction point of the two resistors 49 and 51. The shunt condenser 55 and the resistor 51 are connected in parallel whereby the grid circuit of the dynatron oscillator has impressed thereon the voltage which appears across the condenser 55. In the grid circuit, the resistor 49 functions to prevent the control grid from becoming too positive, while the resistor 51 functions both as a coupling resistor and as a grid leak resistor.

The horizontal deflecting circuit is similar to the vertical deflecting circuit and comprises a dynatron oscillator 59 and a saw-tooth current generator 61. The oscillator 59 is adjusted to oscillate at a frequency slightly lower than the frequency of the horizontal synchronizing impulses, whereby it may be pulled into synchronism with the horizontal deflection at the transmitter.

The horizontal synchronizing impulses are impressed upon the grid circuit of the oscillator 59 substantially to the exclusion of the framing impulses. This is accomplished by providing a filter circuit consisting of a condenser 63 having small capacity which is connected in series with a high impedance resistor 65. The output circuit of the separating tube 29 is connected through the coupling condenser 57 to one terminal of the condenser-resistor combination 63-65, while the other end of the condenser-resistor combination 63-65 is connected to ground whereby the comparatively high frequency synchronizing impulses will pass through the condenser 63 and the comparatively low frequency framing impulses will be excluded. The grid circuit of the oscillator 59 is coupled across the resistor 65 by means of a coupling condenser 70 to receive the horizontal synchronizing impulses. The condenser 70 and the dynatron grid resistor 72 form a second filter section which may be omitted, if desired.

The characteristic of the vertical separating circuit is that it passes the comparatively low frequency components of the synchronizing impulses and excludes the higher frequency components, while the characteristic of the horizontal separating circuit is that it passes these higher frequency components which are excluded by the vertical circuit and excludes the lower frequency components. Separating circuits which have these characteristics substantially isolate the framing impulses and the horizontal synchronizing impulses, since impulses having the general character shown in the above-mentioned French patent are characterized by the fact that most of the energy in the framing impulses appears in a frequency band below a certain frequency (in general, the horizontal synchronizing frequency), while most of the energy in the horizontal synchronizing impulses appears in a frequency band above this frequency.

It has been found that for the best operation of a television receiver the framing impulses and the horizontal synchronizing impulses should be isolated. By following this procedure the framing impulses cannot produce undesirable transient effects in the horizontal deflecting circuit, and likewise, the horizontal synchronizing impulses cannot produce similar effects in the vertical deflecting circuit.

Specific values in ohms, megohms, and micro-

farads have been indicated on the drawing, but it is to be understood that there may be a wide departure from these values in practicing my invention.

The saw-tooth current generators indicated in Figs. 1 and 2 may be of any suitable type, such as those disclosed in French Patent No. 738,475, published December 26, 1932. It will be understood, of course, that if the cathode-ray tube is provided with deflecting plates instead of deflecting coils, suitable saw-tooth voltage generators will be provided.

I claim as my invention:

1. A television receiver comprising means for intercepting picture signals accompanied by horizontal and vertical synchronizing impulses, the vertical synchronizing impulses being of longer duration than, and of substantially the same amplitude as, the first impulses and occurring at a substantially lower frequency, a cathode-ray tube, horizontal and vertical deflecting circuits therefor, means comprising an electric discharge tube for separating said impulses from said picture signals, said tube having an input circuit and an output circuit, means for impressing said impulses upon said input circuit, a resistor and a capacitor connected in series to form a horizontal separating circuit, a resistor and a capacitor connected in series to form a vertical separating circuit, said two separating circuits being connected in parallel across said output circuit, said horizontal deflecting circuit having its input circuit connected across the resistor of said horizontal separating circuit, and said vertical deflecting circuit having its input circuit connected across the capacitor of said vertical separating circuit, the capacity of the capacitor in said horizontal separating circuit being so small that the horizontal synchronizing impulses are supplied to the horizontal deflecting circuit substantially to the exclusion of said vertical synchronizing impulses.

2. In a television receiver wherein a composite signal is received, said signal comprising picture signals and periodically recurring synchronizing signals to said synchronizing signals being of greater amplitude than picture signals of like polarity, a cathode ray tube having deflecting means associated therewith for deflecting the cathode ray, a picture signal channel through which said composite signal is supplied to said cathode ray tube, a synchronizing signal channel having its input circuit coupled to said picture channel and having its output circuit coupled to said deflecting means, an electric discharge tube having a cathode, a control grid and a plate and being located at a point in said synchronizing channel where said synchronizing signals appear on said control grid with a negative polarity, two resistor sections connected in series between said control grid and said cathode, the signals in said synchronizing channel being impressed across only the resistor section adjacent to said cathode whereby any picture signals which may be present are prevented from appearing in the output circuit of said electric discharge tube.

3. The invention according to claim 2 characterized in that the resistance value of the resistor section adjacent to said control grid is greater than the resistance value of the other resistor section.

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