Aug. 8, 1944. R. BARTHELEMY 2,355,135

SYNCHRONIZING APPARATUS FOR CATHODE RAY OSCILLOGRAPHS

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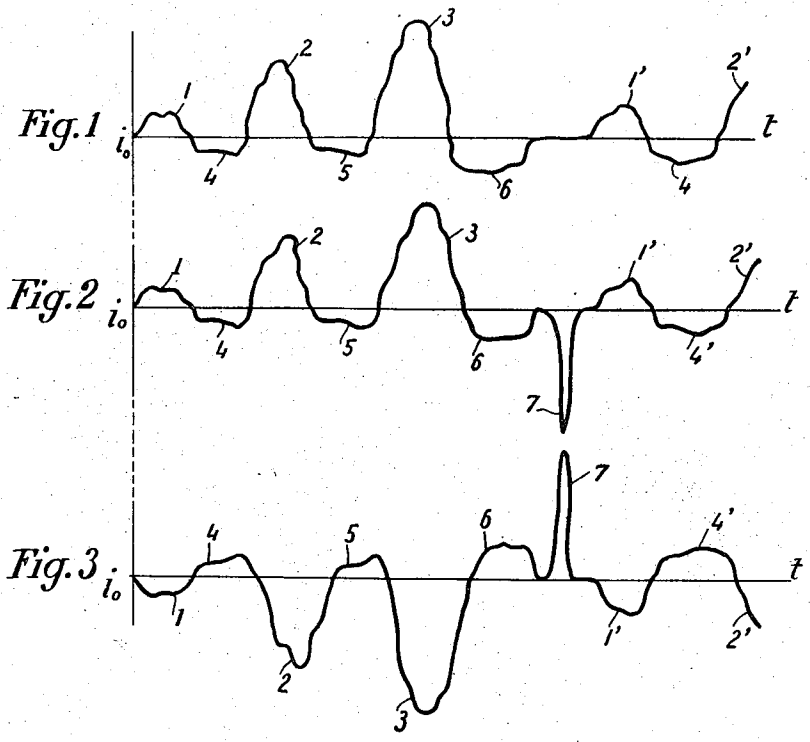
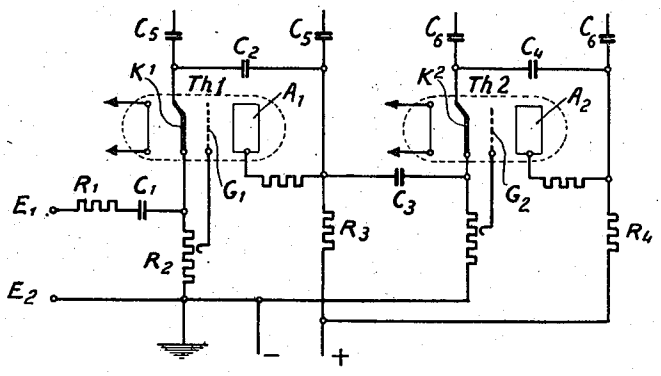


Fig. 4



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SYNCHRONIZING APPARATUS FOR CATHODE-RAY OSCILLOGRAPHS

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2 Claims. (Cl. 178—69.5)

It is known, in the production of "saw-tooth" potential differences for controlling the movement of the luminous spot in cathode ray oscillographs, to use relaxation circuits including gas discharge tubes known as "Thyratrons." One of these systems used for television in which there are two scannings movements at right angles to one another known as "line" movement and "image" movement, consists more particularly, in giving to the corresponding Thyratron circuits appropriate time constants to trigger the oscillations of the line circuit by means of impulses synchronized with the transmission of the signals to be reproduced, and to trigger the oscillations of the image circuit by the passage of a current in the line circuit. In these known systems the synchronizing impulse is received on the grid of the line Thyratron which it depolarizes in such a manner as to render the Thyratron conductive.

The object of the present invention is to provide an improvement of the above-mentioned systems, which improvement is characterized by the use of the synchronizing impulses. In effect in order the more readily to differentiate, in the modulated current, the synchronizing impulses from the variations of current due to the analysis of the image, it has been proved to apply the synchronizing impulses to the current modulated by the image in such a manner that the variations of current due to the synchronizing impulses are of the same sense as the variations of current due to the dark parts of the image. As will be explained hereinafter this method enables the synchronizing apparatus at the receiver to be controlled by the whole of the modulated voltage received without the necessity of separating out the synchronizing signals by means of filters or other appropriate apparatus.

Figures 1, 2, and 3 of the accompanying drawing represent the curves of the modulated current as a function of time.

Figure 4 is a circuit diagram of a synchronizing apparatus at the receiver.

Fig. 1 shows the normal curve of the current modulated by the analysis of the image. The parts 1, 2 and 3 correspond to the bright parts of a line and the parts 1', 2' . . . correspond to the bright parts of the following line. On the other hand, the parts 4, 5, 6, 4' . . . correspond to the dark parts. The mean current i_0 is such that, for an interval equal to the analysis of an image, the total surfaces of the curve corresponding to the bright parts in equal to the surfaces of the curve corresponding to the dark parts. It will be appreciated that the maximum amplitude of the dark parts, compared with the mean current i_0, is small compared with the maximum amplitude of the bright parts. It is on the appreciation of this fact that the present invention is based. It is known practice to insert the synchronizing impulses in the current modulated by the image in such a manner that the impulses produce current variations of the same sense as the bright regions of the image. It may thus happen that the maximum amplitude of the bright regions is close to the amplitude of the synchronizing signals. Filters are then necessary, at the receiver, to separate the signals out of the whole of the modulated current received.

According to the present invention, on the contrary, the amplitude of the synchronizing signals is of the same sense as the dark parts of the analysis, as is shown in Fig. 2, in which 7 represents a synchronizing signal transmitted between two successive lines. It will thus be seen that this signal is clearly distinguished from the obscure parts 4, 5, 6. It is then possible to operate the synchronizing apparatus at the receiver directly by the received modulated current without the interposition of a filter. It is, in effect, sufficient to polarize this apparatus in such a manner that the obscure parts do not cause the same to function whilst the synchronizing signals bring it into action.

As shown in Figure 2 the synchronizing signals correspond to a reduction of the intensity of the modulated current which may even annul it. When the synchronizing device at the receiver consists of gas discharge tubes, considerable difficulties are encountered in obtaining the precise triggering of these tubes by means of the annulment of the modulated current. Therefore, the present invention provides also that the modulation, at the transmitter, shall be such that the bright parts 1, 2, 3 of the image correspond to the reduction of the intensity of the modulated current (Fig. 3) whilst the dark parts 4, 5, 6 and the synchronizing signals 7 correspond to an increase of the said current.

The principal advantages of this process are: the increase of security of reception of the synchronizing impulses; the easy separation of the synchronizing signals from the remainder of the modulation; the provision of a very precise triggering of the gas discharge tube at the receiver; protections against interference due to the fact that if the intensity of the synchronizing signals is twice that of the mean intensity the en-

ergy corresponding to the same is four times that of the mean energy.

Figure 4 shows a circuit diagram of a convenient synchronizing device more particularly for the reception of the modulated current of the form shown in Figure 3. This device comprises essentially two gas discharge tubes Th_1 and Th_2 controlling, respectively, the "line" movement and the "image" movement of a cathode beam. The received modulated voltage is applied to the terminals E_1 and E_2 and is transmitted to the terminals of a resistance R_2 through the intermediary of a resistance R_1 and a condenser C_1. One of the terminals of the resistance R_2 is connected to the earth line of the receiver and the other terminal is connected to the cathode K_1 of the tube Th_1. Moreover, R_2 forms a potentiometer permitting the application, between the grid G_1 and the cathode K_1, of the whole or a part of the modulated voltage received. This application is made in such a sense that the synchronising signals, which correspond to an increase of the modulated potential received, bring about a reduction of the potential of the cathode K_1 in order to render the tube Th_1 conductive. When only a part of the modulated potential is applied across the grid and the cathode the potential of the cathode will be reduced more than the potential of the grid or, in other words, the potential of the cathode with respect to the grid will be reduced and the tube will become conductive. The contact on the resistance R_2 feeding the grid G_1 enables the point of triggering of the tube Th_1 to be adjusted.

The line oscillating circuit comprises the condenser C_2 and the charging resistance R_3. An electrostatic coupling provided by the condenser C_3 which is very small compared to the condenser C_2 is feeding the cathode K_2 of the image gas discharge tube Th_2 associated with which is the condenser C_4 and resistance R_4 forming the image oscillating circuit. The capacities C_5 and C_6 serve to connect the oscillating circuits to the deflector plates of the cathode tube.

The heating circuits of the two gas discharge tubes are well insulated from one another and have as small a capacity as possible.

It will be obvious that, without departing from the scope of the present invention, many modifications may be made in the construction and coupling of the oscillating circuits, the feeding of the cathode without separation of the modulated signals being one of the characteristic features of the present invention.

What I claim is:

1. A synchronizing circuit for a television system comprising a gas discharge tube, a cathode, a grid and an anode in said tube, a direct current source having positive and negative terminals, a condenser connected across said cathode and anode, a first resistor connected between the positive terminal and said anode, a second resistor having a first terminal connected to said negative terminal and a second terminal connected to said cathode, a tap on said second resistor connected to said grid, a deflector circuit connected across said condenser, and a source of synchronizing impulses having a positive terminal connected to said first terminal of the second resistor and a negative terminal connected to said second terminal of the second resistor.

2. A synchronizing circuit for a television system comprising a pair of gas discharge tubes each having a cathode, a grid and an anode, a direct current source having a negative terminal, means fed from said source for causing a gradual increase of voltage of each of said anodes with respect to its cathode, a line deflector circuit connected across the anode and cathode of one of said tubes, a frame deflector circuit connected across the anode and cathode of the other of said tubes, a first resistor having a first terminal connected to said negative terminal and a second terminal connected to the cathode of said one of said tubes, a tap on said first resistor connected to the grid of said one of said tubes, a second resistor having a first terminal connected to said negative terminal and a second terminal connected to the cathode of the other of said tubes, a tap on said second resistor connected to the grid of the other of said tubes, a source of synchronizing impulses having a positive terminal connected to said first terminal of said first resistor and a negative terminal connected to said second terminal of said first resistor, and a coupling condenser connecting the anode of said one of said tubes to the second terminal of said second resistor.

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