Jan. 31, 1956 E. NEUMANN 2,733,293

DEVICE FOR IMAGE SYNCHRONIZATION IN TELEVISION EQUIPMENT

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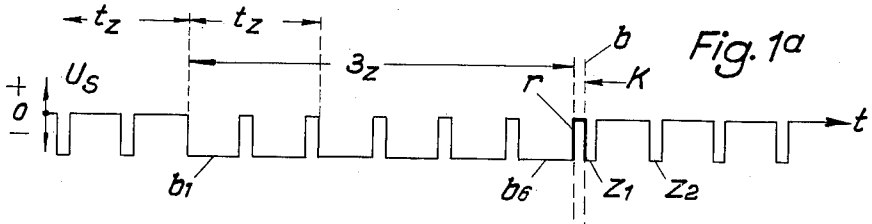


Fig. 1a

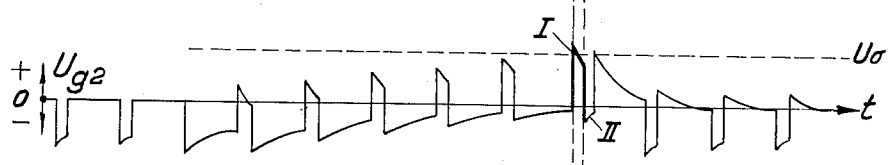


Fig. 1b

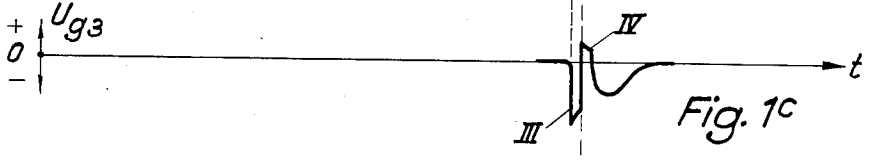


Fig. 1c

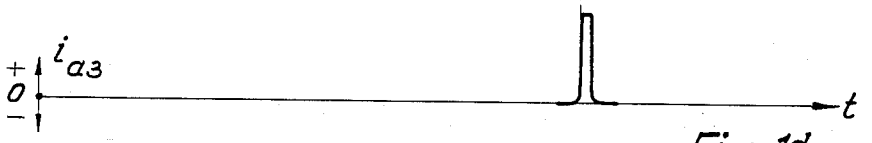


Fig. 1d

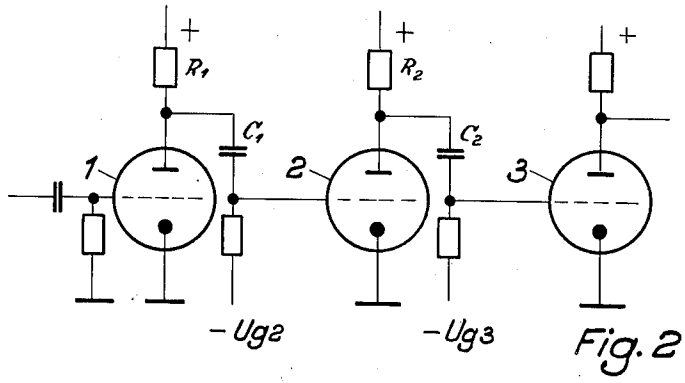


Fig. 2

Inventor:
Egon Neumann

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DEVICE FOR IMAGE SYNCHRONIZATION IN TELEVISION EQUIPMENT

Egon Neumann, Berlin-Friedenau, Germany, assignor to Loewe Opta A. G., Berlin-Steglitz, Germany, a company of Germany

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2 Claims. (Cl. 178—69.5)

In television installations, particularly those which work according to the line-interlacing principle, very exact arrival of the image relaxation current, dependent upon the course of the image synchronization signal, is necessary. In accordance with Fig. 1*a*, the image synchronization signal consists, for example, of 6 broad negative single impulses b_1 to b_6, which fill out altogether the time of 3 lines ($3z$). The last of these single impulses, b_6, shows a vertical rear edge *r*, which serves to release the succeeding image relaxation current, which is to begin at the same moment when the first edge *k* of the impulse z_1, following one line-impulse width later, becomes effective.

In the procedure customary up till the present, the image relaxation current impulse was achieved directly through the rear edge *r* of the last partial impulse b_6 by means of incomplete differentiation, specifically, for example, by a circuit arrangement which is shown in principle in the left part of Fig. 2 in the shape of valve **1** and the resistance-capacity element R_1C_1, which lies in its anode circuit. It works as follows:

When the synchronizing impulses shown in Fig. 1*a* are fed into the grid circuit of this valve **1**, a voltage cycle arises on the grid of the following valve **2**, as shown in Fig. 1*b*. The grid voltage of this value u_{g2} is shifted further into the positive after each single partial impulse b_1 to b_6, until finally the rear edge of the last partial impulse b_6 exceeds a positive grid voltage amount u_o. This is shown in Fig. 1*b* at I.

Up till now this impulse component was used directly in order to generate the corresponding image relaxation current in the anode circuit of valve **2**. As can be seen from Fig. 1*a* and 1*b*, this impulse I and therefore the relaxation current starts somewhat earlier, however, than would correspond to the edge *k*, specifically about one line-impulse width earlier. It would be correct if the image relaxation current were to begin precisely at the moment when the front edge *k* of the impulse z_1, following on the last partial impulse b_6 of the image synchronizing signal, begins. This problem is solved by the present invention in that the peak I, which overcomes the blocking grid voltage u_o of valve **2**, and which follows the last partial impulse b_6 of the image synchronizing signal, does not release the image relaxation current immediately in its anode circuit, but is at first subjected to another differentiation, which creates the necessary image relaxation current in a succeeding valve **3** (Fig. 2). The effect of this line differentiation is shown in detail in the curve sections of Fig. 1*b* and 1*d*. The course of the grid voltage u_{g3} in valve **3** can be seen from Fig. 1*c*. At the moment when the blocking voltage u_o in the grid circuit of valve **2** is exceeded, there arises on the grid of valve **3** the negative voltage cycle III (Fig. 1*c*). Approximately one line-impulse width later, as a result of the differentiation of this partial impulse by means of the resistance capacity element R_2C_2, the positive voltage section IV is generated on the grid of valve **3**. This finally leads to the formation of a positive impulse of the anode current i_{a3}, which is shown in Fig. 1*d*. This anode voltage impulse starts, as is discernible from the dotted line *k*, with great accuracy at the moment when the front edge of the first line impulse a_1 following the line synchronization signal appears.

This invention is applicable to all scanning generators which are to run synchronously with the time tapper with great accuracy. The circuit given in Fig. 2 shows, for example, a part of a television reception circuit, in which the synchronizing signals are fed into valve **1** separated from the contents of the image.

What I claim is:

1. A device for image synchronization in television equipment containing a control grid valve, the anode circuit of which being provided with means differentiating the rear edge of the last partial impulse of the series of impulses which form the image synchronizing signal after said rear edge has overcome the negative blocking voltage of a control valve and thereby released the image relaxation voltage, additional means for a second differentiation being provided in the circuit of a succeeding control-grid valve with negative blocking voltage, said further means for differentiation being adapted to create a positive impulse which begins one line-impulse width later, and which releases the image relaxation current in the anode circuit belonging thereto.

2. A device for image synchronization in television equipment containing a control grid valve, the anode circuit of which being provided with means differentiating the rear edge of the last partial impulse of the series of impulses which form the image synchronizing signal after said rear edge has overcome the negative blocking voltage of a control valve and thereby released the image relaxation voltage, additional means for a second differentiation being provided in the circuit of a succeeding control-grid valve with negative blocking voltage, said further means for differentiation being adapted to create a positive impulse which begins one line-impulse width later, and which releases the image relaxation current in the anode circuit belonging thereto, said means for differentiating consisting in resistance-capacity-elemets, the resistance member being arranged between the positive anode current source and the anode, the capacity member being arranged between said anode and the grid of the succeeding valve.

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