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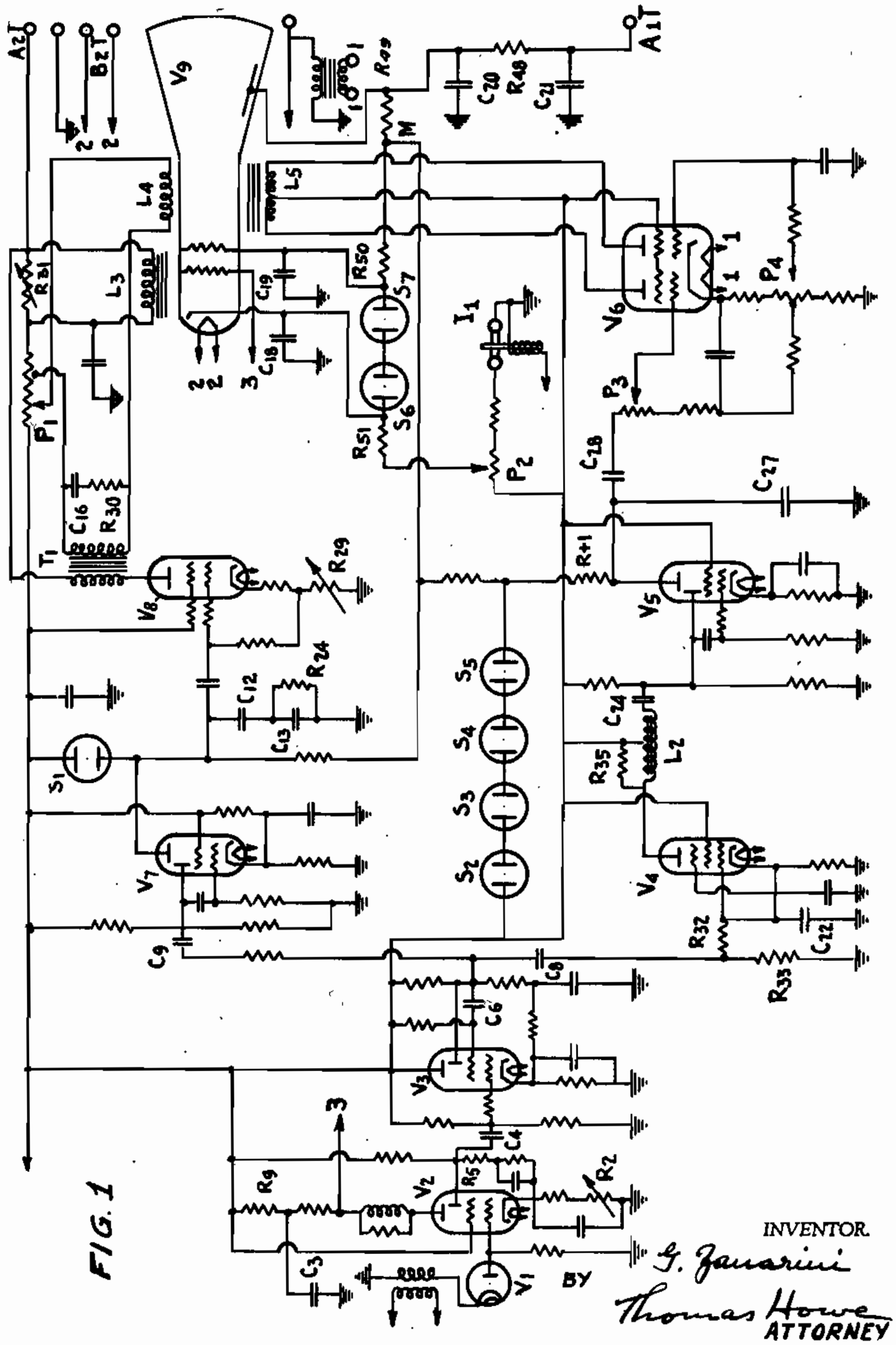

FIG. 1

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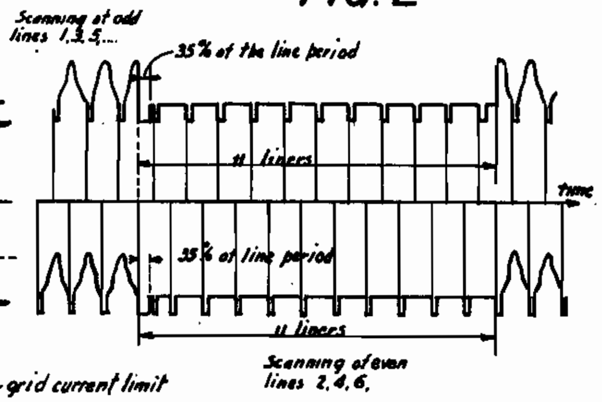
FIG. 2



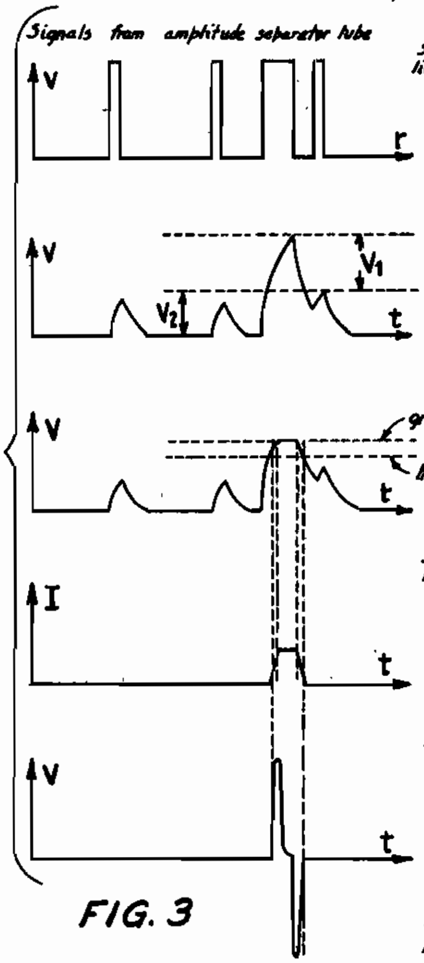


FIG. 3

FIG. 5

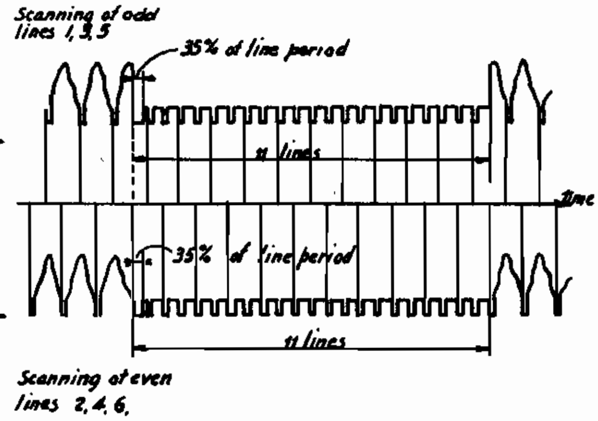
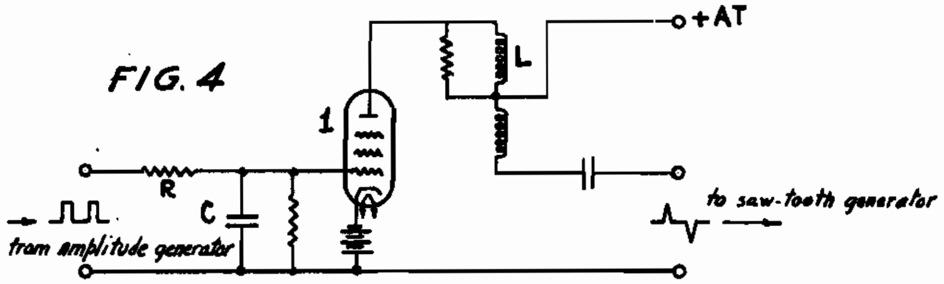


FIG. 4



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ALIEN PROPERTY CUSTODIAN

TELEVISION APPARATUS

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Application filed July 31, 1940

This invention relates to a wireless apparatus, more particularly suited for the reception of television pictures.

The features which distinguish this apparatus chiefly concern the synchronizing circuits, video frequency amplifier and video frequency reproduction circuits; they afford a completely self-adjusting synchronization together with a perfect response of the cathode ray tube to all video frequencies concerned.

The apparatus and the functions of the various circuits shall be described with reference to the accompanying drawing, in which:

Fig. 1 shows the portion of the electric diagram of the apparatus embodying this invention and includes the video frequency amplifier, cathode ray tube and synchronizing devices.

Fig. 2 shows the diagram of the synchronizing signals;

Figure 3 shows the process of separation of the amplitude differentiated signals in the case of the signals of the type shown in Figure 2;

Figure 4 shows the wiring diagram of the hold up tube;

Figure 5 shows a diagram of a synchronizing signal of another type, by which the separator secondary emission tube may be dispensed with.

The envelope of the video and synchronizing signals, after H. F. and I. F. amplification, is detected by diode V_1 and then applied to the control grid of tube V_2 which acts, at the same time, as a video frequency and synchronizing signal amplifier. Tube V_2 is of the secondary emission type, for instance of the Philips EE 50 type and can therefore supply amplified signals of opposite phase, which can then be taken from the anode and secondary cathode, respectively.

The direction of the synchronizing signals was heretofore generally opposite that of the video signals so that phase reversal was necessary in order to actuate the synchronizing devices. This is no longer necessary according to this invention which uses a secondary emission tube, as the tube itself can supply the two desired signals in opposite phase. Supposing by way of example the diagram of the synchronizing signals is that given in Fig. 2, the signals for the actuation of the synchronizing devices are taken from the secondary cathode, as shown in the electric diagram of Fig. 1, while the video signals are taken from the anode and applied to the control grid of the cathode ray tube V_9, after having undergone a proper correction, the particulars of which will be explained in detail hereinafter. Owing to the direct coupling, existing between the rectifying diode and tube V_2 and between the tube V_2 and cathode ray tube, the medium shade also is totally reproduced.

The signals taken from the secondary cathode of tube V_2 (the amplitude of which depends upon resistor R_5) are applied to the control grid of the amplitude separator tube V_3 through capacity C_4. The tube V_3 also is of the secondary emission type (for instance EE 50 Philips type) and the main feature of the arrangement consists in a reactive coupling between the secondary cathode and screen grid. By virtue of said coupling the tube always operates (for input signals not below a certain limit, approximately 4–5 volts of the video synchronizing envelope) between a blocked condition existing during the video signals and a saturated condition existing during the interval corresponding to the synchronizing signals. For any value of the input signals amplitude (within certain limits) the amplitude of the separated synchronizing signals supplied by the secondary cathode of the tube V_3, remains constant and of considerably high value (of the order of 140 volts). Moreover, by virtue of the reactive coupling C_6 existing between the secondary cathode and screen grid, the rectangular form of the synchronizing signals is further improved, while the sensitivity to external static is decreased.

From the secondary cathode of tube V_3 two frequency separator circuits, respectively, are derived for the frame and line signals. Said circuits may be differently arranged according to the type of synchronizing signals. The frame signals are separated by amplitude differentiation obtained by an integration process (circuit formed by elements R_{33}, R_{32}, C_{22}).

The amplitude differentiated signals are then sharply discriminated by tube V_4 which may be a usual pentode. Fig. 3 shows the separation process in the case of signals of the type shown in Fig. 2.

As a consequence of the integrative process, the frame signals, are of a greater magnitude than line signals and this greater magnitude of the frame signals is utilized for obtaining a sharp separation by means of tube V_4. The cathode of tube V_4 is made sufficiently positive to make the tube inoperative for the line signals; the frame signals only, having a greater magnitude as previously explained, can actuate the tube. Furthermore, the grid current of tube V_4 operates a sharp limitation of the upper part of the frame signals (see diagram Fig. 3), causing the current of the tube to assume a trapezoidal form characterized by two sharp variations which produce in inductance L_2 two voltage peaks, one of them being used to actuate tube V_5. The function of resistor R_{35} is to damp out of the oscillations which would follow each voltage peak.

The separation of the vertical synchronizing signals, operated by tube V_4, is necessary only if the synchronizing signals are of the type indicated in Fig. 2; said separation process does not permit the line signals following the frame signals to affect the duration of the oscillation produced by the oscillator tube V_5; in this case, said influence would disturb perfect interlacing, owing to the different position of the frame signal with respect to the line signals which follow it in both cases, viz. when scanning the odd lines and even lines. Tube V_4, for instance, would no longer be necessary if the diagram of the synchronizing signals were that of Fig. 5.

The vertical synchronizing signals, separated by tube V_4, synchronize the pulse generator formed by the tube V_5 also of the secondary emission type through C_{24}. The arrangement of the circuit of the tube V_5 is characterized by a reactive coupling between the secondary cathode and control grid for the generation of the discharge pulses of capacity C_{27} which therefore generates through the charging resistor R_{41} saw-tooth shaped voltages synchronized with the frame signals as described in my copending U. S. application Ser. No. 340,617 filed June 14, 1940. The operation of tube V_5 thus mounted is characterized by a great flexibility in performance which owing to the considerable amplitude of the actuating signal enables a perfect and completely automatic synchronization within very wide safety limits to be obtained.

The voltage applied to resistor R_{41} (500 Volt approximately) is stabilized by means of small neon bulbs S_2, S_3, S_4, S_5 (the current drawn is approximately 0,5 Ma.) in order to avoid vertical fluctuation of the frame, caused by disturbances of a very low frequency reaching the apparatus through the supply circuit.

The saw-tooth signals generated by capacity C_{27} actuate through C_{28} the twin-pentode V_6 operating in push-pull through cathode coupling. The function of the tube V_6 is to generate saw-tooth currents which, flowing through the deflecting coil L_5 generate the vertical magnetic deflection field.

By the push-pull arrangement for the generation of said currents a perfectly linear deflection may be obtained with the aid of very simple means. The potentiometer P_3 makes the adjustment of the amplitude deflection possible and the potentiometer P_4 provides the vertical centering of the frame. Finally, said push-pull arrangement has the advantage of permitting the elimination of the coupling transformer (or impedance) and of drawing practically constant current.

Tube V_6 may be for example of the Philips ELL 1. type.

The line signals taken from the secondary cathode of tube V_3 are separated by derivation by means of capacity C_9 and synchronize the pulse generator formed by the secondary emission tube V_7 (for instance of the Philips EE 50 type). Apart from the time constants which determine its natural period, said tube operates according to the invention in the same manner as the frame impulse generator formed by the tube V_5 and is featured by the same stability characteristics. Capacity C_{12} fed by resistor R_{53} generates a saw-tooth voltage synchronized by the line synchronized by synchronizing signals. The small neon bulb S_1 operates initially only to limit the anode voltage of the tube V_7 while the cathode is still cold. During normal operation the tube S_1 must not be glowing.

The net formed by resistor R_{24} and capacity C_{13} gives rise to a desirable distortion of the saw-tooth in order to compensate for the curvature of the mutual characteristic of the tube V_8.

The line saw-tooth signal actuates the tube V_8, a high slope power pentode, for instance of the EL 6 Philips type, which generates the saw-tooth currents necessary for the generation of the horizontal deflection magnetic field.

The circuit of tube V_8 is characterized in that a current negative feedback is provided in order to obtain considerable deflection linearity. The adjustable resistor R_{29} allows adjustment of the horizontal deflection amplitude by varying the amount of feedback. The horizontal deflection coils L_4 are connected to tube V_8 through a proper transformer T_1. The damping net $R_{30}C_{16}$ renders the deflecting circuit aperiodic in order to avoid parasitic oscillations.

Horizontal centering of the frame is obtained by supplying the deflecting circuit with a proper amount of d. c. by means of the center-tapped potentiometer P_1.

The coils L_3 provide the magnetic concentration of the cathode beam and focussing of the picture is obtained by adjusting the value of the variable resistor R_{31}. The anode and cathode supply of the cathode ray tube is obtained, according to the invention, by means of a special bridge circuit formed by elements R_{48}, R_{49}, R_{50}, R_{51} and C_{18}. The capacities C_{20}, C_{21} and C_{19} have a smoothing action.

Said bridge circuit is featured by the presence of a point M in which the voltage with respect to ground is independent from the current consumption of the cathode ray tube. Said voltage may be chosen within certain limits by properly designing the bridge elements and, according to the invention, the same voltage is used to feed the discharge devices which generate the saw-tooth line and frame signals needed for driving tubes V_8 and V_6, respectively.

The voltage in question may be chosen of a considerably high value (for instance, 1000 volt with $A_1t = \sim 5000$ volt) in order to obtain saw-tooth voltages of a very linear form and of considerable amplitude (as required, for instance, for the actuation of tube V_8 owing to the feedback arrangement of the same). The resistor R_{51} which is an element of the bridge circuit, is properly designed in order to safeguard the cathode ray tube, should the A_2t voltage (about 300 volt) accidentally fail.

In such case, the control grid of tube V_9 would fall to ground potential, while the cathode of the tube would assume with respect to ground the voltage appearing across R_{51}, said voltage being chosen of a value sufficient to cause blocking of the tube. The current of the electronic beam of tube V_9 flowing in resistor R_{51} produces a negative feedback effect, its value depending upon the frequency in relation with capacity C_{18}.

The lower the frequency, the greater the negative feedback will be and, according to the invention, it is totally compensated for by means of the net R_9C_3 placed in the anode circuit of the video frequency amplifier tube V_2. The effect of the net R_9C_3 consists in an increase in the amplification of the lower frequencies and is such as to exactly compensate for the negative feedback just described.

The two small neon bulbs S_6 and S_7 stabilize the potential difference existing between the screen grid and cathode of the cathode ray tube V_9. Said stabilization is very useful, considering that the screen grid current of the cathode ray tube of the same type may assume widely different values. Potentiometer P_2 allows adjustment of the average bias of the cathode ray tube and consequently varies the medium shade of the picture. The thermic delayed relay I_1 avoids the formation of the luminous spot on the fluorescent screen at the time when the set is switched on and the cathodes of the tubes are still cold.

The external controls of the assembly just described are reduced to a single control P_2 for the adjustment of the medium shade. All other semi-fixed elements (R_2, R_{29}, R_{31}, P_1, P_3, P_4) are inside the apparatus and are adjusted during the lining up of the set.

No control is provided for the adjustment of synchronization, as this is completely self-adjusting. Practically, it was found unnecessary to provide the set with controls of that kind owing to the wide safety limits of the synchronizing circuit.

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