

Oct. 3, 1939.

K. SCHLESINGER ET AL

2,175,033

PICTURE TRANSMISSION

Filed May 18, 1938

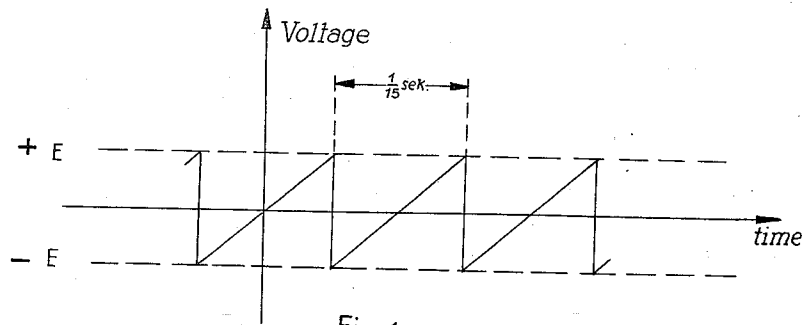


Fig. 1

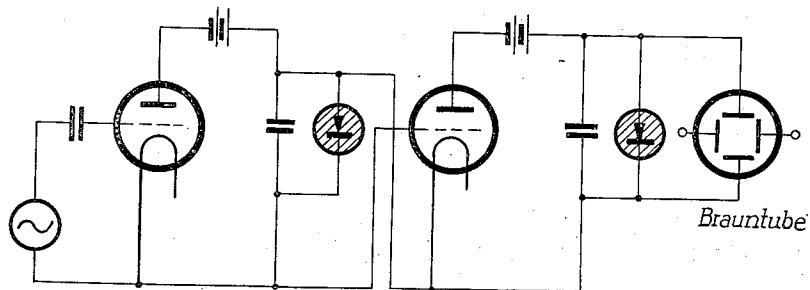


Fig. 2

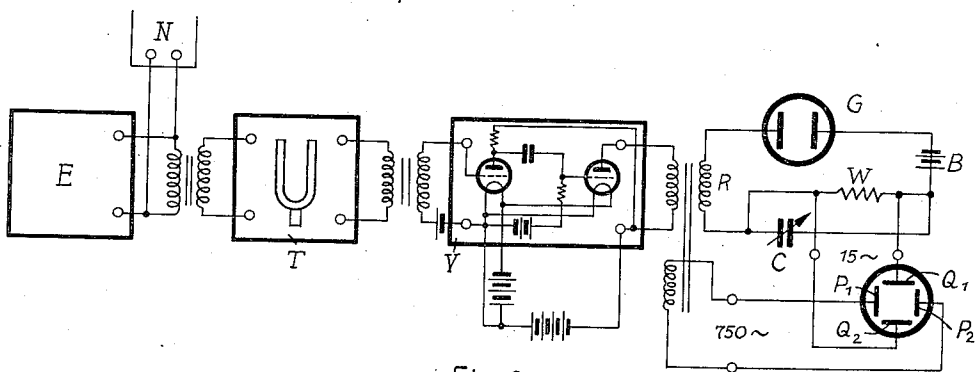


Fig. 3

Inventor:
Kurt Schlesinger
Kaufmann & Co.

UNITED STATES PATENT OFFICE

2,175,033

PICTURE TRANSMISSION

Kurt Schlesinger and Manfred von Ardenne,
Berlin, Germany; said von Ardenne assignor
to Radioaktiengesellschaft D. S. Loewe, Ber-
lin-Steglitz, Germany, a company of Germany

Application May 18, 1938, Serial No. 208,528

4 Claims. (Cl. 178—7.5)

This application is a continuation-in-part of Ser. No. 532,462, filed April 24, 1931.

Among the considerable advantages which have led to an ever increasing use of Braun tubes to television reception purposes is the fact that extremely small controlling power inputs are required for the operation of such tubes. On the other hand this advantage is capable of being utilized in its full scope only if in the case of television reception apparatus of this description those parts which heretofore have been driven by a motor may be omitted entirely, and replaced by stationary devices operating purely electrically. The problem is as follows: There are three voltages to be supplied to the tube: Light intensity voltage (for controlling the quantity or intensity of light at the picture elements), line-deflection of the light beam in line direction and frame-changing or picture-changing voltage (i. e. the voltage controlling the deflection of the light beam in a direction perpendicular or at least transversal to the line direction. For reasons of a practical nature the simultaneous transmission of all three frequency bands on the same carrier wave is absolutely essential.

Reference is to be had to the accompanying drawing, in which Fig. 1 is a diagram illustrating the relation of voltage to time, while Fig. 2 is a circuit diagram of a frequency reduction device such as may be used in connection with our invention, and Fig. 3 is a circuit diagram of a typical embodiment of our invention.

The present invention relates to the generation of the line deflection voltage and the picture-changing voltage, and comprises the use of a snap-initiated oscillation, especially an oscillation of saw-tooth or so called relaxation oscillations and especially to the synchronisation of the picture-changing voltage, on the one hand with the line-deflection voltage and on the other hand with the change of picture in the transmitter. Assuming in the first place that there is a moving roll of film on the transmitter the vertical progress of the line-deflection the receiver must occur evenly from the upper to the lower edge of the picture, and then spring back with a jerk to the upper edge when the picture is changed. The corresponding time curve of the voltage at the deflecting plates (vertical plates of the Braun tube) is shown in Fig. 1.

In one known arrangement the picture changing voltage is produced by charging a condenser over a saturated electronic tube. The initiation of the condenser discharge upon the change of the picture is effected from the transmitter

through the medium of a control voltage radiated at the edge of the picture. The transmitter accordingly transmits all three bands simultaneously. The transmitter and receiver must accordingly include three filter chains and three independent amplifiers which the invention avoids.

The change of the potential from maximum negative to maximum positive value upon change of picture or frame occurs, according to the invention, automatically in the receiver by means of a snap-initiated oscillation system and is merely maintained in pace from the transmitter. This mere control of the picture-changing may be performed without the assistance of a special control frequency, for example by the line-deflection frequency, if the latter is coupled with the picture-changing frequency automatically in the necessary frequency ratio, for example 50:1. Electrical systems of this nature which maintain a given frequency ratio with extreme reliability, are known per se. An example is the frequency reduction connection employing gaseous conduction lamps, possibly in an arrangement of tubes according to Fig. 2.

Fig. 2 shows a two-stage reduction system of this kind, for use in those cases in which a single stage does not provide a frequency division of a sufficiently steady kind. The connection system may operate, for example, in such manner that by reason of a periodical voltage applied to the first grid there occurs a charge of the condenser and, corresponding to this charge, a variation in the voltage of the anode up to the instant when the gaseous conduction lamp is caused to light. This instant occurs regularly after a certain number of cycles on the input side, for example after 10 cycles. A similar operation occurs in the second stage so that the total resulting change is to a period or frequency which is equal to the product of the variation in both stages. In employing, according to the invention, a frequency reduction device of this or a similar kind with a television system having Braun tubes, synchronous scanning of the picture is performed, for example, as follows:

In connection with the transmitter it is assumed that there is a horizontally oscillating picture-decomposing or scanning means and a steadily moved film. The advance of the film and the line-scanning operation may be coupled mechanically in very simple fashion, so that there are for instance exactly 100 lines to each picture or frame. The line frequency is, in the known manner, conjointly transmitted to the receiver by

means of a longitudinal edge, or possibly a double edge, is there filtered, amplified, and employed in direct manner for transverse deflection, i. e. in the line direction of the cathode ray. The same frequency is simultaneously passed to the frequency divider (1:50 for scanning to and fro, or 1:100 for scanning only in one direction), and emerges from the same in the form of the frame-changing voltage in correct frequency and characteristic as saw-tooth line voltage. If in addition there is also a tone selection for filtering out the line tone from the reception band, an arrangement is arrived at in accordance with Fig. 3.

Fig. 3 shows a receiving apparatus according to the invention in diagrammatical form. The receiver E picks up simultaneously: on the one hand the current for subsequent amplification purposes for the picture or frame amplitudes by means of a device N which, in connection with the present invention, does not require to be described in detail, and on the other hand the line frequency, which is preferably transmitted conjointly by the transmitter, for example a frequency of 750 cycles. The line frequency, according to Fig. 3, is passed to a device T for selection of the tone. This tone-selecting device—which in contradistinction to the three filter chains hitherto required may, in the case of our invention, be the only oscillation selector employed—can consist of a tuning fork arrangement or a similar electro-mechanical vibration device, by means of which the whole of the middle and the high frequency oscillations of the frame amplitude are eliminated and merely the one frequency (the line deflection-frequency amounting, for example, to 750 cycles is transmitted with practically constant amplitude to the amplifier V, which permits the amplification of this frequency. It is important that the output power of this amplifier should maintain a constant value, as it is only under this condition that frequency reduction to certain constant amounts will be successful. Variations in the output power might occur upon fluctuations of the line-frequency, upon variations in the degree of amplification on the part of the tone amplifier etc. In order to preclude these disturbing influences the input amplifying and end stages of the tone amplifier area according to our invention, so dimensioned that from the end stage the maximum power pertaining thereto is always transmitted to the remaining parts of the television apparatus.

From the tone amplifier V the line frequency is for the one part conducted in direct fashion to the one pair of plates P₁, P₂ of the Braun tube for the purpose of line deflection (the oscillations transmitted thereto may be for instance of sine form). Furthermore, the oscillations are passed by the amplifier V to a frequency dividing system A, which in Fig. 3 represented diagrammatically in single stage form by a gaseous conduction lamp G, battery B, movable plate condenser C and resistance W. If, for example, there is a frequency reduction down to the one-fiftieth part, there results at the ends of the resistance W a periodical fluctuation in voltage of the frequency 15. This is conducted to the pair of plates Q₁, Q₂ of the Braun tube. To enable the same to be utilized as a vertical deflection for the sudden change of the frame or picture, a fluctuation in potential is required approximately in the form according to Fig. 1. And this in particular may be achieved in reliable and simple manner

through the medium of the frequency reduction circuits employing gaseous conduction lamps.

In those cases in which a synchronized main supply of electric current is available, the picture-changing frequency may be taken therefrom by way of a frequency reduction or of a synchronously controlled relaxation or saw-tooth oscillation. Vice versa, it is possible to utilize the picture-changing frequency, which is produced by a synchronized main supply or by a tuning fork generator with the assistance of frequency reduction, or is taken in any other suitable manner from a low frequency generator without frequency reduction for the production of the line deflection frequency by taking the latter from the picture-changing frequency in the form of a higher harmonic, for example by way of a tone selection device, or by means of any suitable apparatus for raising the frequency in reliable manner, for instance an apparatus of that particular type which is based on the curvature of a characteristic.

Controlled saw-tooth or relaxation oscillations are also useful in other instances in connection with the television apparatus employing Braun tubes; quite generally, they effect the transformation of a sine voltage into a snap-initiated line voltage of a frequency reduced in any degree desired. This, for example, is absolutely essential when transmitters performing the scanning operations by means of a Nipkow disc are employed in conjunction with receivers using Braun tubes. The line-tone in this case is not conducted in direct fashion to the transverse deflection elements of the Braun tube, but is first employed for controlling a saw-tooth oscillation of the same frequency, and only the voltage at the condenser, which is the desired line-voltage, is passed to the tube.

Our invention is not particularly confined to television. The same may also be employed for other picture transmission purposes for example for film transmission.

We claim:

1. A television receiving system comprising a receiver adapted to pick up intensity controlling oscillations and synchronizing oscillations of a frequency emitted by a television transmitter, a selector for separating the synchronizing oscillations from the intensity controlling oscillations, a Braun tube having two ray deflecting systems, means to couple one of said systems to the output of said selector so that the beam is deflected in one direction at the received frequency, and frequency demultiplying means also coupled to the output of said selector, the other system being operated by said synchronizing oscillations through said demultiplying means whereby to deflect said ray in another direction.

2. A television receiving system comprising a receiver adapted to pick up intensity controlling oscillations and synchronizing oscillations of a frequency emitted by a television transmitter, a selector for separating the synchronizing oscillations from the intensity controlling oscillations, a Braun tube having two ray deflecting systems, the first of said systems including deflecting means for deflecting a ray horizontally, means to couple the first of said systems to the output of said selector so that the beam is deflecting horizontally at the received frequency, the second of said systems including means for deflecting said ray vertically, and frequency demultiplying means also coupled to the output of said selector, the said second system being operated by said syn-

chronizing oscillations through said demultiplying means whereby to deflect said ray vertically.

5 3. A television receiving system comprising a receiver adapted to pick up intensity controlling oscillations and synchronizing oscillations of a frequency emitted by a television transmitter, a selector for separating the synchronizing oscillations from the intensity controlling oscillations, a Braun tube having line scanning means and frame scanning means, means to couple said line scanning means to the output of said selector so that the beam is deflected in a line scanning direction at the received frequency, and frequency demultiplying means also coupled to the output of said selector, said frame scanning means being operated by said synchronizing oscillations through said demultiplying means.

10

15

4. A television receiving system comprising a

receiver adapted to pick up intensity controlling oscillations and synchronizing oscillations of a line scanning frequency emitted by a television transmitter, a selector for separating the synchronizing oscillations from the intensity controlling oscillations, a Braun tube having line scanning means and frame scanning means, means to couple said line scanning means to the output of said selector so that the beam is deflected in a line scanning direction at the received frequency, and frequency demultiplying means also coupled to the output of said selector, the frame scanning means being operated by said synchronizing oscillations through said demultiplying means whereby to deflect said ray in another direction.

5

10

15

KURT SCHLESINGER.
MANFRED VON ARDENNE.