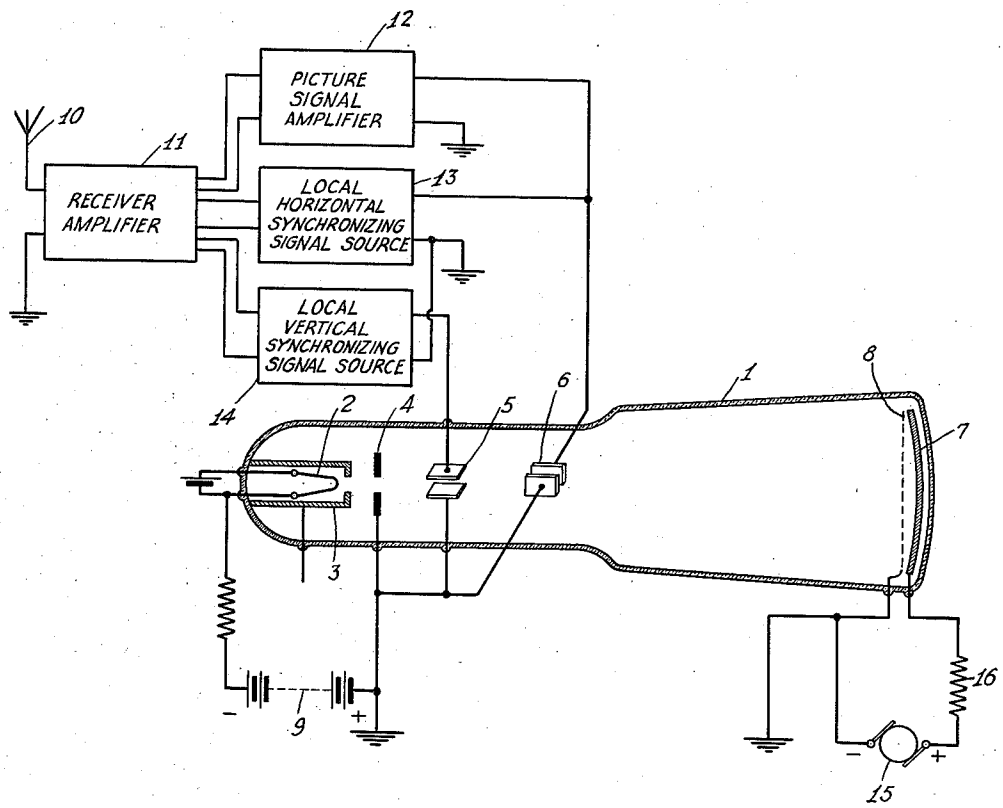
April 13, 1937. F. SCHRÖTER 2,076,674

TELEVISION APPARATUS

Filed April 6, 1932



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Patented Apr. 13, 1937 2,076,674

UNITED STATES PATENT OFFICE

2,076,674

TELEVISION APPARATUS

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Application April 6, 1932, Serial No. 603,530
In Germany April 10, 1931

2 Claims. (Cl. 178—6)

The present invention relates to television apparatus and is concerned primarily with the receiving end of the system.

In order to avoid moving parts and to increase the efficiency of operation of television receivers the cathode ray tube has proven extremely satisfactory because of its lack of inertia, ease of control, faithfulness of response and brilliance of the reproduced electro-optical effect.

A primary object of this invention is to utilize a cathode-ray or Braun tube which is made responsive to picture signals received over radio channels or wire lines for the purpose of reproducing.

The essential features of intensity control for the cathode ray tube consist in utilizing contradistinct to the brightness or intensity control principle heretofore most commonly practiced, luminous points or spots of variable velocity and constant intensity rather than spots or points of constant speed and variable intensity of brightness. The brightness of the television picture at any given point in this type system is then inversely proportional to the brightness of the producing spot of light. For practicing this line-control principle the use of the cathode-ray or Braun tube has been considered since, because of the lack of inertia of the pencil of electrons, it permits practically instantaneous changes in velocity thereof so that the requisite sharp or sudden changes from bright to dark are easily obtainable.

With such a tube, which is operable both as a transmitter as well as a receiver, the motion of the cathode-ray pencil or stream in the direction of the two coordinate axes of the picture is mostly produced by so-called "tilting potentials" whose frequency relation is so chosen that the mean speed along the picture line or row and the mean speed of the displacement or shift of the luminous spot at right angles to the direction of the lines is of the proper value. These tilting potentials in dependence upon the brightness distribution in the picture are modulated by the photo-electric scanning device of the transmitter in such a way that the acceleration and decelerations along the line and in dependence thereon also at right angles thereto are superposed upon the regular tilting oscillation.

If in connection with the use of the cathode-ray tube, for a purpose as hereinbefore stated, maximum brightness or brilliancy of the fluorescent spot upon the screen is to be insured, which is desirable both for the scanning at the sending end as well as for the chances of enlarging the incoming picture at the receiver end of the system, it is necessary to use considerable plate potentials in order that a high kinetic energy may be impressed upon the electrons of the cathode ray—pencil passing through the anode to impinge upon or bombard the fluorescent screen. However, as the velocity of the electrons increases the potentials or currents required for causing deflection of the pencil, that is, in accordance with whether electrostatic or electromagnetic deflection fields are used to control the path of the cathode ray across the fluorescent end wall of the tube. This means that in amplifications of the transmitted or locally produced tilting potentials in the receiving station high potential differences and large currents must be made available. This, in turn, means the provision of larger amplifier means and consequently greater chances of distortions in the controlling voltage and current curves which finally would conduce to correspondingly serious shifts of the picture points or units.

When using a cathode-ray tube as hereinbefore suggested for the purpose of insuring line control according to this invention the necessity of providing high tilting potentials or large currents is obviated by having recourse to the following description and the single figure of the accompanying drawing.

According to the present invention, the electron stream originating from the heated cathode of the tube is first accelerated by as low an anode potential as possible, and they pass in the form of a pencil through the anode aperture into the deflector space. Since the particles have up to the present reached no excessively high speeds comparatively low potentials and feeble currents will be found adequate for producing the desired amplitudes of deflection. The deflected pencil thereupon enters into another constant field of acceleration at a point a short distance ahead of its impinging upon the screen; and this field imparts to the electrons a large amount of accelerative energy without substantially affecting or changing the point of incidence, so that the production of large luminous spot intensities is assured.

To illustrate now, a preferred embodiment of the invention reference may be made to the form illustrated by way of example in the drawing. Referring to the drawing, the cathode ray or Braun tube is provided with a heated cathode element 2 which is enclosed by a Wehnelt screen 3. An anode electrode 4 supplied with potential from a source 9 is arranged to draw the electrons from the cathode and to act as a diaphragm.

Signals received from a transmitting point are brought upon an antenna 10, or any other suitable form of receiving means, which may even be a telephone line provided of course, that the line is responsive at the desired frequency band necessary for television, and are then brought to act upon the receiver amplifier system, generally designated 11. The received signals may include where desired, in addition to the picture modulated signals, also indications to represent the synchronism with which the cathode ray stream originating from the cathode 2 must be controlled. These signals are then divided so that the picture signals are further amplified in the picture signal amplifier 12_0. The horizontal synchronizing frequencies are impressed upon a local horizontal synchronizing signal source 13 which generates a controlling frequency of substantially the correct frequency to move the cathode ray pencil along the desired horizontal path; and a local vertical synchronizing signal source 14 is also controlled from the received signals.

The picture signals as amplified are then led to one pair of deflecting plates which, in the form in which the invention illustrated has been shown as the plates serving to deflect the cathode ray pencil in a horizontal path, and simultaneously with the application of the picture signals upon the horizontal deflecting plates 6 the locally generated horizontal synchronizing signals, as controlled by the received signals, are superimposed. To move the cathode ray pencil generated in a vertical plane so as to cause the successive horizontal paths traced to produce a series of parallel paths, the locally generated vertical synchronizing signals are impressed across the deflecting plates 5. One terminal of each pair of deflecting plates 5 and 6 is connected together and in turn grounded in any suitable and desired manner.

As the ray pencil generated now moves toward the fluorescent or luminous screen 7 of the cathode ray tube it is traveling at a relatively low velocity so that it is especially sensitive to the controlling or deflecting potentials. However, to produce a maximum luminous effect upon the screen, it being known that the brilliance of the resulting light spot on the fluorescent screen is a function of the velocity at which the electrons impinge upon the screen, the cathode ray pencil shortly before it strikes the luminous screen 7 enters into a constant field which is set up between a grid-like electrode 8 which is mounted directly in front of the screen and the conductive support or backing, or rear face, of the screen 7 which is placed at a potential which is relatively high with respect to the potential of the screen so that the ray is accelerated rapidly. This potential herein has been designated as being supplied from a generator 15 through a resistance 16 so that the positive terminal of the generator connects with the screen. It is thus seen that the electrons when they pass beyond the grid or screen-like electrode 8 are suddenly speeded up and strike the fluorescent screen with increased velocity to produce increased brilliance of illumination.

With the form in which the invention has been shown, it is also seen that the controlling signal impulses impressed simultaneously with the locally generated horizontal synchronizing signals serve to vary the constancy of the time period during which the ray pencil is able to impinge upon any one section of the screen so that the time of impact instead of being constant is continuously varied in accordance with the intensity of the received signalling impulses and thus the density of the electron stream is not diminished at any time but merely the velocity at which the stream traverses the field or screen 7 is continuously changing.

Having now described my invention, I claim:

1. A cathode ray tube television system having a fluorescent viewing screen responsive to cathode rays, which comprises means for producing a cathode ray pencil and moving said pencil substantially throughout the length of the tube at a constant axial velocity, means for causing the cathode ray pencil to traverse predetermined paths in a plurality of directions at right angles to each other, means for impressing signal voltages upon one of the traversal control means for varying under the control of the signal voltages the velocity of ray traversal along at least one path of the plurality of paths to vary the period of impact of the cathode ray pencil upon the fluorescent viewing screen, and means to accelerate the cathode ray at a constant rate only in the area immediately adjacent the fluorescent screen so as to increase the brilliance of the fluorescent effect produced by the cathode ray.

2. In a television system, means for producing a cathode ray beam within an electron tube, means for moving said produced cathode ray beam axially of said tube throughout substantially the length thereof at substantially constant velocity and substantially zero acceleration, means located at the end of said tube opposite said source of cathode rays for producing luminous effects upon impact of said cathode ray beam thereon, means located in the area immediately adjacent said means for producing said luminous effects for accelerating the developed cathode beam prior to impact, means located within the area of said tube whereat zero acceleration of the developed cathode beam takes place for deflecting said developed cathode beam in one direction, a second means also located in the area of said tube whereat zero acceleration of the developed cathode beam takes place, and means to deflect the said developed beam in a direction substantially perpendicular to the first path of deflection at a variable rate under the influence of applied signals.

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