

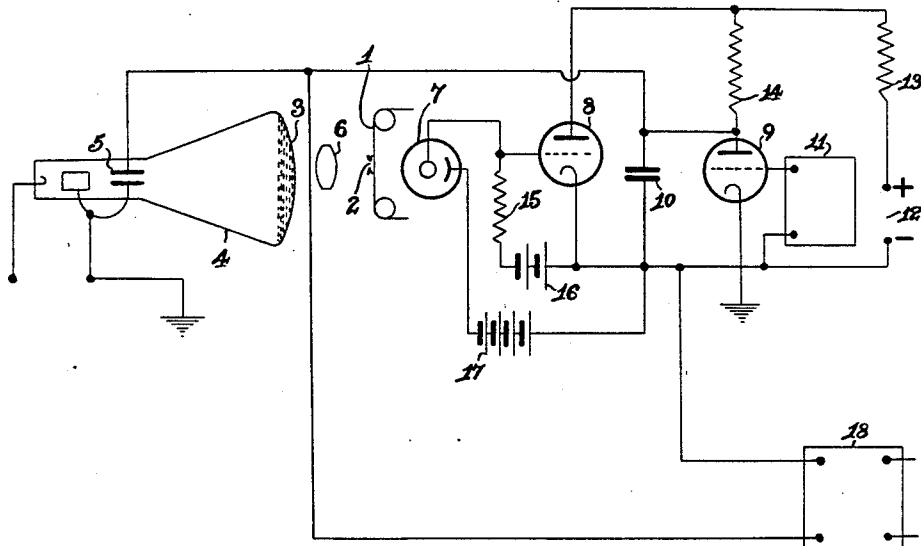
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TELEVISION

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TELEVISION

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The present invention relates to television.

All systems of television may be classified broadly into two types. In the first type the object to be transmitted or received is scanned at constant speed and light of intensity varying with the brightness of the object is either reflected from or projected through the object in the case of analysis in transmission, or the light is projected on to a screen in the case where an image of the object is to be reconstituted at a receiver. In the second broad type the object is both analyzed and reconstituted by means of a light beam of constant intensity but of speed varying with the brightness of the object.

These two types will be called the "brightness modulation" and "velocity modulation" systems respectively and the present invention is particularly concerned with systems of the latter type.

In one system of velocity modulation television already known the object at the transmitter and its image at the receiver are scanned in synchronism in straight parallel lines by points of light of constant intensity. Each scanning stroke is performed at a speed varying with the brightness of the particular point being scanned, whilst at the end of each scanning stroke the points of light return immediately to the commencement of a successive line. The time interval between the commencement of scanning of successive lines is therefore not constant but depends upon the average brightness of whole lines. For a normal object the point of light travels faster at dark points than at bright points and therefore if the average brightness of a whole line is low the time taken to scan the line is small and scanning of the next line commences comparatively early.

Similarly if the average brightness of all the lines in a picture is low, that is to say, if the background brightness of the picture is low, the whole picture is scanned in less time than a picture of high average brightness. Thus in a given time more pictures of low average brightness are scanned than pictures of high average brightness. The effect of this on the eye is to even up the background brightness and the system fails to reproduce faithfully variations in this background brightness.

A further difficulty is encountered when motion picture films are transmitted upon this system. If the film is held stationary whilst each complete picture is scanned the film has to be moved forward at irregular intervals of time owing, as explained above, to the variations in average brightness of successive pictures. On the

other hand if the film be moved forward in the intervals between the scanning of successive lines, the film still has to be moved irregularly owing to the variations in average brightness of successive lines.

The production of apparatus to effect this irregular motion of the film is obviously difficult and it is an object of the present invention to provide a system of the above described type in which the necessity for moving the film irregularly is avoided.

According to the present invention there is provided a method of scanning, in a television system of the velocity modulation type, in which the time intervals between the commencement of scanning of successive lines of each complete picture are substantially equal.

According to a further feature of the present invention there is provided scanning apparatus adapted for use in a television system of the velocity modulation type comprising a cathode ray tube, a condenser adapted to control scanning deflections of the cathode ray, and means adapted to discharge said condenser at substantially equal intervals of time.

A constructional embodiment of the invention will now be described by way of example, reference being made to the accompanying drawing which illustrates, diagrammatically, television transmitting apparatus adapted to scan a motion picture film.

It will be assumed that scanning at both the transmitter and receiver is effected with the aid of a cathode ray tube, images of the film being reconstituted at the receiver upon a fluorescent screen associated with the receiving tube.

Referring now to the figure, at the transmitter a positive motion picture film 1 is moved at uniform speed vertically downwards past a scanning gate 2 which is in the form of a long slit disposed perpendicularly to the direction of motion of the film. The narrow strip of film which lies in the scanning gate is illuminated by an image of a fluorescent spot formed upon a fluorescent screen 3 of a cathode ray tube 4. The cathode ray tube may be of any known or suitable type adapted to emit a ray of substantially constant intensity, a pair of plates 5 being provided for electrostatically deflecting the ray backwards and forwards in a horizontal straight line over the fluorescent screen. An image of the moving fluorescent spot is optically projected upon the scanning gate 2 by means of a lens 6 and light passing through the film in the gate is collected by a photo-electric cell 7 placed behind the film 1.

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The electric circuit associated with the deflecting plates 5 comprises two thermionic valves 8 and 9, a condenser 10 and an oscillator 11.

The deflecting plates 5 are connected to the 5 plates of the condenser 10 and one plate of each pair is earthed.

The filaments of the valves 8 and 9 are earthed, the anode of valve 8 is connected to the positive terminal of a high tension source 12 through resistance 13, the anode of valve 9 is connected to the positive terminal of source 12 through resistances 13 and 14 and the negative terminal of source 12 is earthed.

Picture currents generated in the cell 7 pass 15 through a resistance 15 which is connected between the grid and filament of valve 8, grid bias for this valve being supplied from battery 16.

The potential difference between the anode and cathode of valve 8, that is to say the amplified picture signal voltage, causes current to flow through 20 resistance 14 into condenser 10 so that the latter is charged at a rate depending upon the value of the picture signal voltage. Condenser 10 is also charged at a substantially uniform rate, through 25 resistances 13 and 14, from source 12. Battery 17 serves as high tension supply for the photo-electric cell 7.

The valve 9 is normally biased back so that substantially no current passes in its anode circuit but a series of "triggering" impulses of constant frequency generated by the oscillator 11 are 30 applied between the grid and filament so as to make this valve conductive at regular intervals of time.

The condenser 10 thus receives a charging current of constant intensity from the source of potential 12 and a charging current of intensity varying with the picture impulses from the valve 8, whilst at regular intervals of time the condenser discharges through the valve 9. The potential difference applied to the deflecting plates 5 thus rises in accordance with the picture impulses and falls to zero at regular intervals of time whilst the film 1 is scanned in a series of 45 strokes the time intervals between the commencement of which are constant.

The actual time between the commencement of scanning of successive lines, that is to say, the time between successive triggering impulses, is 50 arranged to be slightly greater than the time taken to scan a completely transparent line on the film, so that the scanning spot after completing the scanning of any line moves off the line and generates corresponding irregular impulses in the 55 photo-electric cell 7. Means which will be described later, however, are provided for ensuring that these impulses do not appear in the reconstituted picture.

The triggering impulses for the line scanning 60 may be generated in any known or suitable manner. They may be derived, for example, from a local oscillator the frequency of which is controlled by means of a tuning fork or piezo-electric crystal.

The impulses supplied to the deflecting plates 5 of the cathode ray tube 1, which are a combination of picture, charging and triggering impulses are passed to an amplifier 18 and transmitted to the receiver. There are also transmitted, over 70 the same or a different channel, a series of framing impulses; these are derived from the motion of the film drive (not shown), one impulse being sent at the end of the scanning of each complete picture on the film.

75 The receiver comprises a cathode ray tube having

the more usual two pairs of perpendicularly disposed deflecting plates and a fluorescent screen. One pair of plates controls the framing of the pictures upon the screen whilst the other pair controls the scanning of lines on the picture. 5 In order to effect the framing of the picture a saw tooth wave of comparatively low frequency, say twenty-four per second, is generated locally by means of a relaxation oscillator or discharger of known type, the frequency of the wave being 10 controlled by the received framing impulses. These impulses are applied directly to the plates controlling the framing deflections of the ray.

The picture, charging and triggering impulses are applied, after amplification, to the line scanning 15 plates.

One component, say the horizontal component, of the motion of the cathode ray at the receiver is thus held in synchronism with the horizontal, linear motion of the ray at the transmitter whilst 20 the vertical component of the motion, which is determined by the locally generated saw tooth wave, consists of a uniform, comparatively slow motion in one horizontal direction and quick return in the reverse direction. 25

Under the influence of these two deflecting fields the ray is caused to scan the fluorescent screen in a series of straight parallel lines. The irregular impulses generated at the transmitter at the end of each line are prevented from appearing in the reconstituted picture by placing a screen over the appropriate border of the picture.

It will be apparent that at both the transmitter and receiver the spacing between the scanned 35 lines is substantially constant as is also the time interval between the commencement of scanning of successive lines. Furthermore the time between the commencement of scanning of successive pictures is also constant. The background brightness of the pictures is thus faithfully reproduced. 40

It is not essential that scanning be effected with the aid of a cathode ray tube. To those skilled in the art it will be apparent that other types of 45 oscillograph may be used and that any suitable means may be provided for ensuring that the intervals between the commencement of scanning of successive lines are constant.

If a negative film is to be scanned the scanning spot may be made to travel more quickly 50 over the more transparent portions of the film than over the opaque portions. In order to achieve this the currents generated in the photo-electric cell may be applied to the grid-filament 55 of the first valve in the reverse sense to that for positive film or an actual object.

I claim:

1. In a television system, the method of obtaining velocity modulation type signals for transmission which comprises producing a cathode ray beam and causing the same to be moved across the fluorescent tube screen according to a predetermined pattern to illuminate a subject of which the image is desired, influencing a light translating element continuously in accordance with the light intensity upon the instantaneously illuminated elemental areas of the subject to produce electric currents of intensities proportional to the light intensity of the illuminated area, controlling the rate of charge in accordance with the produced currents, simultaneously storing an electric charge at a constant rate utilizing the stored electrical charge to control the rate at which different elemental areas of the subject are 75

caused to influence the light translating element at a constant periodicity, removing the stored charge from the storage element and controlling a transmission channel in accordance with the varying instantaneous charges in the storage element.

2. In a television system, means for obtaining signals for producing velocity modulation type electro-optical effects, a cathode ray tube arranged to illuminate in accordance with the production of fluorescent effects upon the end wall thereof an image of which the electro-optical representation is desired, a light translating element for producing electrical currents of intensities proportional to the intensity of light and shadow on an elemental area of the subject coordinated in space relationship with the elemental area of the tube screen instantaneously fluorescent, a storage element, means for controlling the rate at which the storage element acquires charges in accordance with the current flowing from the light translating system, further means for simultaneously charging said storage element at a constant rate, means to control in accordance with the instantaneous charge on said storage element the deflection from normal of the cathode ray beam produced within the cathode ray tube, means for discharging the storage element at regular predetermined intervals to vary thereby the deflection voltage applied to deflect the beam within the cathode ray tube, and means for influencing a transmission channel in accordance with the instantaneous deflection voltage applied to the cathode ray tube.

3. In a television system of the velocity modulation type, a cathode ray tube illuminated in accordance with the production of fluorescent effects upon the end wall thereof, a subject of which the electro-optical representation is desired, a photoelectrically responsive element for converting the varying intensities of light and shadow on the elemental areas of the subject illuminated into proportional strength electric current impulses, a storage element, means for charging said storage element, means for controlling the rate at which said storage element acquires a charge varying between minimum and maximum in accordance with the instantaneous current produced from the light translating element, a second means for simultaneously charging said storage element at a constant rate, means for controlling the instantaneous position of the fluorescent effect upon the cathode ray tube screen in accordance with the instantaneous charge upon the storage element, means for instantaneously releasing the charge in the storage element in accordance with a predetermined fixed cyclically operable control element, and means for controlling a transmission channel in accordance with the instantaneous stored voltage in said storage element.

4. In a television system, means for obtaining signals for producing velocity modulation type electro-optical effects, a cathode ray tube arranged to illuminate in accordance with the production of fluorescent effects upon the end wall thereof an image of which the electro-optical representation is desired, a light translating element for producing electrical currents of intensities proportional to the intensity of light and shadow on an elemental area of the subject coordinated in space relationship with the elemental area of the tube screen instantaneously

fluorescent, a storage element, means for controlling the rate at which the storage element acquires charges in accordance with the current flowing from the light translating system, and in addition, means for simultaneously charging said storage element in accordance with a predetermined constant rate, means to control in accordance with the instantaneous charge on said storage element the degree of deflection from normal of the cathode ray beam produced within the cathode ray tube, an oscillator of fixed frequency, a gaseous discharge device connected with said oscillator for discharging the storage element at regular predetermined intervals to vary thereby the deflection voltage applied to deflect the beam within the cathode ray tube, and means for controlling a transmission channel in accordance with the instantaneous deflection voltage applied to the cathode ray tube.

5. In a television system of the velocity modulation type, a cathode ray tube illuminated in accordance with the production of fluorescent effects upon the end wall thereof, a subject of which the electro-optical representation is desired, a photoelectrically responsive element for converting the varying intensities of light and shadow on the elemental areas of the subject illuminated into proportional strength electrical current impulses, a storage element, means for charging said storage element, means for controlling the rate at which said storage element acquires a charge in accordance with the instantaneous current produced from the light translating element, means for controlling simultaneously said charging of said storage element in accordance with a fixed rate of charge, means for controlling the instantaneous position of the fluorescent effect upon the cathode ray tube screen in accordance with the instantaneous charge upon the storage element, a local oscillator, a grid controlled gaseous discharge device for instantaneously releasing the charge in the storage element in accordance with the predetermined fixed cyclic operation of the local oscillator, and means for controlling a transmission channel in accordance with the instantaneous stored voltage in said storage element.

6. In a television system wherein electro-optical effects are produced by variable velocity modulation of the scanning medium, the control method steps which include storing electrical energy at a substantially constant rate for predetermined time periods, simultaneously storing electrical energy at a variable rate dependent upon instantaneous brilliance of electro-optical effect beam produced, developing a source of control signals, periodically discharging the stored energy in accordance with the control signals, and controlling reproduction of the electro-optical effects in accordance with the sum of the said storing rates.

7. In a television system, a cathode ray tube having deflecting means therein, a photoelectric cell, means to project light from said object upon said photoelectric cell, a condenser, means for charging said condenser at a constant rate, means for simultaneously charging said condenser at a rate dependent upon the light projected upon the photoelectric cell, a thermionic discharge tube connected across said condenser, a source of impulses, and means to supply the impulses to the discharge tube.

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