

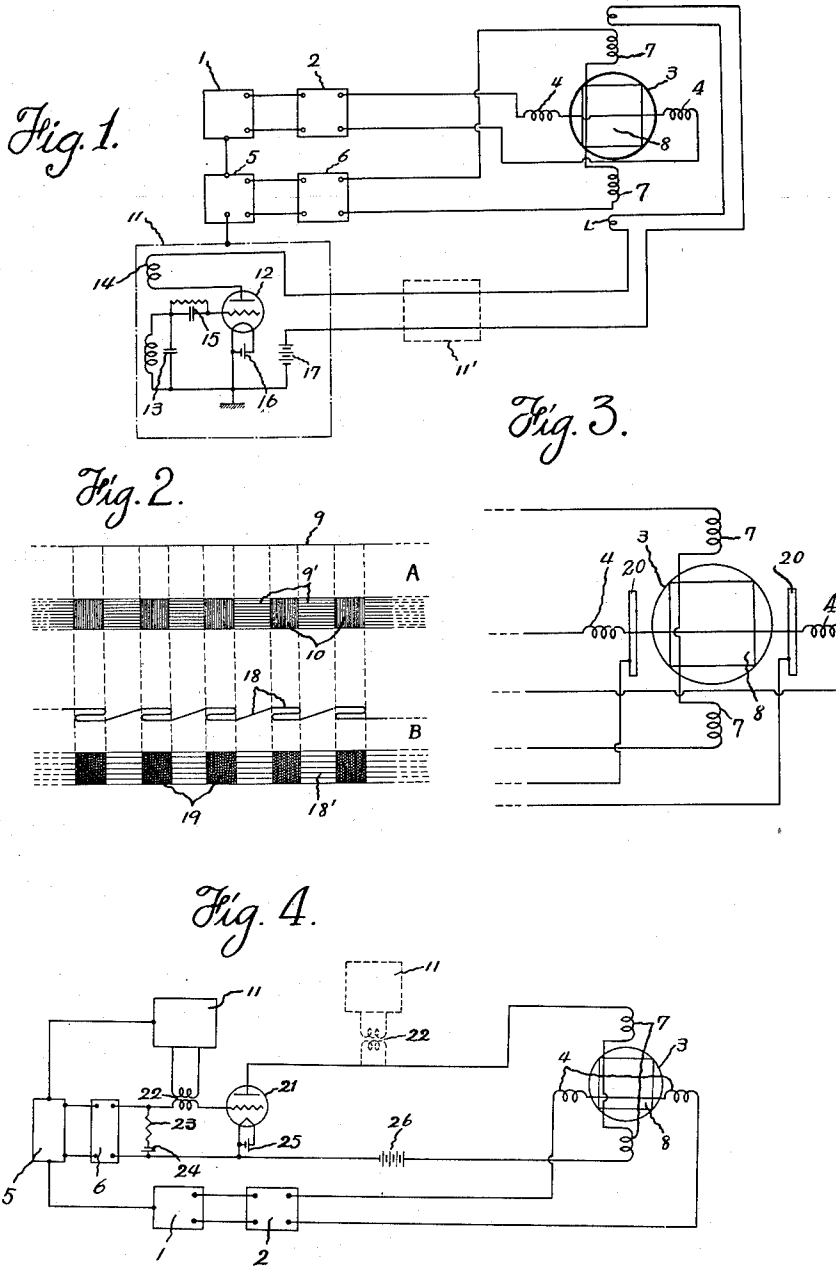
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TELEVISION RECEIVING SYSTEM

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TELEVISION RECEIVING SYSTEM

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This invention relates to television receiving systems and more particularly to television scanning systems whereby the pictures are produced on the fluorescent screen of a Braun tube by series of distinct spots without trace of scanning lines, and its principal object is to provide very fine and clear television pictures by simple and reliable means.

In television systems using a cathode ray tube, such as a Braun tube, at the television receiving end, pretty good results may be obtained with the deflecting current or voltage, especially the current or voltage of a saw tooth wave form applied to the deflecting coil or plate provided for the Braun tube in synchronism and in the same phase with respect to the scanning operation at the sending station. In former systems, however, all picture elements on the fluorescent screen are connected by the scanning motion and the image consists of parallel scanning lines so that the observer feels disagreeable.

In accordance with this invention the above defects owing to the continuation of the scanning lines is obviated by producing each picture element by a series of distinct and independent spots.

For the consideration of what we believe to be novel and our invention, attention is directed to the following specification and the claims appended thereto. In the drawing, Fig. 1 is a connection diagram illustrating a television receiving system embodying this invention; Fig. 2 shows curves taken for explanation of this invention; Figs. 3 and 4 are connection diagrams illustrating modified arrangements of this invention.

Referring to Fig. 1 of the drawing, 1 represents a low frequency oscillator of an ordinary type having the frequency equal to the number of pictures per second. 2 is a saw tooth current generating means which is controlled by the oscillator 1 and which produces a saw tooth shaped current of the same frequency as that of the low frequency oscillator 1. The output side of the saw tooth shaped current generator 2 is connected to one set of deflecting coils 4 of a Braun tube 3 to effect low speed scanning operation. The Braun tube 3 for simplicity should naturally be connected and arranged in an ordinary manner for television systems, though the picture current receiving system is not shown in the drawing. However, 5 represents an oscillator having the frequency equal to the line scanning frequency, and 6 is a saw tooth wave form current generating means having the same frequency as that of the oscillator 5. The output side of the saw tooth

current generator 6 is connected to the other set of deflecting coils 7 which are arranged at right angle with respect to the deflecting coils 4 to effect the line scanning operation. In the above arrangement, the oscillators 1 and 5 should of course be operated in synchronism with the scanning operation in the sending station. In other words, a picture current receiving circuit should be associated with the grid of the Braun tube 3 in order to control the cathode ray corresponding to the luminous variation of the picture elements.

With the arrangement so far explained in the above which is an ordinary arrangement of deflecting coils, the fluorescent screen 8 of the Braun tube 3 will be scanned only once for each picture at substantially uniform scanning speed by the cathode ray controlled by the deflecting coils 4 and 7. Such condition can be explained more clearly by Fig. 2. In Fig. 2—A, the line 9 represents the direction of scanning cathode ray and 10 represents a spot corresponding to a picture element. Residual light or trace of the scanning line is left in the space 9' between the spots so that the entire picture will become indistinct.

In accordance with this invention, (refer to Fig. 1) an auxiliary deflecting coil L is wound differentially with respect to the high speed scanning deflecting coil 7, and arranged in close relation thereto. The auxiliary coil is connected in the output circuit of an oscillator 11 having the frequency equal about to the number of picture elements per second. The oscillator 11 should be operated in the same phase relation with the oscillators 1 and 5 by starting them simultaneously. Though the oscillator 11 may be of any suitable type which produces a voltage or current of any suitable wave form, yet such an oscillator which generates a voltage of sine wave form or the like is illustrated in the drawing. 12 designates an oscillator valve and 13 is an oscillation element consisting of a condenser and an inductance, connected in the grid circuit of the oscillator valve 12. 14 shows an oscillation coupling coil which is connected to the plate circuit of the oscillator wave 12 and cooperates with the oscillation element 13. 15 is a grid bias device such as consisting of a capacity and a resistance, while 16 and 17 represent the A- and B-batteries of the oscillator valve 12 respectively. The coupling coil L is preferably energized through a saw tooth shaped current generating means 11' which is controlled by the oscillator 11 with the current or voltage of saw tooth wave form having the frequency equal to the number of the picture elements to be produced per second.

The operation of the above mentioned arrangement is as follows:—Assuming that the device shown in Fig. 1 is operated in synchronism with the scanning operations at the sending station, and so that the cathode ray in the Braun tube 3 is controlled by the grid thereof in a manner corresponding to the luminous variation of the picture elements, then the magnetic field caused by one-half cycle of the current passing through the deflecting coil L will oppose, at the position corresponding to every picture element, to the magnetic field caused by the current passing through the high speed scanning deflecting coil 7 so that the deflection of the cathode ray may be momentarily stopped or tend to decelerate at the position corresponding to every picture element as shown by 18 in Fig. 2—B. Then the cathode ray will be quickly shifted to the next spot since at the position between adjacent picture elements the cathode ray is accelerated by the resultant magnetic field caused by the co-operation of currents passing through the main deflecting coil 7 and the auxiliary deflecting coil L so that the scanning line can not be seen clearly as shown by 19 in Fig. 2—B. By properly regulating the intensity of current supplied to the deflecting coil L more distinct picture elements 19 may be produced and clear images may be seen without influence of the scanning lines. The intensity of the current supplied to the deflecting coil L is such that the cathode ray is deflected back only for a very short distance equal to the size of one picture element at the position corresponding to every picture element, in the direction opposite to the normal scanning direction of the cathode ray due to the current passing through the deflecting coil 7, so that a very small current through the deflecting coil L is enough for this purpose. If the deflecting coil L is arranged in oblique relation to the deflecting coil 7 the picture element will be produced obliquely to the direction of the scanning line and then the trace of the scanning line may be eliminated more effectively.

In Fig. 3, instead of the deflecting coil L, a pair of opposite deflecting plates 20 is arranged at the position parallel to the field of the deflecting coil L and applied with the output voltage of the oscillator 11. The other connections are similar to those described with reference to Fig. 1. In this arrangement, the cathode ray will be deflected in the direction of the electric field which is produced by the deflecting plates 20 and which is normal to the magnetic field caused by the deflecting coil 7 so that the object of this invention may equally be attained with the same result as explained with regard to Fig. 1, if the polarities of the deflecting plates 20 are properly selected.

In the modified arrangement of this invention shown in Fig. 4, the oscillator 11 having the frequency equal to the number of picture elements per second is connected to the primary winding of a transformer 22, the secondary winding of which is inserted in the grid or plate circuit of an amplifying vacuum valve 21 which is connected to the saw tooth voltage or current generating means 6 of the high speed scanning frequency. Thus the auxiliary deflecting coil L in Fig. 1 or plates 20 in Fig. 3 can be omitted. 23 and 24 are the grid bias resistance and grid bias source of the amplifying valve 21 respectively. 25 and 26 represent the A- and B-batteries respectively.

In this arrangement, the deflecting voltage of the line scanning frequency applied from the saw tooth wave form voltage generating means 6 and

the voltage having the frequency equal to the number of picture elements applied from the oscillator 11 are superposed in the deflecting coil 7. Hence the cathode ray may be deflected in the manner similar to that described above so as to produce the distinct picture elements.

Assume, for instance, that one picture consists of 10,000 picture elements and that the number of pictures interchanged per second is twenty, then the number of picture elements per second will become 200,000. The object of this invention will be attained by selecting the number of frequencies of the oscillators or generators 1, 5 and 11 as 20, 2,000 and 200,000 respectively and by operating these oscillators in the same phase as those of the sending station.

As above described according to this invention, the picture elements can be seen as the distinct spots free from the trace of scanning lines so that the image can be seen very clearly on the fluorescent screen of the Braun tube.

What we claim as new and desire to secure by Letters Patent of the United States, is:

1. In television receiving systems using a cathode ray tube having a control grid, the combination of an electro-magnetic coil arranged adjacent to the cathode ray tube to deflect the grid controlled cathode ray in such cathode ray tube at a frequency equal to the number of pictures per second, an electro-magnetic coil arranged normally to said first mentioned electro-magnetic coil and adjacent to the cathode ray tube for deflecting the grid controlled cathode ray at the line scanning frequency, an auxiliary deflecting coil wound differentially and arranged closely to said electro-magnetic coil for the line scanning frequency speed to accelerate and decelerate the line scanning speed of the grid controlled cathode ray in the direction of the line scanning at a frequency equal to the number of the picture elements per second, said electro-magnetic coils being energized, respectively, from an oscillator having a frequency equal to the number of pictures per second, an oscillator having the line scanning frequency and an oscillator for generating a current of any wave form having a frequency equal to the number of picture elements per second for energizing said auxiliary deflecting coil, and thereby decelerating the line scanning speed of the grid controlled cathode ray against the deflecting action of said second mentioned electro-magnetic coil so as to stop the grid controlled cathode ray at a position corresponding to every picture element.

2. In television receiving systems using a cathode ray tube having a control grid, the combination of an electro-magnetic coil arranged adjacent to the cathode ray tube to deflect the grid controlled cathode ray at a frequency equal to the number of pictures per second, an electro-magnetic coil arranged normally to said first mentioned electro-magnetic coil and adjacent to said cathode ray tube to deflect the grid controlled cathode ray at the line scanning frequency, an auxiliary deflecting plate arranged normally to said second mentioned electro-magnetic coil and closely to said cathode ray tube to accelerate and decelerate the line scanning speed of the grid controlled cathode ray in the direction of line scanning at a frequency equal to the number of the picture elements per second, said electro-magnetic coils being energized, respectively, from an oscillator having a frequency equal to the number of pictures per second, an oscillator having the line scanning frequency and an oscil-

lator for generating the voltage of a frequency equal to the number of picture elements per second to be applied to said auxiliary deflecting plate, and thereby decelerating the line scanning speed of the grid controlled cathode ray in opposition to the deflecting action of said second mentioned electromagnetic coil so as to stop the grid controlled cathode ray at a position of every picture element.

3. In a television image producing system using a Braun tube having a control grid, the combination of an electromagnetic coil arranged adjacent to said Braun tube for deflecting the grid controlled cathode ray in said Braun tube at a frequency equal to the number of pictures per second, an electromagnetic coil arranged normally to said electromagnetic coil and adjacent to said Braun tube to deflect the grid controlled cathode ray in said Braun tube at the line scanning frequency, a saw tooth wave form current generator controlled by an oscillator having a frequency equal to the number of pictures per second for energizing said first mentioned electromagnetic coil, another saw tooth wave form current generator controlled by an oscillator having the line scanning frequency for energizing said second mentioned electromagnetic coil, an amplifying vacuum valve, the input circuit of which is connected to said second mentioned saw tooth wave form current generator and the output circuit of which is connected to said second mentioned electromagnetic coil, and an oscillator of a frequency equal to the number of the picture elements per second connected in the grid circuit of said amplifying vacuum valve to energize said second mentioned electromagnetic coil through said amplifying vacuum

valve in such a manner that the line scanning speed of the grid controlled cathode ray in said Braun tube is decelerated so as to stop the grid controlled cathode ray at the position corresponding to the picture elements and accelerated in the space between the adjacent picture elements.

4. In a television receiving system utilizing a cathode ray tube having a constant grid which controls the cathode ray corresponding to the brightness of the picture elements, the combination of means for deflecting said grid controlled cathode ray in said cathode ray tube at a frequency equal to the number of pictures per second, means also for deflecting said cathode ray within said tube in a direction normal to the first deflecting means at the line scanning frequency, auxiliary means for accelerating and decelerating the line scanning frequency of said grid controlled cathode ray in the direction of the line scanning at a frequency equal to the number of picture elements per second, said means being energized, respectively, from an oscillator having a frequency equal to the number of pictures per second, an oscillator having the line scanning frequency and an oscillator for generating a current of any wave form having a frequency equal to the number of picture elements per second to be applied to said auxiliary means, and thereby decelerating the line scanning speed of the grid controlled cathode ray in opposition to the deflecting action of said second deflecting means so as to momentarily stop said grid controlled cathode ray at a position corresponding to every picture element.

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