April 11, 1939. K. SCHLESINGER 2,154,386

DEFLECTING SYSTEM

Filed June 24, 1933

Fig. 1.

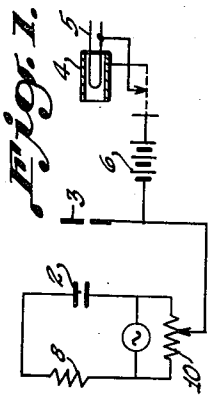


Fig. 2.

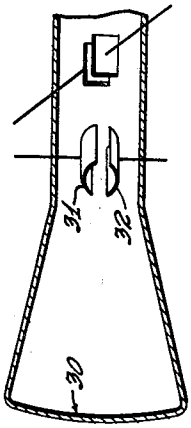
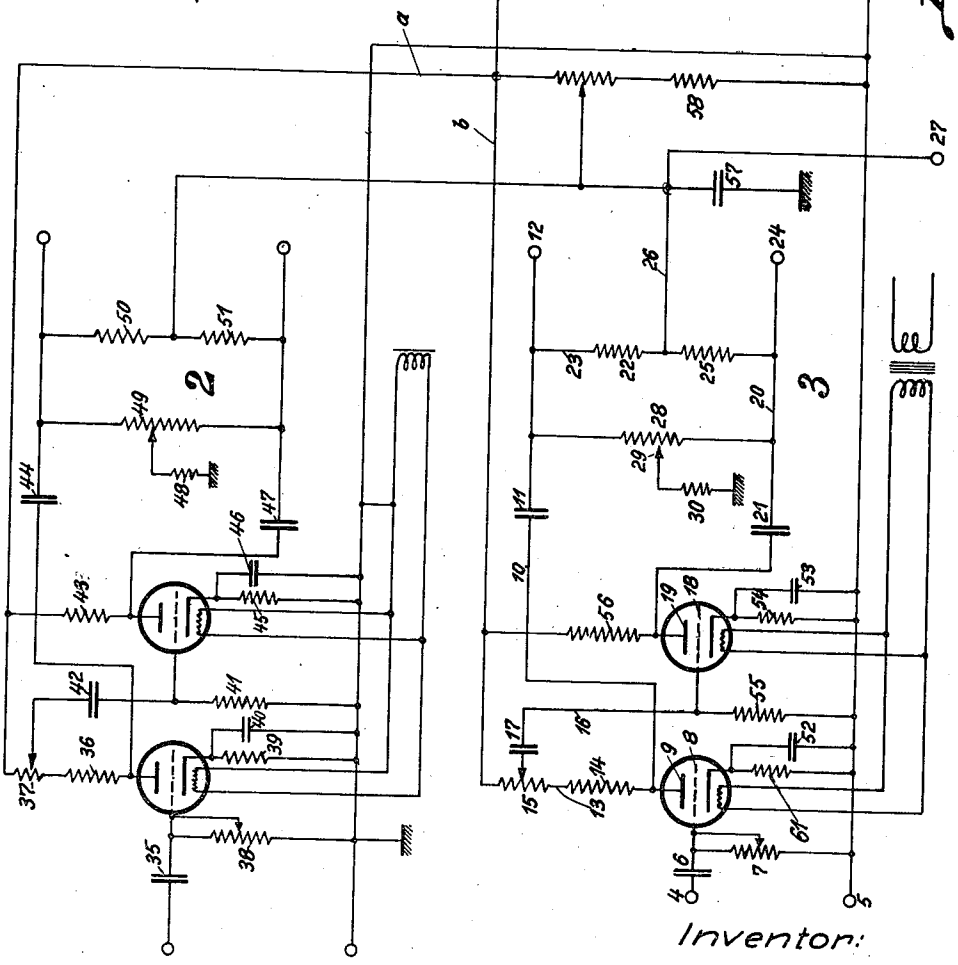


Fig. 3.



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DEFLECTING SYSTEM

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4 Claims. (Cl. 178—7.7)

It is known to employ deflecting plates for deflecting the cathode ray in Braun tubes.

In the well known arrangements of this kind the deflecting potential is linked up with the one plate, whilst the other plate possesses the potential of the—usually earthed—anode. For the purpose of attaining the requisite sensitiveness there is required in this connection system a relatively high deflecting potential, which is extremely difficult to produce when employing Braun tubes of large size. Further these arrangements have the image form distortion error, which makes itself evident in such a way that in place of a rectangle or square form a trapezium is formed on the image screen. This error arises in the following manner:

The ray upon its passage through the first pair of deflecting plates receives additional accelerations of varying extent dependent on its position in relation to the two plates, and accordingly enters at different speeds into the space between the second pair of plates. Since now the rate of deflection depends on the speed of the ray, the latter upon its passage through the second pair of plates is deflected to varying extents. The deflection at the one edge of the image is accordingly considerably smaller than that at the opposite edge of the image. In consequence one edge is considerably shorter than the other. Since the speed of the ray, and accordingly the deflection sensitiveness, varies continuously, there results in this fashion in place of a rectangular or square image an image of trapezoidal form.

According to the invention the control potential proceeding from a suitable generator—in the case of television arrangements, for example, from a tilting generator,—is applied to the one deflecting plate, and another potential which is derived from the first potential, and is of the same amplitude but reverse phase, to the second deflecting plate. For reversal of the phase there may be employed an electronic tube which preferably at the same time acts as amplifier.

By reason of this measure according to the invention there is obtained in the first place a doubling of the deflection sensitiveness, i. e., the tube operated by the method according to the invention possesses either in the case of the same control potential twice the sensitiveness, or in the case of half the control potential the same sensitiveness. A cross-current error is no longer able to take place at all. The longitudinal distortion is reduced to approximately one-quarter of the error occurring in the case of the known arrangement.

Fig. 1 shows the cathode ray tube with its deflecting circuit.

Fig. 2 shows curved deflecting plates.

Fig. 3 shows a line diagram of the deflecting circuits.

An arrangement of this kind is schematically shown in Fig. 1, wherein the deflecting plates are arranged in a reverse phase circuit. Each of the plates 2 is connected to one terminal of the deflecting voltage generator 7, the inner resistance of which is schematically indicated at 8; the generator 7 is bridged by a potentiometer 10, the mid-point of which is connected to the earthed anode 3. Thus, one of the deflecting plates is supplied with a scanning deflecting potential, while the other plate is supplied with a potential of the same amplitude and frequency as said scanning potential but of reverse phase.

In this connection there occurs in place of a trapezoidal edge a slightly curved upper edge.

This remaining error may be avoided in accordance with the invention by means of employing in place of flat parallel deflecting plates in the second deflecting system curved deflecting plates (i. e., deflecting plates, therefore, which possess a curved cross-section in the direction vertical to the direction of the ray). In this connection the form of the plates requires to be selected in such fashion that the same possess the widest spacing at that particular point at which the ray passes with the greatest speed, and the smallest spacing at the points where the ray passes with the lowest speed so that the deflecting sensitiveness remains constant in each position of the ray, i. e., in such fashion, therefore, that the variation in sensitiveness occasioned by the variation in the speed of the ray is compensated by the particular—correspondingly non-homogeneously—structure of the field.

An arrangement of this kind is shown by way of example in Fig. 2, wherein the deflecting plates 31 and 32 possess a slightly curved cross-section.

A circuit diaphragm for a television arrangement with Braun tubes according to the invention is shown in Fig. 3 wherein 1 is the supply portion, 2 the arrangement for controlling the image change plates and 3 the arrangement for controlling the line control plates. The arrangements 2 and 3 are fundamentally of the same construction.

The control potential from the line tilting generator is supplied to the line control apparatus at the terminals 4, 5. Connected with this potential, through the medium of the condenser 6 and the potentiometer 7, is the grid 8 of the

amplifying tube 9. By shifting the potentiometer tapping the potential at the grid 8, and accordingly—with constant amplification—the amplitude of the control potential at the control plates, and, therefore, also the form of the image produced, may be varied as desired. The control potential amplified in the tube 9 is applied, through the medium of the line 10 with the condenser 11, in direct fashion to the terminal 12, with which there is connected the one of the line deflecting plates of the tube. At the anode resistance 13, which may consist of the fixed resistance 14 and the potentiometer 15 connected in series therewith, there is tapped a potential, which is equal in amplitude to the control potential conducted to the grid 8. This potential is conducted over the line 16 with the condenser 17 to the grid 18 over the second amplifying tube 19. The tube 19 possesses the same degree of amplification as the tube 9, and supplies, through the medium of the line 20 with the condenser 21, a control potential to the terminal 24 in direct connection with the second line deflecting plate of the Braun tube, which potential is equal in amplitude to the control potential supplied to the first control plate, but as compared with this potential is of reverse phase. According, therefore, to the invention, there is conducted to the two line control plates a potential of equal amplitude and shifted phase.

The lines 10 and 20 are bridged by the line 23 with the two resistances 22 and 25. Through the medium of the line 26 the control plates receive from the potentiometer bridging the lines *b* and 75 a negative bias in relation to the anode. This bias, according to the invention, is selected at least at −500 volts. In this manner it is possible in accordance with the invention to cause the known light ion cross otherwise always occurring in gas-filled tubes to disappear completely.

The lines 10 and 20 are also bridged by the potentiometer 28. By displacing the earth point 29 at this potentiometer the bias of the plates is varied in relation to each other. In this manner the position of the image may be adjusted as desired.

The control potential from the image tilting generator is supplied to the image control apparatus at the terminals 73 and 74. Connected with this potential, through the medium of the condenser 35 and the potentiometer 38, is the grid 83 of the amplifying tube 81. By shifting the potentiometer tappings the potential at the grid 83, and accordingly—with constant amplification—the amplitude of the control potential at the control plates, and, therefore, also the form of the image produced may be varied as desired. The control potential amplified in the tube 81 is applied, through the medium of the line 77 with the condenser 44, in direct fashion to the terminal 79, with which there is connected the one of the image deflecting plates of the tube. At the anode resistance 81, which may consist of the fixed resistance 36 and the potentiometer 37 connected in series therewith, there is tapped a potential, which is equal in amplitude to the control potential conducted to the grid 83. This potential is conducted over the line 85 with the condenser 42 to the grid 84 of the second amplifying tube 82. The tube 82 possesses the same degree of amplification as the tube 81, and supplies, through the medium of the line 78 with the condenser 47, a control potential to the terminal 80 in direct connection with the second image deflecting plate of the Braun tube, which potential is equal in amplitude to the control potential supplied to the first control plate, but as compared with this potential is of reverse phase. According therefore, to the invention, there is conducted to the two image control plates a potential of equal amplitude and shifted phase.

The lines 77 and 78 are bridged by the line 86 with the two resistances 50 and 51. Through the medium of the line 87 the control plates receive from the potentiometer 27 bridging the lines *b* and 75 a negative bias in relation to the anode. This bias, according to the invention, should be selected at least at −500 volts. In this manner it is possible in accordance with the invention to cause the known light ion-cross otherwise always occurring in gas-filled tubes to disappear completely.

The lines 77 and 78 are also bridged by the potentiometer 49. By displacing the earth point 88 at this potentiometer the bias of the plates is varied in relation to each other. In this manner the position of the image may be adjusted as desired.

Each of the valves 9, 19, 81 and 82 is provided with an indirectly heated cathode having an equipotential surface 72 provided with an emissive substance and a heating filament 52.

Each of said equipotential surfaces 72 is earthed over a resistance 45 having a condenser 46 connected in parallel thereto.

Each two of the heating filaments 52 are connected to the secondary of a transformer 53.

1 is a supply unit comprising a rectifier valve 39 and smoothing means 59, 60, 61.

The single elements may be measured for instance as follows:

The condensers: 6=0.1 mf.; 11, 17, 21, 35 and 42=0.5 mf.; 44 and 47=1 mf.; 40, 46, 52, 53 and 57=2 mf.; 59 and 60=4 mf.

The resistances: 22, 25, 28, 55, 7, 38, 41, 49, 50 and 51=1,000,000 ohms; 58=2,000,000 ohms; 30 and 48=500,000 ohms; 43, 14 and 56=100,000 ohms; 15, 36 and 37=10,000 ohms; 39, 45, 54 and 61=4,000 ohms.

The drawing shows merely possible forms of embodiment of the invention, to which the same is in no way restricted. Thus, for example, in place of the tilting generators referred to by way of example it is also possible to employ any other suitable generators.

I claim:

1. In a television receiving arrangement including a Braun tube containing a pair of deflecting plates, two equally high resistances connecting said plates to the anode, a relaxation oscillation generator producing a relaxation voltage, an electronic A-amplifier, the input of said amplifier being coupled with the output of said relaxation oscillation generator, the output of said amplifier being coupled with a pair of deflecting plates of said Braun tube, said amplifier being so constructed as to supply both of said deflecting plates with a scanning deflecting voltage having the same amplitude but reverse phase, and means for biasing the deflecting plates negative with respect to the anode of the cathode ray tube.

2. In a television receiving arrangement including a Braun tube containing two pairs of deflecting plates, two equally high resistances connecting said plates to the anode, two relaxation oscillation generators producing relaxation voltages, two electronic A-amplifiers, the input of each of said amplifiers being coupled with the output of one of said relaxation oscillation gen-

erators, the output of each of said amplifiers being coupled with a pair of deflecting plates of said Braun tube, said amplifiers being so constructed as to supply both of said deflecting plates with a scanning deflection voltage having the same amplitude but reverse phase, and means for biasing the deflecting plates negative with respect to the anode of the cathode ray tube.

3. In a television receiving arrangement including a Braun tube containing two pairs of deflecting plates, two equally high resistances connecting said plates to the anode, two relaxation oscillation generators producing relaxation voltages, two electronic A-amplifiers, the input of each of said amplifiers being coupled with the output of one of said relaxation oscillation generators, the output of each of said amplifiers being coupled with a pair of deflecting plates of said Braun tube, said amplifiers being so constructed as to supply both of said deflecting plates with a scanning deflection voltage having the same amplitude but reverse phase, and means for supplying each of said deflecting plates with the same negative bias with respect to the anode of said Braun tube, and means for biasing the deflecting plates negative with respect to the anode of the cathode ray tube.

4. In a television receiving arrangement including a Braun tube containing a pair of deflecting plates, two equally high resistances connecting said plates to the anode, a relaxation oscillation generator producing a relaxation voltage, an amplifier tube comprising cathode, grid and anode, said grid of said amplifier tube connected with the output of said generator, a potentiometer resistance being connected to said anode of said amplifier tube, a further amplifier tube equal to the first said one comprising cathode, grid and anode, a condenser being connected to one terminal of said potentiometer resistance on the one hand and to the grid of said second amplifier tube on the other hand, and means to connect the anode of said first amplifier tube with one of said deflecting plates, and to connect the anode of said second amplifier tube with the other one of said deflecting plates.

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