Dec. 31, 1940. K. SCHLESINGER 2,227,021

ARRANGEMENT FOR MAGNETIC DEFLECTION OF A CATHODE RAY

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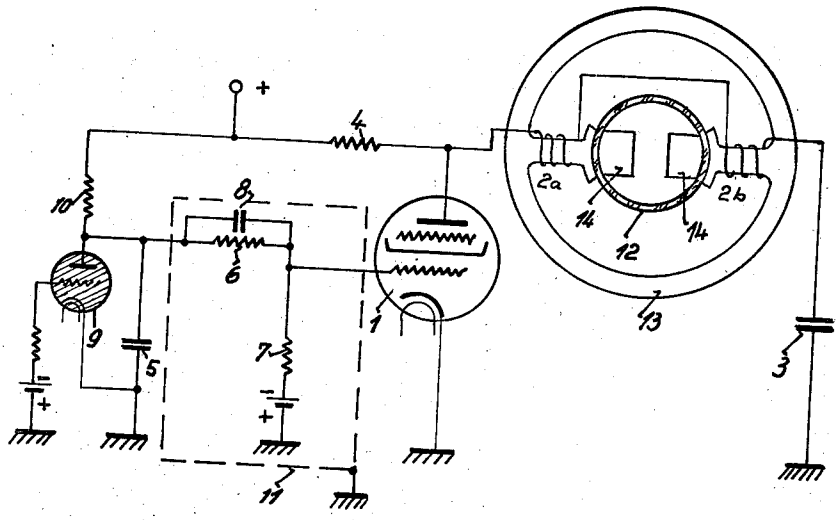

Inventor:

Kurt Schlesinger

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ARRANGEMENT FOR MAGNETIC DEFLECTION OF A CATHODE RAY

Kurt Schlesinger, Berlin, Germany, assignor, by mesne assignments, to Loewe Radio, Inc., a corporation of New York

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4 Claims. (Cl. 250—27)

The invention relates to a device for producing a rectilinear magnetic deflection of a cathode ray, such as required in the case of television, both for the line as well as the image deflection.

It is known to use for this purpose an electromagnet the winding of which is fed by the anode current of an electronic tube controlled on its grid side by means of a linear relaxation oscillation. In first approach the plate current is then also chronologically linear, and consequently also the magnetic deflection. It is known in practice, however, that the precision necessary for television purposes cannot be obtained with this simple connection system. There occur a crowding together at one and a distention at the other edge of the image.

It is the object of the invention to improve the rectilinearity of the deflection by arranging the device so that the impedance of the winding of the electromagnet is small as compared with the inner resistance of the tube. Further improvements are described in the following specification.

Further objects of the invention will be best understood by reference to the following description taken in connection with the accompanying drawing, in which is a diagram of the connection according to the invention.

In the drawing 12 is the cross-section of a Braun tube surrounded by the electromagnet 13 preferably provided within the tube with pole pieces 14 leaving between them but a small gap for the ray. The symmetrical windings 2*a* and 2*b* of the electromagnet are connected to the anode of the amplifier tube 1. This tube is provided with a screening grid as only in this case the condition described above is able to be fulfilled. The control grid of tube 1 is connected to a relaxation oscillator of a well known kind consisting of a grid controlled gas-filled thermionic tube 9, charging resistance 10 and storage condenser 5.

In order to withhold from the winding 2 the direct current the latter, in a well known manner, is conducted through the anode resistance 4 whilst a large condenser 3 is connected in series to the winding. The value of this resistance has to be large as compared with the impedance of the electromagnet but small as compared with the inner resistance of tube 1; the impedance of the electromagnet, however, has to be small as compared with the inner resistance of the tube.

Notwithstanding these measures there is still a distortion of the rectilinearity to be observed, owing to the fact that the combined anode resistance is no longer a pure inductance, but a mixture of resistance and self-induction. This remaining distortion may be compensated by giving to the relaxation curve which is linear in itself an inverse distortion to render prominent its higher harmonics. This may be produced, for example, by providing a high frequency coupling between the relaxation condenser 5 and the grid of the tube 1. This coupling consists in its most simple form of a resistance potentiometer 6, 7, the feed branch 6 of which is bridged by a condenser 8 for the higher relaxation harmonics. A calculation shows that the correction of the non-linearity is exactly attained only in respect of quite a certain time constant 6, 8 and potential distribution 6, 7.

Practical values are, for example:

r_6=.5 megohms,
r_7=.5 megohms,
c_8=10,000 cm. at
r_4=5,000 ohms.

In this connection the blocking condenser 3 is also so large that its resistance disappears in relation to that of the coil (electrolytic condenser of 10–20 mf.).

Owing to the comparatively high resistance values it is necessary in practice to shield the grid complex towards the outside along the broken line 11.

I claim:

1. In a device for the rectilinear deflection of a cathode ray comprising a relaxation oscillator furnishing a rectilinear voltage, an amplifier tube having an anode and a control grid, a cathode ray tube having at least one pair of electromagnetic deflecting coils connected to the anode of said amplifier, the anode circuit resistance of said amplifier tube being purely ohmic, means to compensate distortions of the deflecting voltage curve effected by said anode circuit resistance, said means including a coupling element connecting said relaxation oscillator and said control grid and preferring the higher harmonics of said rectilinear voltage, said coupling element consisting of a condenser shunted by a resistance.

2. In a device for the rectilinear deflection of a cathode ray comprising a relaxation oscillator furnishing a rectilinear voltage, an amplifier tube having an anode and a control grid, a cathode ray tube having at least one pair of electromagnetic deflecting coils connected to the anode of said amplifier, the anode circuit resistance of

said amplifier tube being purely ohmic, said relaxation oscillator being coupled to said grid by a condenser shunted by a resistance, the circuit containing said deflecting coils being blocked by a condenser, the impedance of which is low as compared with the impedance of the deflecting coils.

3. In a device for the rectilinear deflection of a cathode ray comprising a relaxation oscillator furnishing a rectilinear voltage, an amplifier tube having an anode and a control grid, a cathode ray tube having at least one pair of electro-magnetic deflecting coils connected to the anode of said amplifier, the anode circuit resistance of said amplifier tube being purely ohmic, said relaxation oscillator being coupled to said grid by a condenser shunted by a resistance, the said anode circuit resistance being large as compared with impedance of the deflecting coils and being low as compared with the internal resistance of the amplifier.

4. In a cathode ray oscillograph system, a cathode ray tube having means to develop a cathode ray beam and at least one pair of electro-magnetic coils to deflect the ray, a thermionic amplifier having at least a cathode, a control grid and an anode, a connection between the anode of said amplifier and the deflecting coil, a source of anode voltage for said amplifier, a resistor connected between the source of anode voltage and the anode, a charge storage element, means for charging said charge storage element substantially linearly, a thermionic discharge device for abruptly discharging said charge storage element at predetermined time intervals to produce across said storage element a voltage of substantially saw tooth wave form, a coupling circuit comprising a parallel resistance and capacity element connecting the discharge device and the control grid of said amplifier for supplying the saw tooth voltage wave to said amplifier and compensating for distortion in the beam deflection wave supplied to said electro-magnetic coil due to the anode circuit resistance of said amplifier.

KURT SCHLESINGER.