Dec. 31, 1940. K. SCHLESINGER 2,226,996

TELEVISION RECEIVER

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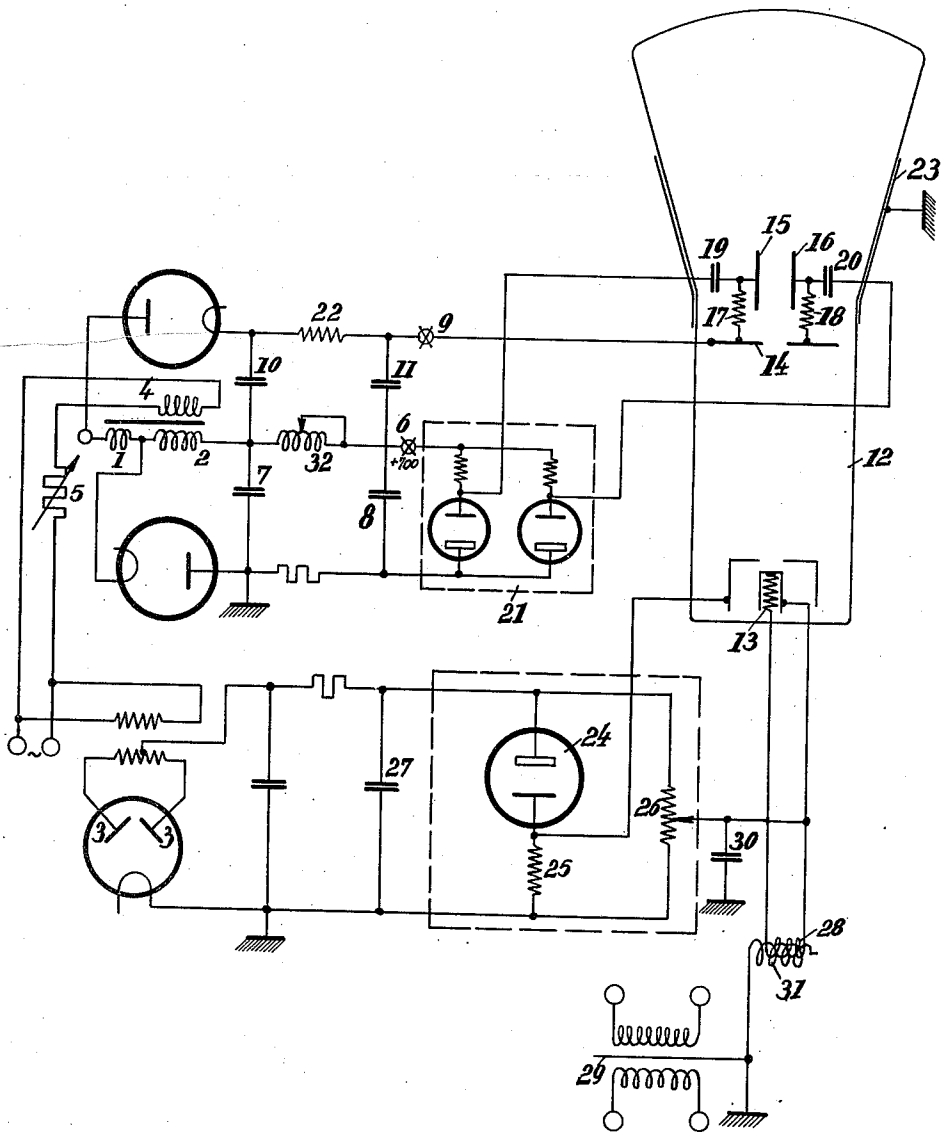

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UNITED STATES PATENT OFFICE

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TELEVISION RECEIVER

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1 Claim. (Cl. 178—7.5)

The invention relates to the supply of anode D. C. potentials to complete television receivers which comprise a radio receiver in combination with a cathode-ray television tube and an appertaining relaxation oscillation generator. In a receiving system of this kind there has usually been performed heretofore in practice a distribution of the current supply over two transformers, of which the one supplies all heating alternating currents for the cathodes, which may be at earth potential or approximately at earth potential, whilst the other, in conjunction with rectifiers, produces all the anode potentials. The disadvantages of a distribution of this kind on the anode side consists in the fact that the three circuits, receiver, screen apparatus and television tube, necessarily influence each other. In particular it has not been possible to increase the anode potential employed for the television tube independently of the other potentials and at the same time keep the picture size constant with increasing light intensity without simultaneously increasing the potential of the receiver. An additional disadvantage associated with all-high-tension systems consists in the frequent break down of the smoothing condensers in practice. If the anode of the television tube and the deflecting plate are earthed, so that the cathode is negative to the extent of several thousand volts in relation to earth, a break down of this kind is in practice nearly always associated with loss of the television tube, as upon the breakdown the potential of the cathode path is raised instantaneously to anode potential, whereby high emissions of a destructive kind are able to take place.

The accompanying drawing shows a mains-connection diagram, which is free from all of these disadvantages. It is based on a system for potential doubling similar to the well known Greinacher connection which, however, has been particularly modified for television purposes. The high-tension transformer is derived from two separate transformer windings 1, 2 and 3, each having a separate iron core, of which the windings 1 and 2 supplies solely the anode potential for the relaxation oscillation generator and for the television tube, whilst the winding 3 assumes merely the feeding of the receiver with anode direct current. It is accordingly possible to vary the excitation of the primary winding 4, which belongs to the secondary winding 1/2, in itself, for example by means of a series resistance 5, without any effect on the potential of the receiver. With a variation of this kind at 4 the anode potential and relaxation potential are increased to an equal amount, so that the size of the image remains exactly constant, whilst the intensity of the image increases with the anode potential of the television tube.

The supply section 1, 2, 4 operates in accordance with the invention in half-wave connection, whilst the anode potential section 3 operates in full-wave connection. This is possible because the requirement for anode potential on the part of the screen apparatus and the Braun tube is comparatively small. Thus, for example, in a Braun tube of present-day construction with a relaxation apparatus supplying relaxation voltages of reversed phase and 2000 volt electrodes an anode potential of 700 volts is sufficient for the relaxation oscillation generator. This is already obtained at the terminal 6 when the winding 2 in effect has merely 500 volts. The condensers 7 and 8 are accordingly also constructed merely with a testing potential of approximately 1,500 volts. As in the case of the terminal 6 the double potential would develop entirely alone at the terminal 9. Since this is not quite sufficient there is conveniently employed an auxiliary winding 1 of 300 volts in effect. There then results at the terminal 9 a potential amounting as follow:

$$700V+\sqrt{2}\cdot(500+300)=1{,}800\ V$$

The condensers 10 and 11, therefore, merely require to withstand the difference in potential between 9 and 6, and to not break down.

According to a subsidiary feature of the invention a variable impedance 32 is provided in the lead connection to the relaxation oscillation generator apparatus 21, said impedance being arranged between the two condensor groups 7, 10 and 8, 11. By varying this impedance preferably of the form of an ohmic resistance an independent regulation of the proportion of the image brightness on the one hand and of the size of the image on the other hand may be performed. In this case an adjustment of the anode-potentials for the relaxation generators may be performed without variation of the anode potentials for the Braun tube.

According to the invention, the Braun tube 12 is connected with an earthed cathode 13 earthed through a condenser 30, and its anode 14 is raised to a positive high tension against earth. The deflecting plates 15 and 16 are preferably connected within the tube with the anode by means of fixed resistances 17 and 18. The trans-

mission condensers **19** and **20**, which are necessary for feeding the relaxation oscillations on the part of the screen apparatus **21** may be accommodated with advantage in the high vacuum of the television tube **12** in order to render impossible a breakdown of these condensers operating with a working potential of almost 2000 volts. The time circuits **19/17** and **18/20** should be selected with consideration to the relaxation frequencies to be transmitted thereto. The condensers, become small and handy the larger the leakage resistances **17** and **18** are capable of being made, and these, particularly in the case of a negative bias between plates and anode and location in a vacuum, may amount to 1 megohm. In this case the transmission of relaxation oscillations with 25 image changes is already quite successful with a capacity of 0.05 M. F.

In the connection system according to the invention not only are fluctuations in the potential of the television anode counterbalanced by fluctuations of equal size and equal direction in the anode potential of the scanning apparatus, but also the humming potentials of both circuits **6** and **9** compensate each other there belong also co-phasal low anode potentials of **21**, so that the form of image is always confined by straight lines. Owing to this natural compensation the smoothing required (**22/11**) may be kept so low that the loss of potential at the condenser **11** as compared with **10** remains less than 2%. Also in this there is to be recognized an appreciable improvement as compared with the Braun tube connection systems with earthed anode of **12**, in which the ripple elimination of the control circuit **13** requires to be made better than 10^{-3}. The provision of a metallic deposit on the outer wall **23** of the tube and the connection thereof with earth is not to be avoided owing to the effect exerted by the surroundings.

In the drawing there is also shown the connection of the grid cathode circuit of **12** with the final tube of the receiver, the rectifier **24**. According to the invention there is selected also in this case a bridge connection for steadying the grid circuit and for adjusting the correct mean value of the light intensity. This consists of the final tube **24** with its anode resistance **25** on the one hand and the potentiometer **26** on the other hand. The latter may be operated from the exterior, or may also be mechanically coupled with the switch for switching on or off the receiver. Even with traces of ripple at the smoothing capacity **27** no humming stripes occur in the image, because the grid bias of the television tube is situated in the bridge diagonal to **27**, and the ripple potential in the anode feed for the receiver is accordingly eliminated in the control circuit for the intensity.

In view of the very considerable consumption of current in the case of a radio receiver for television purposes having a large number of stages, amounting to approximately 80–100 milliamperes, two-way rectification **3/3** is, in accordance with the invention, retained in this part of the rectifier for the purpose of effecting economy in smoothing means. The heating of the television tube **13** is derived from a 4-volt winding **28**, which is preferably also wound on to the common heating transformer **29**, supplying the heating filaments of all tubes operating in the receiver. An interfering hum in the winding supplying the heating voltage for the television tube is prevented by a capacity **30**. For the same purpose there may be provided in addition an earthed protective coil **31** and earthing of the iron core **29**.

I claim:

In a television receiving apparatus wherein is included a cathode ray tube provided with at least a cathode and an anode and a control electrode and wherein is also included electron beam deflecting means for deflecting the developed cathode ray and a relaxation generator connected to energize the beam deflecting means, a power supply system including a pair of input terminals adapted to be energized from a source of alternating current voltage, a transformer having a primary and a secondary winding, a connection from the primary winding to the input terminals to supply energy to the primary winding and to cause energization of the secondary winding, a pair of half-wave rectifier tubes, a connection from the end terminal of the secondary winding to the anode and cathode elements of one of the rectifiers, a connection from an intermediate point on the transformer secondary winding and one end terminal of the said winding to the anode and cathode of the other rectifier with the said other rectifier being connected in opposite polarity to the first rectifier, a filter comprising series resistance and parallel capacity connected to the output circuit of each rectifier, and a plurality of output terminals for the system whereby between one of said output terminals and a predetermined point of constant potential a voltage is developed to energize the relaxation generator and between the second terminal and the said point of fixed potential is developed a voltage which is a multiple of that appearing at the first terminal so as to energize the anode cathode elements of the cathode ray tube and whereby voltage fluctuations tending to alter the velocity of the cathode ray beam by variations in anode voltage are compensated in a pattern traced thereby by proportional variations controlling the relaxation generator to develop the energy to deflect the cathode ray beam.

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