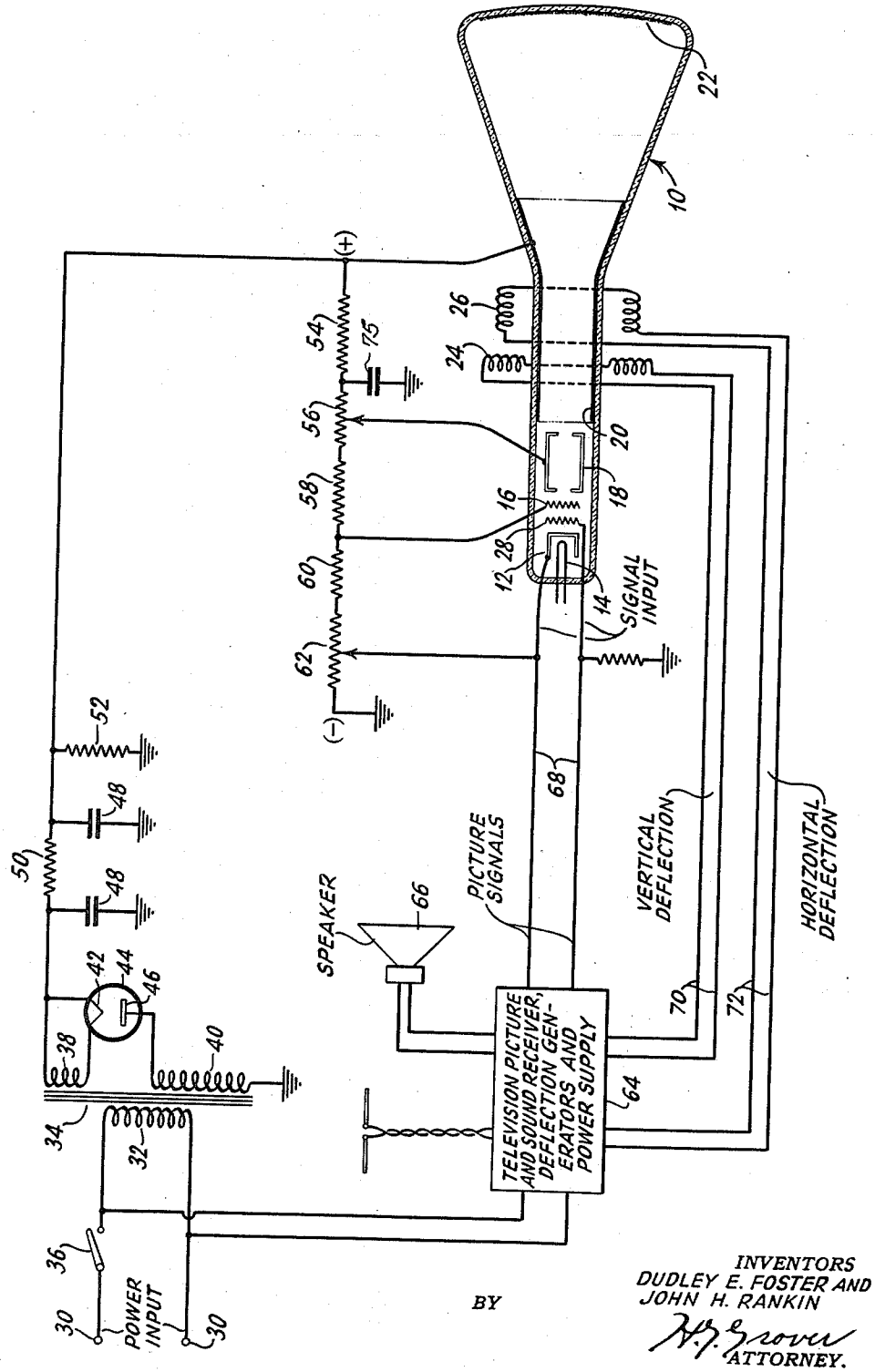
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TELEVISION POWER SUPPLY

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INVENTORS
DUDLEY E. FOSTER AND
JOHN H. RANKIN

BY

W. F. Grover
ATTORNEY.

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TELEVISION POWER SUPPLY

Dudley E. Foster, South Orange, N. J., and John A. Rankin, Port Washington, N. Y., assignors to Radio Corporation of America, a corporation of Delaware

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1 Claim. (Cl. 250—27)

This invention relates to an improvement in television receivers and more particularly in the power supply used in such receivers.

In a television receiver a cathode ray tube is used in which a beam of electrons is generated, the electron beam being directed against a fluorescent, luminescent or electron responsive target surface in order to produce light as a result of the electronic stream bombardment. The electron beam is deflected in substantially mutually perpendicular directions in order to scan the target surface and the intensity of the electron beam is altered in accordance with the received picture signal series. The produced variations in the intensity of the cathode ray beam, therefore, together with the scanning operation, produce the television light image at the electron responsive target. The light image produced at the target surface may be viewed directly or may be enlarged by projection through a series of lenses upon a viewing screen.

In order to produce a television picture having the desired light intensity it is necessary to use an electron beam of considerable velocity and it has been found that velocities and intensities which are necessary to produce the desired results are sufficient to permanently damage the target surface unless the cathode ray beam is continuously deflected. Should the cathode ray beam remain substantially stationary at any particular point on the target surface permanent injury would result and the surface of the target would be spoiled.

The possibility of permanently damaging the target surface of the cathode ray receiving tube is particularly great when the receiver is initially turned on, since frequently the cathode ray tube and its power supply are in an operating condition before the deflection generators associated therewith have been sufficiently heated to produce the desired beam deflections. Under these conditions a cathode ray beam will be produced and will be directed against a relatively small area on the target surface for an appreciable length of time prior to the operation of the deflection generators and as a consequence the target surface will be burned over that particular area.

In order to avoid such an operation in conventional receivers, users of the receivers have been cautioned to move the beam intensity control knob to minimum beam position when the receiver is turned on and to leave the control knob in that position for a time sufficient for the deflection generators to begin operation. The intensity of the cathode ray beam may then be increased by the manipulation of the control knob to a value necessary for proper operation of the tube and receiver. Such a precaution, of course, is annoying to the operator of the receiver and should such a procedure be overlooked, it is quite possible that the television receiving tube would be irreparably damaged.

One purpose of the present invention, therefore, resides in an improvement in the power supply associated with the television receiving tube such that production of a cathode ray beam will be prevented for a length of time sufficient to permit the deflection generators to begin operation.

Another purpose of the present invention resides in the provision of means associated with the power supply of a television receiving tube whereby the receiver may be turned on without the necessity of previously adjusting the position of the beam intensity control member.

A still further purpose of the present invention resides in the provision of means associated with the power supply of a television receiving tube whereby the entire television receiver may be brought to proper operating temperatures and conditions before a cathode ray beam is permitted to be developed in the television receiving tube.

Still other purposes and advantages of the present invention will become more apparent to those skilled in the art from the following specification, particularly when considered with the single figure wherein a power supply for a television receiver is shown incorporating the present invention to accomplish the purposes set forth above.

In the drawing, a television receiving tube **10** is shown having a cathode **12**, a heater element **14** therefor, a screen grid electrode **16**, a first accelerating anode **18**, and a second accelerating anode **20**. When proper potentials are applied to these electrodes, a focused cathode ray beam is produced and projected against the target surface **22** at the enlarged end of the television receiving tube **10**. For deflecting the cathode ray beam in mutually perpendicular directions deflecting coils **24** and **26** are provided which when energized with the proper voltage variations cause vertical and horizontal deflections of the cathode ray beam respectively. Although electromagnetic deflecting means are shown in the drawing, it is to be understood, however, that electrostatic deflection or a combination of these types of deflections may be used. The

choice of the wave form of the voltage variations applied to the particular deflecting means is of course determined in accordance with the type of deflection used and the velocity of the cathode ray beam.

In cathode ray tubes of the type described, it is necessary that the second accelerating anode 20 be maintained at a high positive potential with respect to the cathode 12. Furthermore, the potential of the first accelerating anode 18 is also maintained at a positive potential with respect to the cathode, the potential being somewhat less than the potential on the second accelerating anode. Furthermore, the screen grid electrode 16 is maintained positive but by a lesser amount as is well known to those skilled in the art.

The cathode ray tube also includes a control electrode 28 by means of which the intensity of the cathode ray beam may be controlled and this control electrode is normally maintained negative with respect to the cathode 12. In order to modulate the intensity of the cathode ray beam signals are applied as between the control electrode 28 and the cathode 12. In order to maintain the proper biased relationship between the control electrode and the cathode of the cathode ray tube, the cathode may be normally operated at a slight (and adjustable) positive potential with respect to ground and the control electrode may be operated at substantially ground potential. Furthermore, the potential of the first accelerating anode is adjustable with respect to the potential of the second accelerating anode in order to produce the proper focal condition of the cathode ray beam.

For producing the desired potentials which must be applied to the cathode ray tube, the power is applied to the terminals 30 which are connected to the primary winding 32 of the power transformer 34 by way of the control switch 36. The power applied by the terminals 30 is normally derived from the 60 cycle, 110 volt commercial supply system. The transformer 34 has two secondary windings 38 and 40, the former being for the purpose of supplying the heating current to the cathode 42 of the half-wave rectifier tube 44. The other secondary winding 40 which supplies high voltage is connected between ground and the anode 46 of the rectifier tube. When the rectifier tube is energized, pulsating direct current may be derived between cathode 42 and the grounded end of the winding 40, with the cathode positive in polarity with respect to ground.

In order to produce substantially uni-directional current from the pulsating current a filter circuit is provided which includes condensers 48 and a resistance 50. Due to the electrostatic capacity of the condensers 48 and the impedance of the resistance 50, the potential available at the output of the filter is substantially constant. It is possible to use a resistance 50 in place of a conventional inductance choke inasmuch as the power required to operate the television receiving tube is relatively low, the current demand being of the order of a few milliamperes.

Connected between the output of the filter supply and ground is a high resistance 52 which is not entirely necessary in the circuit but when included assists in improving the regulation of the rectifier. The output terminal of the filter supply is highly positive with respect to ground and this terminal is connected directly to the second accelerating anode 20. In order to have available the necessary positive potentials of lower intensity a potentiometer is connected across the high voltage supply which includes the high resistance 54 and adjustable potentiometer resistance 56, a resistance 58, a further resistance 60, and a beam intensity control potentiometer 62. The position of the adjustable contact along the potentiometer 56 determines the potential applied to the first accelerating anode and an adjustment of this potentiometer makes possible an adjustment of the focus of the cathode ray beam. The screen grid electrode is connected to the junction of resistances 58 and 60, the values of which are so chosen in proportion to the other resistance members and potentimeters to produce the desired potential for the screen grid electrode for normal operation of the cathode ray tube. The cathode of the cathode ray tube is connected to the adjustable terminal of the potentimeter 62 in order to afford a manual control means for varying the average intensity of the cathode ray beam in order to control the background level of the received television picture in a manner well known to those skilled in the art.

The drawing also shows a television receiver 64 which includes means for receiving both the television picture and sound signals and for developing therefrom audio signals which are applied to the speaker 66 and the detected picture signals which are applied between the control electrode 28 and cathode 12 over conductors 68.

The television receiver 64 also includes deflection generators which respond to received synchronizing signals and which generate voltage variations necessary to produce the required rate of change of electromagnetic flux at the deflection yoke (including coils 24 and 26) for deflecting the cathode ray beam in mutually perpendicular directions. The deflecting coils 24 and 26 are therefore connected to the television receiver 64 by way of conductors 70 and 72 respectively.

The television receiver shown schematically at 64 also includes a power supply unit which is necessary to supply the required operating potentials to the tubes included in the receiver. The power input of the receiver for the power supply contained therein is therefore shown as connected in parallel with the primary 32 of transformer 34 in order that the single control switch 36 may control the operation of the television receiver as well as the application of the potentials to the power supply unit for the television receiving tube.

With the system as so far described, when the power supply switch 36 is closed it is possible for the television receiving tube 10 to begin operation before the television receiver 64 has begun to operate and as a consequence the cathode ray beam produced in the television receiving tube would be directed against the target surface 22 with considerable intensity and velocity before the deflecting coils 24 and 26 would be energized to produce a deflection of the beam. Such an undesirable operation could be prevented as described above by manipulation of the beam intensity control potentiometer 62 so as to increase the bias on the cathode ray tube to a point where no beam would be generated but, as stated above, the purpose of the present invention is to avoid the necessity of such a manipulation and to avoid the possibility of permanently damaging the target screen in the absence of such a manipulation.

Before a cathode ray beam can be generated in a receiving tube, it is necessary that all of the electrodes of the gun structure have applied

thereto approximately the correct operating potentials. If, for example, the potential of the first accelerating electrode 18 has applied thereto a potential considerably lower than that necessary for proper operation of the tube no cathode ray beam will be produced. In accordance with this invention, therefore, there is provided a means whereby proper operating potentials are not applied to all of the electrodes of the cathode ray tube until after sufficient time has elapsed to permit the receiver 64 to assume its normal operating temperature conditions and potentials. In order to prevent the application of the correct potentials to the electrodes of the cathode ray tube for a brief period of time immediately following a closure of the power supply switch 36 a condenser 75 is provided. This condenser is connected between ground or the negative source of high potential and a point along the potentiometer or voltage divider which is connected between the cathode 42 of the rectifier tube 44 and ground. As shown in the drawing this condenser 75 is preferably connected between ground and the junction of resistance 54 and potentiometer 56 so that the screen grid electrode 16 and the first accelerating electrode 18 are not supplied with their proper operating potentials until after the lapse of a predetermined length of time.

The delay in the application of the proper operating potentials to the electrodes 16 and 18 of the cathode ray tube is a result of the time necessary for the condenser 75 to be charged through resistance 54 to a potential corresponding to the static potential of the junction point between resistance 54 and potentiometer 56. When the television receiving set is in an inoperative condition (switch 36 open) the condenser 75 will have no charge thereon since any previous existing charge will be dissipated through resistances 54 and 52 in series as well as through potentiometer 56, resistances 58 and 60 and potentiometer 62. Since the combined resistances of the last named elements is less than the sum of the resistances of elements 54 and 52, any charge which may exist on condenser 75 will be removed relatively rapidly through elements 56, 58, 60 and 62.

When the receiver is initially turned on by a closure of switch 36 a certain rather brief time delay is necessary to permit electrons to flow through the rectifier tube. After the expiration of this time, however, the rectifier tube will operate and a positive potential will appear at the output end of the filter resistance 50. Since the condenser 75 is relatively large and inasmuch as the resistance 54 is quite high, the junction of the resistance 54 and the potentiometer 56 will be at substantially ground potential and the potential of this point will increase in a positive direction at a relatively slow rate. During this time no cathode ray beam can be produced in the television receiving tube since the condenser 75 prevents normal application of proper operating potentials to the electrodes 16 and 18. After the elapse of a predetermined time interval, as determined by the size of the resistance 54 and the capacity of the condenser 75, a cathode ray beam will be produced but by this time the television receiver 64 will have reached proper operating condition and deflection energy will be present in the deflecting coils 24 and 26. Accordingly, through the use of condenser 75 it is possible to turn on the television receiving set without the necessity of first adjusting the background control potentiometer 62 and without any possibility of the production of a cathode ray beam in the receiving beam prior to normal operation of the television receiver 64.

Since the amount of current required to operate the television receiving tube 10 is relatively low, the aggregate resistance of the voltage divider connected across the high voltage power supply may be quite high. The total resistance included in the voltage divider is normally chosen such that the current flow therethrough will be of the order of one or two milliamperes. Furthermore, since the voltage applied to the first accelerating anode 18 is of the order of one-third to one-sixth of the potential applied to the second accelerating anode 20, the value of the resistance 54 is quite high and materially in excess of the combined resistance of the remaining elements of the voltage divider. In view of the fact that a very high resistance is included between the ungrounded plate of the condenser 75 and the positive terminal of the power supply, the charging rate of the condenser 75 is relatively slow and the size of the condenser 75 need not be particularly large and may well be of a value which can be conveniently and economically included in a television receiver. As stated above, the size of the condenser 75 determines the time which must expire before proper operating potentials are applied to the electrodes of the cathode ray tube and accordingly the condenser 75 is chosen in accordance with the length of time that it is desired to prevent production of the cathode ray beam. This time interval should, of course, considerably exceed the length of time required for the television receiver 64 to begin full operation.

From the above, it may be seen, therefore, that a new and improved power supply for a television receiver has been developed wherein any possibility of permanently damaging the target electrode in a television receiving tube by reason of a delay in the operation of the television receiver has been substantially entirely eliminated. Furthermore, it may be seen that through the exercise of the present invention, such a safeguard can be very conveniently and economically included in a television receiver.

It should be understood that the present invention is applicable to either a direct viewing tube or to a projection tube and although a tube of the direct viewing type is shown in the drawing, it is very desirable to apply the described invention to projection tubes since the beam velocities of such tubes and the intensity of the cathode ray beam are relatively high and consequently the target screen could be permanently ruined in a very short space of time.

Various alterations and modifications of the present invention may become apparent to those skilled in the art and it is desirable that any and all such modifications and alterations be considered within the perview of the present invention except as limited by the hereinafter appended claim.

We claim:

A power supply for a television receiver including a rectifier and a filter network for supplying a source of direct current potential, a voltage divider connected across said source of potential including a plurality of resistor elements, a cathode ray tube including a cathode, a first accelerating anode and a second accelerating anode, means for connecting said second accelerating anode to the positive potential end of

the voltage divider, means for connecting the first accelerating anode to one of the resistor elements of the voltage divider means for connecting the cathode to the voltage divider near the negative end thereof, and a condenser directly connected between the negative end of the voltage divider and a point along the voltage divider near where the first accelerating anode is connected whereby when a source of potential is applied to the voltage divider from the rectifier the potential applied to the first accelerating anode will gradually increase in a positive direction at a rate determined by the size of the condenser and the resistance of the voltage divider through which it is charged.

DUDLEY E. FOSTER.
JOHN A. RANKIN.