

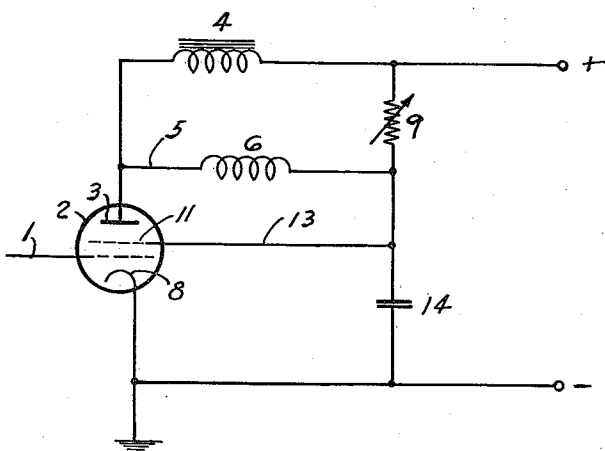
Oct. 1, 1940.

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2,216,273

CENTERING CIRCUIT FOR CATHODE RAY TUBES

Filed April 10, 1939



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UNITED STATES PATENT OFFICE

2,216,273

CENTERING CIRCUIT FOR CATHODE RAY
TUBES

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Application April 10, 1939, Serial No. 267,118
In Germany April 9, 1938

3 Claims. (Cl. 250—27)

(Granted under the provisions of sec. 14, act of
March 2, 1927; 357 O. G. 5)

This invention relates to circuits for magnetic deflection of cathode ray beams and particularly to a centering arrangement for cathode ray beams. It is known in the art to deflect cathode ray beams by means of deflecting coils through which a sawtooth current is caused to flow and through which an additional direct current is also caused to flow in order to adjust the center position about which the cathode ray beam is deflected. For this purpose a circuit is known comprising an electron discharge tube, to the control grid of which sawtooth-shaped voltages and impulses were applied. This tube was arranged in a bridge circuit in such a manner that the discharge gap between plate and cathode constituted one branch. The plate is connected to one end of a choke, the other end of which is connected to a variable resistance, the other end of which is connected to a fixed resistance, the free end of which is connected to the cathode of the tube. The scanning coil is connected between the plate and the junction point between the variable and the fixed resistance. The positive terminal of the power supply is connected to the junction point of the choke and the variable resistance, while the negative polarity is connected to the cathode of the tube. It may be seen that the D. C. current flowing through the deflecting coil can be altered by varying the value of the variable resistance. It may also be seen that the resistance combination across the power supply constitutes an additional load and that any variation in the average plate current of the tube will alter the amount of direct current flowing through the deflecting coil.

It is the object of my invention to overcome the aforesaid disadvantages, to provide a centering circuit in which the adjusted center position is not affected by the change in the average D. C. plate current, and to provide a centering circuit in which the adjusted center position is not affected by any change in amplitude of the sawtooth current wave. Other objects and features of my invention may become evident from the following description.

My invention provides for using a bridge circuit in which discharge gaps within the same electron discharge tube are connected in two branches of the bridge circuit so that any fluctuations in the operating conditions of the tube will not affect the D. C. centering current. I prefer to connect the plate cathode discharge gap in one branch of a bridge circuit and the discharge gap between the cathode and another electrode, preferably the screen grid, in another branch of the bridge. In

a preferred embodiment the plate cathode discharge gap constitutes one branch of the bridge. A choke is connected to the plate, the free end of which is connected to a variable resistance, the free end of the latter being connected with the screen grid of the same electron discharge tube. The deflecting coil is connected across one diagonal of the bridge, viz., between plate and screen grid of the tube. The power supply is connected across the other diagonal of the bridge so that the positive terminal is connected with the junction point of the choke and the variable resistance, while the negative terminal is connected to the cathode. It may be evident that by altering the value of the variable resistance the amount of direct current flowing through the deflecting coil can be varied. It is evident, of course, that the choke and the deflecting coil possess an inherent D. C. resistance.

The drawing shows a schematic circuit diagram of an embodiment of my invention. 2 indicates a vacuum tube possessing a cathode 8, a control grid 1, a screen grid 11 and a plate 3. 4 is a choke connected between plate 3 and the positive terminal of the power supply. Lead 5 connects deflecting coil 6 to plate 3. The other end of deflecting coil 6 is connected through variable resistor 9 to the positive terminal of the power supply. Screen grid 11 is connected through lead 13 with resistance 9 and through condenser 14 to the negative terminal of the power supply to which cathode 8 is also connected. Condenser 14 serves as a filter condenser for the screen grid voltage as well as a return path for the alternating current flowing through deflecting coil 6. A sawtooth voltage and impulses are applied to control grid 1, which cause a sawtooth current to flow through deflecting coil 6. As far as direct current is concerned, a bridge circuit is formed consisting of the cathode anode gap of tube 2, as well as the cathode screen grid gap of tube 2, choke 4 and variable resistance 9. It is, therefore, evident that variation of the direct current flowing through the deflecting coil 6 can be altered by variation of variable resistance 9, whereby the center position of the cathode ray beam is shifted.

By suitable choice of the tube used in this circuit and its operating characteristics, it can be achieved that irregularities of the above-mentioned nature vary the resistance in the two branches of the bridge, not only in the same sense but also by substantially the same amount within a predetermined range of operation, so that the D. C. current flowing through the deflecting coil remains substantially constant. Instead of using

a deflecting coil 6, as shown in the drawing and as described, several deflecting means interconnected in a suitable manner can be used, such as two coils positioned opposite each other or a resistance, or the voltage fluctuations across which are then applied to deflecting plates after amplification, if necessary.

It may be preferable to connect a diode in series with an ohmic resistance in parallel to the deflecting coil for increasing the linearity of the sawtooth wave. In this case an additional centering current will be produced which flows through the deflecting coil in the same direction as the screen grid current. A portion of the plate current of tube 2 will flow through the deflecting coil in the opposite direction. Thus, the current flowing through the deflecting coil is the algebraic sum of these currents and by suitably choosing resistance 9, the magnitude of which determines the portion of the plate current, the direction of the resulting direct current which determines the centering effect can be adjusted.

What I claim is:

1. A centering arrangement for an electromagnetic deflecting system, comprising a bridge circuit having a deflecting coil connected in one diagonal of said bridge, an electron discharge tube including a cathode and a plurality of other electrodes, two of said other electrodes being connected to opposite ends of said deflecting coil, a series circuit including two impedance elements and connected at its opposite ends to the opposite ends of said deflecting coil, a source of direct

current connected between said cathode and the junction point of said impedance elements, and means for adjusting one of said impedance elements to control the flow of direct current through said deflecting coil.

2. In combination, an electron discharge tube having an anode, a cathode, a control grid and a screen grid, a deflecting coil connected between said anode and said screen grid, a source of direct current power, a choke connected between said anode and the positive terminal of said power source, a variable resistance connected between said screen grid and said positive terminal, a capacity connected between said screen grid and said cathode and a conductive connection between said cathode and the negative terminal of said power source.

3. A centering arrangement for an electromagnetic deflecting system, comprising a bridge circuit having a deflecting coil connected in one diagonal of said bridge, an electron discharge tube including a cathode and a plurality of other electrodes, two of said other electrodes being connected to opposite ends of said deflecting coil, a series circuit including a choke and a resistor, and connected at its opposite ends to opposite ends of said deflecting coil, a source of direct current connected between said cathode and the junction point of said choke and said resistor, and means for adjusting said resistor to control the flow of direct current through said deflecting coil.

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