May 21, 1946. W. A. TOLSON ET AL 2,400,791

CATHODE RAY TUBE SYSTEM

Filed Dec. 31, 1941

FIG. 1.

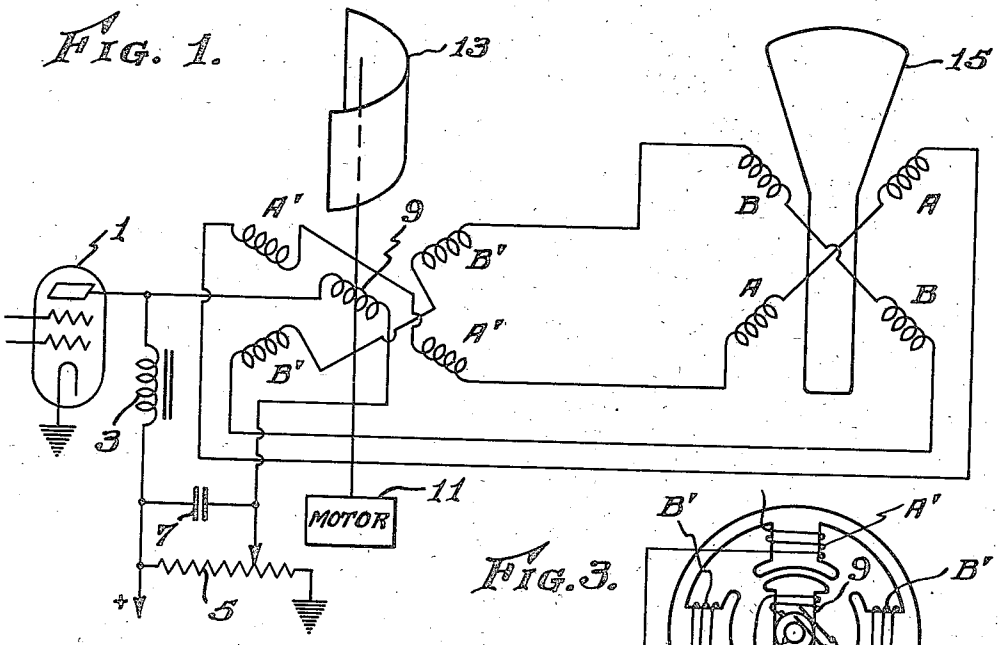


FIG. 3.

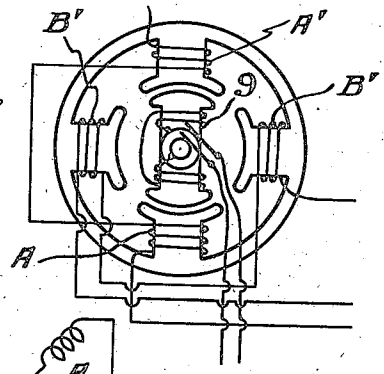
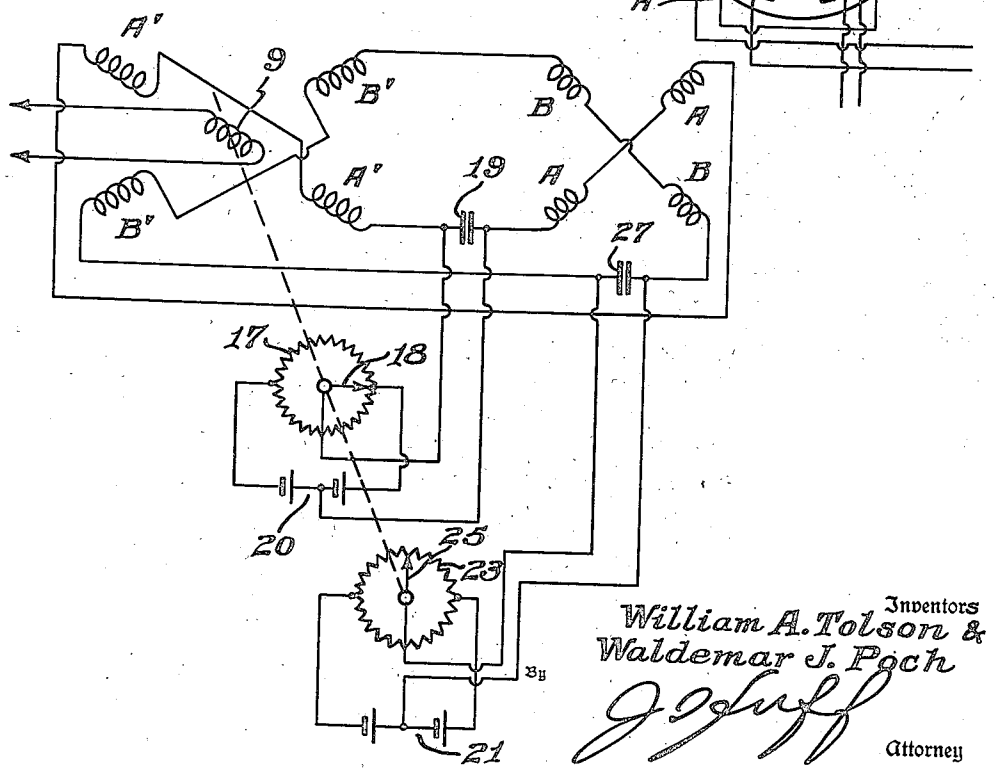


FIG. 2.



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CATHODE-RAY TUBE SYSTEM

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7 Claims. (Cl. 315—27)

This invention relates to cathode ray tube and more particularly to a method and means for deflecting the cathode ray beam.

In cathode ray tube systems it has been desirable to rotate the plane of deflection around the axis of the tube. In certain applications of a cathode ray tube as an indicator for direction and range finding devices it has been desirable to produce such rotation in synchronism with the rotation of an antenna. This is usually accomplished by mechanically rotating the deflection coils about the axis of the tube. Mechanically rotating the deflection coils about the tube may only be accomplished by complicated and bulky equipment and when it is desired to rotate the plane of deflection around the axis of the tube at a high rate, the mechanical method of rotating the deflection coils becomes very impractical.

According to this invention, a set of beam deflecting coils are fixed about the axis of the cathode ray beam tube. These deflecting coils are connected to coils having a similar angular displacement between which there is rotated an auxiliary coil at the speed at which the beam is to be rotated around the axis of the tube, and the deflecting current is impressed through this auxiliary coil. In another form of this invention, there is provided in connection with the rotating auxiliary coil a potentiometer means for feeding into the coil a direct current whereby the A.-C. axis of the deflecting potential may be shifted along a radius perpendicular to the axis of the tube even though the plane of deflection is being rotated very slowly.

The primary object of this invention is to provide an improved method and means for deflecting a cathode ray beam.

Another object of this invention is to provide an improved method and means for rotating the plane of deflection around the axis of a cathode ray beam tube without mechanically rotating the deflecting coils of the tube.

Still another object of this invention is to provide an improved method and means for rotating the plane of deflection around the axis of the cathode ray tube at a slow rate.

Other and incidental objects of the invention will be apparent to those skilled in the art from the following specification considered in connection with the accompanying drawing in which

Figure 1 is a circuit diagram showing one form of this invention,

Figure 2 is a circuit diagram showing another form of this invention, and

Figure 3 is a schematic diagram of one form of this invention for producing the rotating field necessary in carrying out certain forms of this invention.

In the several figures, like parts are indicated by the same reference characters.

Figure 1 shows one form of the invention in which a vacuum tube 1 supplies saw-tooth current to a rotatable coil 9. The plate of tube 1 is supplied with an operating voltage through a choke coil 3. The flow of saw-tooth current through the coil 9 is produced by the application of a saw-tooth voltage to the control grid of tube 1.

In order to cause the cathode ray of the tube indicated at 15 to be deflected from the center of the fluorescent screen (not shown) at the end of the tube, one end of the coil 9 is connected through a variable tap to a point on a voltage divider resistor 5. A suitable bypass condenser 7 is provided. It will be evident that by adjusting the position of the variable tap the amount of direct current flowing through the coil 9 may be adjusted to make the cathode ray deflect from the center of the tube 15 outward. The coil 9 is disposed in the plane of two sets of coils A' and B'. A motor 11 is adapted to rotate coil 9 in the plane of coils A' and B'. A small directional antenna system 13 is also driven by the motor 11 at the same rate as the coil 9.

The cathode ray tube 15 is provided with horizontal deflection coils A and vertical deflection coils B which are connected respectively to coils A' and B'.

If a saw-tooth wave of current is passed through coil 9 from the tube 1, a straight line of deflection will be produced on the cathode ray tube screen. This straight line deflection will rotate about the axis of the cathode ray tube in accordance with the relative position of the coil 9 with respect to the coils A' and B'. This results from the coils A' and B' picking up a voltage by induction from the coil 9 in any of its positions. If the coil 9 is in line with the coils A' there will only be a voltage induced in the coils A' and there will be no voltage produced in the coils B' because the axis of the coils B' will be perpendicular to the magnetic field produced by the current in the coil 9.

If the coil 9 is rotated at a rate sufficiently great a D.-C. component of current in the coil 9 will produce a component of current in the coils A' and B' which will shift the axis of deflection off center with respect to the axis of the cathode ray tube and will cause the deflecting pattern to rotate about the center of the cathode ray tube.

In some cases the rotational velocity will be very low, such for example requiring several seconds for a complete revolution. In this case it will not be practical to shift the axis of the deflection sufficiently by means of a direct current component of current through the coil 9.

Figure 2 shows a method and means whereby the direct current component in the deflecting coils may be secured by means of potentiometers 17 and 23 whose variable taps are mounted on the shaft which rotates the coil 9. A battery 20 or other suitable source of potential is connected across the terminals of the potentiometer 17. The rotatable variable tap 18 of the potentiometer 17 is connected to one side of a condenser 19 connected in series with the coils A and A'. The other side of the condenser 19 is connected to the center tap of the battery 20.

Likewise a battery 21 is connected across a potentiometer 23 whose variable tap 25 is also connected to the shaft driving the coil 9. Variable tap 25 is connected to one side of a condenser 27 which is in turn connected in series with the coils B and B'.

In the operation of the form of this invention shown in Fig. 2, if the speed of rotation of the coil 9 drops below that speed which is required to induce a voltage in the coils A' and B' by induction from the direct current flowing through the coil 9, the potential across the condensers 19 and 27 results from the rotation of the variable taps 18 and 25 of the potentiometers 17 and 23, respectively. The resulting current through the deflecting coils A and B will cause the required deflection of the cathode ray beam from the center of the screen outwardly.

Figure 3 shows, merely by way of example, one possible arrangement of the coils 9, A' and B'. Here the coils A' and B' are wound on magnetic pole pieces, while the coil 9 is wound on a rotatable armature and provided with slip rings and brushes.

We claim as our invention:

1. A cathode ray deflecting system comprising two deflecting means which are angularly displaced with respect to each other and which are mounted upon a cathode ray tube, a pair of windings which are similarly angularly displaced with respect to each other and which are connected to said two deflecting means, respectively, an auxiliary coil which is positioned in the plane of said windings for relative rotation with respect thereto, and means for supplying a deflecting current to said auxiliary coil during said relative rotation whereby a rotating radial deflection of the cathode ray is produced.

2. The invention according to claim 1 wherein means is provided for supplying a direct current component to said auxiliary coil and for so adjusting its value that the cathode ray deflection lies substantially only between the center or axis of the tube and its circumference.

3. The invention according to claim 1 wherein the connections between said deflecting means and said windings each include a condenser and wherein potentiometer means rotatable with said auxiliary coil is provided for supplying direct current components thereto such that the cathode ray deflection lies substantially only between the center or axis of said tube and its circumference.

4. A cathode ray deflecting system comprising at least two pairs of deflecting coils mounted in fixed relation to a cathode ray tube and having a certain angular relation with respect to each other, at least two other pairs of coils connected, respectively, to said first pairs of coils and having the same augular relation to each other as said first pairs of coils, an auxiliary coil positioned in the plane of said other coils and mounted for relative rotation with respect thereto, and means for supplying a deflecting current to said auxiliary coil.

5. The invention according to claim 4 wherein said first pairs of coils are positioned at right angles to each other.

6. The invention according to claim 4 wherein means is provided for supplying a direct current component to said auxiliary coil and for so adjusting its value that the cathode ray deflection lies substantially only between the center or axis of the tube and its circumference.

7. The invention according to claim 4 wherein each of the connections between said first two pairs of coils and said second two pairs of coils includes a condenser and wherein potentiometer means rotatable with said auxiliary coil is provided for applying direct current of such value across each of said condensers that the cathode ray deflection lies substantially only between the center or axis of said tube and circumference.

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Disclaimer

2,400,791.—*William A. Tolson*, Westmont, and *Waldemar J. Poch*, Moorestown, N. J. CATHODE-RAY TUBE SYSTEM. Patent dated May 21, 1946. Disclaimer filed Oct. 25, 1950, by the assignee, *Radio Corporation of America*.

Hereby enters this disclaimer to claim 1 of said patent.

[*Official Gazette November 21, 1950.*]