May 21, 1946. J. M. DODDS ET AL 2,400,814

CATHODE RAY TUBE

Filed Sept. 21, 1943

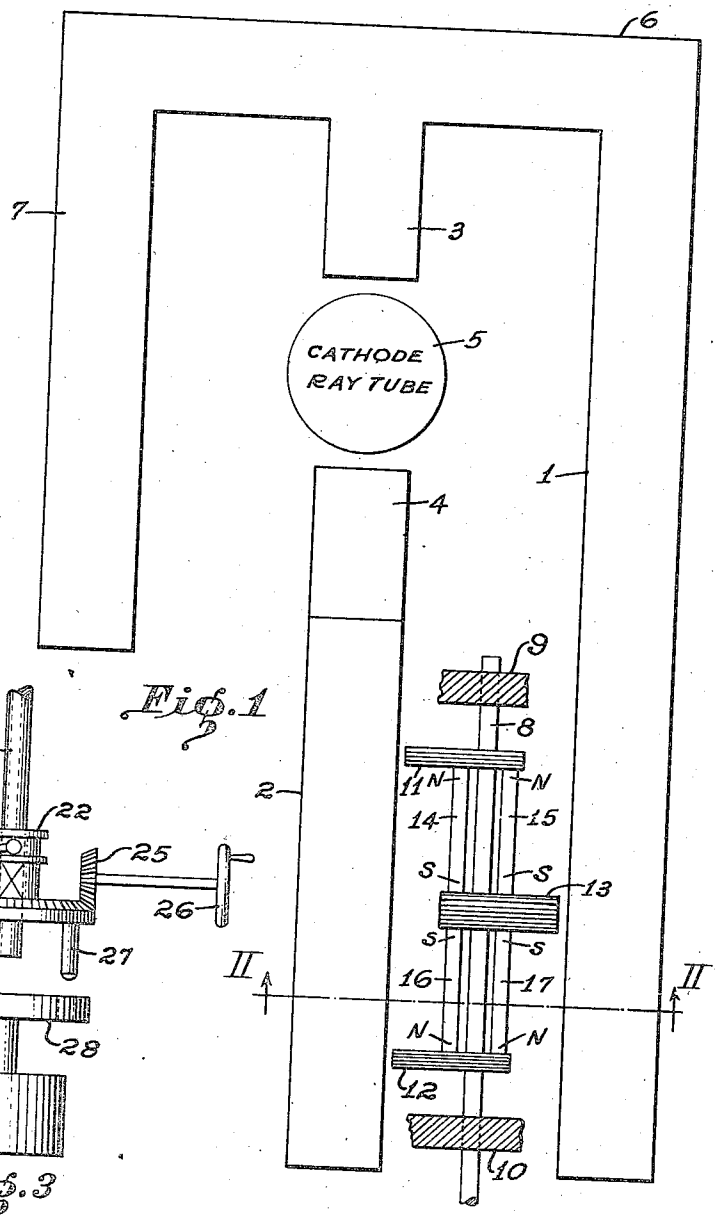

Fig. 1

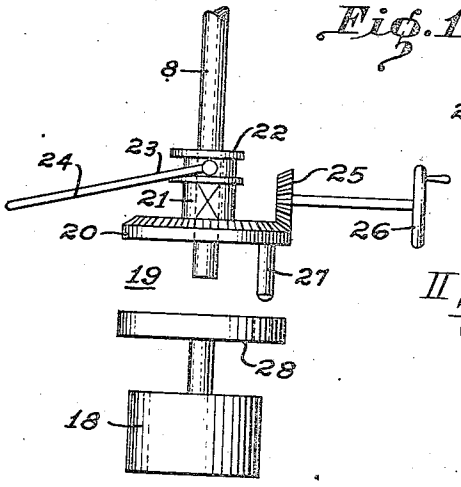

Fig. 3

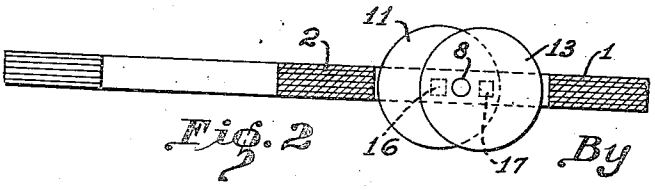

Fig. 2

Inventors:
JOHN MATHIESON DODDS
& CHARLES WALTER MILLER

By Morris & Bottum
Attorneys

Patented May 21, 1946

2,400,814

UNITED STATES PATENT OFFICE

2,400,814

CATHODE RAY TUBE

John Mathieson Dodds, Timperley, and Charles Walter Miller, Sale, England, assignors to Metropolitan-Vickers Electrical Company Limited, London, England, a company of Great Britain

Application September 21, 1943, Serial No. 503,276
In Great Britain August 8, 1941

3 Claims. (Cl. 250—156)

This invention relates to magnetic apparatus for providing time bases for cathode ray tubes.

According to the invention this apparatus comprises two or more magnetic arms preferably of soft iron which at one end at least have low reluctance poles adjacent the neck of the cathode ray tube for directly magnetically deflecting the beam, means for magnetising said poles through said arms, and rotating or oscillating or vibrating magnetic means associated with the arms, remote from the poles, for varying the magnetic flux therein according to a desired law, the latter means conveniently comprising a permanent magnet system disposed between the arms, one or more of which may have a dummy extension for balancing out magnetic leakage between the arms near the cathode ray tube. Preferably a rotatable magnet is used which is substantially astatic and is conveniently formed of three similarly shaped parallel laminated soft iron members such as eccentric discs spaced apart by two or two pairs of axially disposed permanent bar magnets or electromagnets with like poles against the middle laminated disc which extends on the opposite side of the axis to the other two laminated discs. With this form a substantially straight line law time base can be achieved. Alternatively, the permanent magnet or electromagnet may itself be stationary and located with small clearance from the "rotating" members. Or the permanent or bar magnet or magnets may be fixed elsewhere in the magnetic circuit. By the addition of energised coils on convenient parts of the soft iron magnetic circuit and by variously energising such coils, numerous forms of time base can be produced, such as radial, looped or spiral forms. There may be provided more than one means for varying the magnetic reluctance of the arms.

The rotating magnetic means in any form may be driven by clockwork or by an electric motor through reduction gear such as at a speed comparable with the frequency of persistence of vision so that the time base appears as a permanent line on the screen of the cathode ray tube.

The time base apparatus above set forth may be conveniently used in a "panoramic" radio receiver such as described in "Electronics" June 1940, and wherein the scanning of a specified waveband is effected by rotation of a set of tuning condensers such as by the same electric motor which rotates the magnetic reluctance varying means, and in this case, if hand scanning is also required to be permitted a clutch may be interposed between the motor and the shaft of said means and the condensers, and preferably this clutch may be linked with the switch for the motor supply, so as to be automatically declutched when the switch is moved to the open position.

Thus, the invention is in general notably applicable for the deflection of a cathode ray beam either recurrently or to a controllable position, at will, and wherein the displacement of the beam in one direction or axis indicates a relation or a plurality of relations simultaneously, between phenomena causing displacement of the beam in a direction at right angles, such relation being either continuously observable by automatic recurrent control or examinable in detail by manual control. The invention, according to this aspect thereof, includes within its scope the modification of the magnetic deflecting means above set forth according to the invention, wherein the pole pieces adjacent the neck of the cathode ray tube are replaced by the usual deflecting coils, but energised by transformer action from windings on the magnetic arms aforesaid. It will be appreciated that if the screen end of the cathode ray tube has a graduated scale, the arrangement conveniently provides a tuning indicator and frequency meter such as for a panoramic receiver or for examining impedance-frequency characteristics of radio receivers or of any tuned circuits. The invention is especially, but not exclusively, of use in the "single span" type of radio receiver forming the subject of U. S. application Serial No. 514,478, filed December 16, 1943, and then may be applied to the second of the frequency changers.

Provision may be made for extinguishing or trapping the cathode ray beam during its return sweep, and for reducing the brilliance of the spot during manual scanning, in accordance with U. S. application Serial No. 503,282, filed September 21, 1943.

Where the reluctance varying means is oscillatory or vibratory it may be for example the armature of an electric "buzzer" or the like, or be driven by such a device.

In the accompanying drawing:

Figure 1 is a somewhat diagrammatic elevation showing by way of example a magnetic system according to the invention for providing the time base for a cathode ray tube,

Figure 2 is an underneath section of the arrangement shown in Figure 1, and

Figure 3 is a diagrammatic view of a clutch device whereby the automatic operation may be changed to manual operation, as hereinbefore set forth.

Referring first to Figures 1 and 2 of the accompanying drawing, at 1 and 2 respectively are shown the essentially laminated magnetic arms having the respective pole pieces 3 and 4 spaced apart on each side of the neck 5 of the cathode ray tube. The arm 1 has, as shown, the right-angle portion 6 and the depending portion 7, the latter constituting the dummy extension for the purposes hereinbefore stated. The members 1, 2 with the pole pieces 3, 4 provide the magnetic circuit and associated with these members are means adapted to cause a variable reversing flux to traverse the neck 5 of the cathode ray tube to produce a predetermined deflection movement of the cathode ray beam.

According to the simple arrangement illustrated, the means for thus variably and reversibly magnetising the pole pieces 3 and 4 through the arms 1 and 2 respectively comprises a permanent magnet system with laminated poles mounted on a rotating shaft 8 carried in bearings in fixed members 9 and 10. Fixed to the shaft 8 are three soft iron laminated pole members of disc form, namely the upper and lower members 11 and 12 which are eccentrically disposed in similar position and the intermediate member 13 of similar shape but twice the axial thickness of the member 11 or 12 and oppositely eccentrically disposed on the shaft 8 with respect to the members 11 and 12, as will be clearly seen from Figure 2. The shaft 8 is of non-magnetic material. The laminated pole pieces 11, 12 and 13 are spaced apart as shown by at least four permanent bar magnets, namely 14 and 15 between the pole pieces 11 and 13, and magnets 16 and 17 between the pole pieces 12 and 13. The magnets are arranged so as to have like polarity adjacent the pole pieces 11 and 12 and like but opposite polarity adjacent the pole piece 13, as indicated by N, S.

The shaft 8 may be rotated by any suitable means normally continuously, for example by a clockwork or electric motor 18 (Fig. 3) such as through the manually controllable clutch device 19.

It will be appreciated that when the members 11, 12 and 13 are of disc shape as shown more especially in Fig. 2, the resultant deflection of the cathode ray beam can be made to correspond with the rotation of the shaft 8, thus producing a "pyramid" wave form, giving a straight line time base.

The rotating magnet system 11 to 17 is substantially "astatic," but it will be appreciated that one set such as 12, 16 and 17 may be omitted, with the member 13 made the same axial thickness as the member 11.

It is repeated that the numerous modifications mentioned in the preamble hereof may be made within the scope of the appended claims.

Referring now more particularly to Fig. 3 of the drawing, it may be assumed that the lower end of the shaft 8 is of square section, and sliding upon it is a bevel wheel 20 fixed to the sleeve 21 having a grooved collar 22 which is movable up and down by a lever 23 which it may be assumed is pivoted at 24 and operable manually to cause the bevel wheel 20 either to engage with the bevel pinion 25 rotatable by the manual member 26 or to cause a depending peg 27 or other dog clutch member to engage with a counterpart clutch member 28 fixed to the shaft of the motor 18.

We claim:

1. Magnetic deflection apparatus for providing time bases for cathode ray tubes, comprising arms constituting part of a magnetic circuit and normally in fixed relationship with the tube, low reluctance poles carried by said arms adjacent the neck of the cathode ray tube and adapted directly and magnetically to deflect the beam, and a rotatable magnetic device located remotely from the tube in the flux path through said arms and in such a position that when rotated at constant speed the flux in said circuit, and hence the deflection of the beam, may be varied according to a predetermined law.

2. Magnetic deflection apparatus for providing time bases for cathode ray tubes, comprising at least two magnetic arms which at one end have low reluctance poles adjacent the neck of the tube adapted directly and magnetically to deflect the beam, means for magnetizing said poles through said arms, and a rotatable permanent magnet system rotatably mounted within said arms and adapted when rotated to vary the magnetic flux in said poles and hence the deflection of the beam according to a predetermined law.

3. Apparatus as defined in claim 2, wherein said permanent magnet system comprises substantially astatically arranged permanent magnets.

JOHN MATHIESON DODDS.
CHARLES WALTER MILLER.