Feb. 6, 1934. H. W. PARKER 1,945,980

CATHODE RAY TUBE

Filed July 26, 1932

Fig. 1

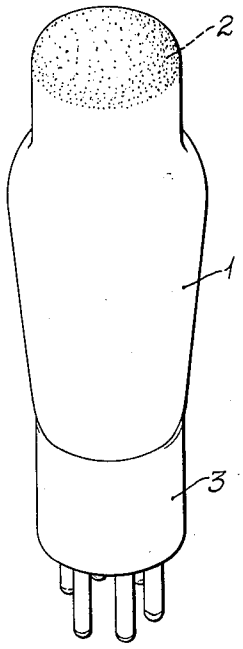


Fig. 2

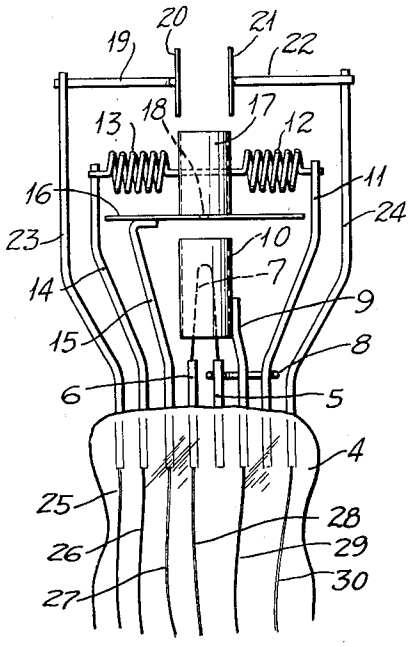
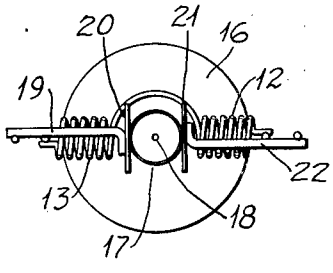


Fig. 3



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1,945,980

CATHODE RAY TUBE

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4 Claims. (Cl. 250—27.5)

My invention relates to cathode ray tubes and pertains in particular to that class of such tubes which are commonly known as cathode ray oscillographs.

An object of my invention comprises producing a simplified cathode ray oscillograph.

Another object comprises producing a cathode ray oscillograph in which full effectiveness in both coordinates is obtained with extremely simple design.

A further object contemplated by my invention comprises producing a cathode ray tube of such design that operative electrical contact may be made to the elements thereof through the use of a standard thermionic tube base and socket.

A still further object comprises producing a simplified cathode ray oscillograph which may be utilized with full effect in both coordinates while employing for electrical contact with the elements thereof a standard thermionic tube base and socket.

I accomplish all of the above noted desirable features and others which will hereinafter be pointed out and discussed by a novel construction whereby the terminals required for fully effective operation of the tube in two coordinates are reduced to six in order that an ordinary thermionic tube base and socket may be utilized for making contact with the electrodes of the tube.

I accomplish this simplification by employing an inductance for deflecting the ray in one coordinate and eliminate one terminal of the tube through connecting the inductance in series with the cathode.

Cathode ray tubes as hitherto known for effective operation in both the horizontal and vertical coordinates require at least seven terminals or leads and therefore require a non-standard base and socket. In my simplified construction I provide a tube which may be utilized with full effectiveness in both horizontal and vertical coordinates and requires only six terminals permitting the use of a standard thermionic tube base and socket in making connections with the electrodes of the tube. Standard thermionic tube bases and sockets are manufactured in great quantity and their use effects considerable saving over the use of non-standard bases and sockets.

My improved tube may be used for any of the present uses in which tubes of this class are employed but in addition, due to its simplified and cheapened construction, it is especially adapted for use in connection with radio or wired radio equipment utilizing alternating current as the source of energy therefor.

In the drawing accompanying and forming a part of this specification:

Fig. 1 is a substantially full size perspective elevation of my improved tube with the stem and electrodes omitted;

Fig. 2 is an enlarged perspective elevation of the stem of my improved tube showing the electrodes in place and their relative positions to each other; and

Fig. 3 is a plan view of the top of the electrode assembly shown in Fig. 2.

Referring now particularly to Fig. 1 which shows the exterior appearance of one embodiment of my improved cathode ray tube, I prefer to employ a glass envelope 1, the upper extremity of which is constricted and provided on the inner concave surface thereof with a coating 2 of material which becomes fluorescent upon bombardment by electrons such as zinc sulphide. I provide the envelope 1 with a standard six-prong thermionic tube base 3 as shown.

Fig. 1 illustrates a substantially full sized view of the external appearance of a preferred embodiment of my cathode ray tube which is especially adapted for use in connection with radio or wired radio receivers as the constricted upper extremity bearing the fluorescent material on the inner surface thereof may, to facilitate observation, extend through the cabinet housing the radio or wired radio equipment.

Referring now particularly to Figs. 2 and 3, the stem and press 4 carried within the tube envelope 1 supports by means of standards 5 and 6 preferably a filamentary cathode 7. Surrounding the cathode 7 there is provided a focussing cylinder 10 which is supported in the press 4 by means of the standard 9 and is provided with a terminal 29 for connection with one of the prongs on the base 3. A standard 15 supports an anode in the form of a circular shield plate 16 provided with a central aperture 18 which is maintained in alignment with the axis of the focussing cylinder 10. United with the shield plate of the anode 16 there is provided a cylinder 17 the axis of which is aligned with the aperture 18.

There is provided a solenoid or inductance, preferably constructed in two portions, 12 and 13, as shown, supported with the axis thereof at right angles to the axis of the tubular portion 17 of anode plate 16 and supported in the press 4 by standards 11 and 14. Standard 11 is connected by means of a conducting strap 8 with standard 5 supporting cathode 7 and connections

for the inductances 12 and 13 and anode 7 are provided by means of the terminals 26, which is connected to standard 14, and 28, which is connected to standard 6 supporting the cathode 7. Terminals 26 and 28 are respectively connected to the proper prongs in base 3.

It will be observed that the inductances 12 and 13 are serially connected with the filament 7 and that the current which traverses the filament 7 likewise traverses the inductances 12 and 13. The inductances 12 and 13 constitute an electromagnetic ray deflecting means and through electromagnetic action cause, due to the variations in current traversing the inductances, the ray composed of electrons evolved from the cathode 7 and focussed by the cylinder 10, to move in a plane perpendicular to the paper upon which the drawing is made.

Standard 24 serves to support through the strap 22 a plate 21 with the surface thereof perpendicular to the axes of the inductances 12 and 13. Similarly, standard 23 serves to support through the strap 19 a plate 20 with the surface thereof perpendicular to the axes of the inductances 12 and 13. Terminals 25 and 30 are provided for connecting plates 20 and 21 respectively with the proper prongs on the tube base 3. Plates 20 and 21 serve as an electrostatic ray deflecting means and by electrostatic action deflect the ray from the cathode 7 in a plane parallel to the surface of the paper upon which this drawing is made.

The anode in the form of a perforated circular plate or disc 16 is so placed as to prevent the cathode ray stream from making contact with the inductances 12 and 13 and there is further provided as a part of the anode the cylinder 17 which further insures against the cathode stream making electrical contact with the inductances 12 and 13.

It will be obvious from the foregoing that as the cathode 7 is serially connected with the electromagnetic ray deflecting means 12 and 13 that there are required only six terminals and six contact prongs in the tube base and socket and that even with this reduced number of contact terminals I am able to attain full effective operation of the cathode ray in both horizontal and vertical coordinates. Further, the reduction of the number of terminals to six permits the use of standard six-prong thermionic tube base and socket and as these are made in mass production in large quantities the fabrication of my cathode ray tube is consequently cheapened over a fabrication requiring a special non-standard base and socket.

In the operation of my improved tube, the cathode 7 is energized by alternating current which likewise passes through the inductances 12 and 13 and moves the cathode ray to traverse a luminous line on the fluorescent material 2 in one coordinate. Varying potentials applied to the electrosatic ray deflecting means 20 and 21 serve to move the ray to traverse a luminous line upon the fluorescent material 2 in the remaining coordinate.

Obviously, my improved tube may therefore be used for any purpose for which cathode ray oscillographs are now utilized and further it may economically be utilized in connection with radio or wired radio equipment the cathodes of the thermionic tubes of which are energized by alternating current.

Having thus completely described one embodiment of my invention, what I claim as new and desire to secure by United States Letters Patent is as follows:

1. A cathode ray tube comprising, a partially evacuated envelope bearing a coating of fluorescent material on the inner surface of one extremity thereof and enclosing, a cathode, a focussing cylinder for said cathode, an anode in the form of a shield, electrostatic ray deflecting means, and a solenoid positioned between said anode and said fluorescent screen and electrically connected in series within said envelope with said cathode.

2. A cathode ray tube comprising, a partially evacuated envelope enclosing, a filamentary cathode, a focussing cylinder therefor, an anode in the form of an apertured plate positioned with the aperture substantially in line with the axis of said focussing cylinder, electrostatic ray deflecting means, and electromagnetic ray deflecting means in the form of a solenoid positioned between said anode plate and said electrostatic ray deflecting means, said electromagnetic means being serially electrically connected within said envelope to said cathode.

3. A cathode ray tube comprising, a partially evacuated envelope enclosing, a cathode, a focussing cylinder therefor, electromagnetic ray deflecting means in the form of a solenoid electrically connected in series within said envelope with said cathode, and an anode in the form of a centrally perforated plate positioned between said electromagnetic ray deflecting means and said focussing cylinder with said perforation in alignment with the axis of said focussing cylinder and electrostatic ray deflecting means.

4. A cathode ray tube comprising, a partially evacuated envelope enclosing a cathode, a focussing cylinder therefor, electromagnetic ray deflecting means in the form of a solenoid electrically connected in series within said envelope with said cathode, an anode in the form of a centrally apertured plate and a cylinder, the axis of said cylinder being substantially aligned with the center of the aperture in said plate, said anode being positioned between said electromagnetic ray deflecting means and said focussing cylinder with the aperture in said plate substantially in line with the axis of said focussing cylinder and electrostatic ray deflecting means.

HENRY W. PARKER.