Aug. 29, 1939. W. HEIMANN 2,170,819

CATHODE RAY TUBE RECORDING DEVICE

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Fig. 1

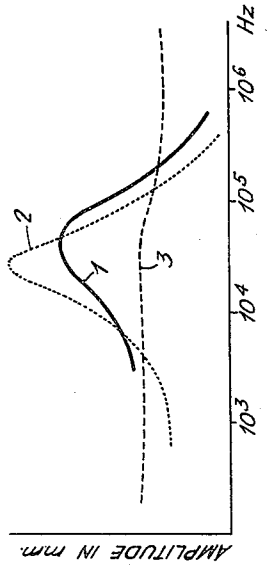
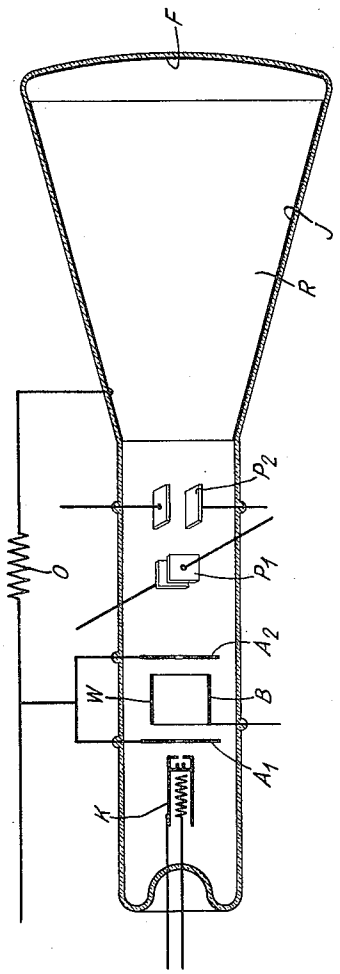


Fig. 2



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CATHODE RAY TUBE RECORDING DEVICE

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2 Claims. (Cl. 250—162)

This invention relates to a cathode ray tube with a low voltage gas-focused pencil for the oscillographic recording of high frequency oscillations.

In making oscillographic records of high frequency oscillations, say, above 10^4 cycles per second by the aid of the cathode ray low voltage tube working with gas-focused pencils, the tube exhibits a certain anomalous behavior as regards its sensitiveness, manifesting itself in an initially marked rise followed by a steep droop of the sensitiveness. The reason underlying this phenomenon is that inside the space between the deflector plates and the fluorescent screen, owing to the influence of the proximate glass walls, a negative space charge is built up which occasions a supplemental oscillation of the electron pencil which becomes superposed upon the oscillation of the pencil caused by the plate potential; as a result the amplitude experiences an increase, and the shape of the curve of the oscillations is distorted.

The invention may best be explained by referring to the drawing in which:

Fig. 1 shows sensitivity curves of a cathode ray tube as a function of the frequency applied thereto, and,

Fig. 2 shows my invention as applied to a cathode ray tube.

Sensitivity curves are shown in Figure 1, where the abscissae indicate the frequency in terms of Hertz or cycles per second, and the ordinate the amplitude of the deflection, in the presence of a constant deflecting potential, say, for an argon gas filling or atmosphere (graph 1) and a xenon filling (graph 2). As can be seen the deflection above 10^4 Hertz exhibits a pronounced rise which has a very marked crest at 50,000 cycles per second, for example, whereafter the deflection shows a strong droop inside the range between 10^5 and 10^6 cycles per second. The steep droop in the sensitiveness at around 10^5 cycles per second may be explained by the fact that the sojourn, as it were, of the ions in the pencil is greater than the length of the period of the pencil moved by the deflector potential. The higher the concentration or focusing (gas pressure) the more noticeable will be the said droop.

Now, according to this invention, these disturbing actions are avoidable by providing upon the inside wall of the cathode ray tube between the deflecting plates and the fluorescent screen a metallic coat or deposit which is maintained at anode potential. The potential of the said coat could also be chosen at a lower value, though only so low that a substantial impediment of the pencil inside the space bounded by the metallic deposit will not happen. By the provision of the metallic inside coat or deposit the negative space charge is drained so that any stray oscillations are precluded. Inasmuch as the metallic coat on the glass wall causes additional focusing of the electron pencil, the pressure of the gas atmosphere provided in the tube can be chosen considerably lower because of the said assistance produced by the inside metallization of the tube of this invention compared with what would normally be required for focusing the electron pencil. For example, when using an argon atmosphere, the pressure can be reduced from 3×10^{-3} mm. Hg column to 1×10^{-3} mm. With the use of other gas fillings, the pressures should be chosen in accordance with the ionizing power of the respective gases in such a way that the same number of ions will arise inside the space traversed by the electron pencil. In this manner, conditions are so that undue concentration or focusing and thus the steep droop of the sensitivity where higher frequencies are concerned, will be substantially diminished so that by the simultaneous use of inside metallization and reduced gas pressure extensive uniformizing of the sensitivity graph for the cathode ray tube is obtainable.

One exemplified embodiment of the invention shall be explained by reference to Fig. 2 in the drawing. R is a cathode ray tube comprising an electron accelerator system B and the conventional deflector plate pairs P1 and P2. The electron accelerator system may, for instance, consist of an indirectly heated cathode K which is of the hollow or cavity type, an auxiliary anode A1, a cylinder W for focussing the developed ray, and a main anode A2. The anodes A1 and A2 are preferably maintained at identical potential. The tube is filled, for example, with a gas for the purpose of concentrating or focusing the electron pencil, say, argon, and it is operable with anode potentials of a few hundred V. The tube is also supplied with a fluorescent screen F.

Now, according to this invention, the inside wall of the tube in the part located between the pair of deflector plates P2 and the fluorescent screen F is provided with a metallic coat or deposit, say, a silver coat J, with a view to enhancing the sensitivity of the tube in making oscillographic records of high frequency oscillations, especially those above 10^4 cycles per second. The said metallic deposit is preferably kept at anode potential. Care should be taken so that the inside deposit will not extend too close to the deflector plates in order that mutual influences be-

tween the said deflector plates and the said metallic deposit may be avoided. It is recommendable to make the intervening distance at least 3 cm. The said metallic deposit may be kept also at a voltage less than that of the anode in that, for instance, a high ohm resistance O is interposed in the connecting lead between the said metallic deposit and the anode lead as shown in the drawing. In this case the space between the metallic coat and the deflector plates may be diminished. The potential of the metal coat, however, should not be chosen so low that an appreciable obstruction of the electron pencil during its passage through the space bounded by the metallic coat is caused.

The gas pressure of the atmosphere filling the tube, according to another object of this invention is chosen essentially lower than what is customarily chosen for such an atmosphere of gas in tubes without inside metallization, under otherwise identical conditions. For instance, the gas pressure in the presence of an argon filling may be, for instance, 1×10^{-3} mm. Hg. column. The sensitiveness curve obtained for such a tube is indicated by graph 3, Fig. 1, applying to an argon atmosphere.

Having thus described the invention, what is claimed is:

1. In cathode ray tube construction, an envelope including therein electrode structure for producing upon application of suitable controlling voltages a cathode ray beam, fluorescent screen structure for rendering the produced cathode ray beam visible, beam deflecting means for causing the beam to traverse the screen, a metallic coating upon the inner tube wall extending longitudinally of the tube in the area intermediate the deflecting means and the screen and removed by a longitudinal spacing of at least three centimeters from the deflecting system, said coating being adapted to be maintained at a voltage at least no greater than the tube anode voltage, and an inert gaseous filling within the tube at a pressure of the order of 1×10^{-3} mm. mercury.

2. A cathode ray tube construction of the character claimed in claim 1 wherein the inert gaseous filling is argon gas.

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