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2,450,618

INDICATING DEVICE

Filed May 18, 1944

FIG-1

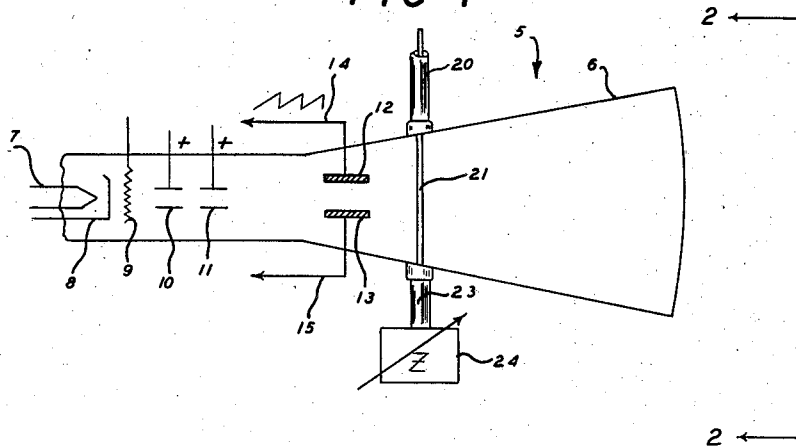


FIG-2

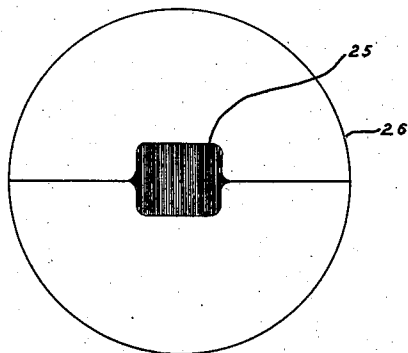
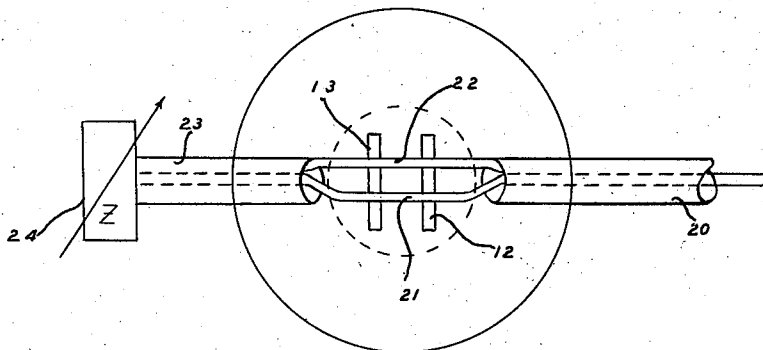


FIG-3

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INDICATING DEVICE

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2 Claims. (Cl. 250—158)

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This invention relates to an indicating device and more particularly to a device wherein it is possible to observe the envelope shape of a modulated radio frequency output from a high frequency generator such as a magnetron. In many instances, particularly in the case of a pulsed type generator such as commonly used in a radar system, the envelope shape of the output pulse does not necessarily conform to the original direct voltage modulating pulse. Thus, while it is possible by conventional methods to observe the shape of such modulating pulse, it also may be desirable to observe the envelope shape of the radio frequency output.

Heretofore such observations have been made by the method of detecting a small portion of the output by means of a crystal detector, or other device, amplifying the envelope in a video amplifier and applying the resultant detected wave to a suitable oscilloscope. Because of distortion introduced in the detector and amplifier stages, the wave form determined by this prior method must be viewed with caution.

The principal object of the present invention is to provide a means for observing the envelope shape of a modulated radio frequency output directly on the screen of a cathode ray tube with a minimum of distortion to the wave shape. This object is accomplished in the invention by utilizing an open two-wire transmission line in a cathode ray tube in lieu of one set of the usual deflecting plates. The two-wire transmission line has one end thereof connected through a suitable line directly to the radio frequency generator, the other end preferably being terminated in a variable impedance. In the region within the cathode ray tube, the transmission line has its two wires spaced apart, the distance between the wires being as small as possible consistent with the maximum deflection desired. With the usual sweep voltage applied to the conventional deflecting plates, a faithful reproduction of the modulated radio frequency output is traced out on the tube screen.

In the drawing, Fig. 1 is a diagrammatic top view of a cathode ray tube containing the invention; Fig. 2 is an end view of the tube shown in Fig. 1; and Fig. 3 is a view of the tube screen showing a sample type of indication obtained.

Referring now to Fig. 1, a cathode ray tube is indicated generally by 5. Tube 5, with the usual evacuated glass envelope 6, has an electron gun comprising heater 7, cathode 8, control grid 9, first anode 10 and second anode 11. Elements 7-11, inclusive, are conventional and are of the type found in the electron gun of any usual

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cathode ray tube. Deflecting plates 12 and 13 also are provided in a conventional manner within the tube, the plates being shown for convenience as horizontal plates, although they could as well be disposed as vertical plates. Plates 12 and 13 are connected through leads 14 and 15, respectively, to a suitable source of sweep voltage, this voltage being preferably synchronized with the modulating voltage used with the high frequency generator. Means for generating a suitable sawtooth sweep voltage are well-known in the art and need not be described here.

Wave energy from a radio frequency generator may be conducted to cathode ray tube 5 by means of a suitable coaxial line 20. Any other type of conductor adapted to handle the frequencies used may be substituted for line 20 if desired. A transmission line comprising two wires, 21 and 22, is suitably coupled to coaxial line 20, the two-wire line extending through the interior of cathode ray tube 5 and terminating on the side opposite to the feeder coaxial line in a second coaxial line 23. The two-wire line lies in a plane normal to the axis of the tube with the two wires extending in spaced parallel relation. Wires 21 and 22 are disposed within the tube so as to exert a force on the electron beam perpendicular to the beam deflecting force of plates 12 and 13, the spacing between the wires preferably being as small as possible consistent with a sensible beam deflection. The two-wire line may be coupled to coaxial lines 20 and 23 in the usual manner with wire 21 connecting the respective central conductors and wire 22 connecting the two outer coaxial conductors, wire 22 preferably being tapered at the connections. Wires 21 and 22 may be flattened slightly to increase their width along the tube axis. Coaxial line 23 is terminated in a variable impedance 24, the impedance being tunable for a maximum or desired deflection of the beam.

The envelope wave form 25 shown on the usual fluorescent screen 26 of the tube (Fig. 3) thus is an accurate indication of the radio frequency output. As will be understood, the area on the screen within the envelope will be more or less uniformly illuminated by the radio frequency vertical motion of the electron beam. It is generally desirable to keep the section of open two-wire line as short as possible and to maintain the distance between the wires at a small value. It may also be desirable to provide a certain amount of shielding around the cathode ray tube. With an indicating device of the character described, it is possible to observe the envelope wave forms

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of modulated microwave generators with unusually high fidelity.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent is:

1. A cathode ray tube having an electron gun, a pair of deflecting plates adapted to have a periodic sweep voltage applied thereto and a fluorescent screen, said tube also including means impressing a beam deflecting force perpendicular to the beam deflecting force of said plates, said means comprising an open two-wire transmission line disposed within said cathode ray tube, said line lying in a plane normal to the tube axis and adapted to have flowing therein high frequency currents.

2. The combination of claim 1 having a variable impedance at the termination of said open

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two-wire line whereby the amplitude of the high frequency beam deflections may be controlled.

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