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PHASE INVERSION CIRCUITS FOR CATHODE-RAY TUBES

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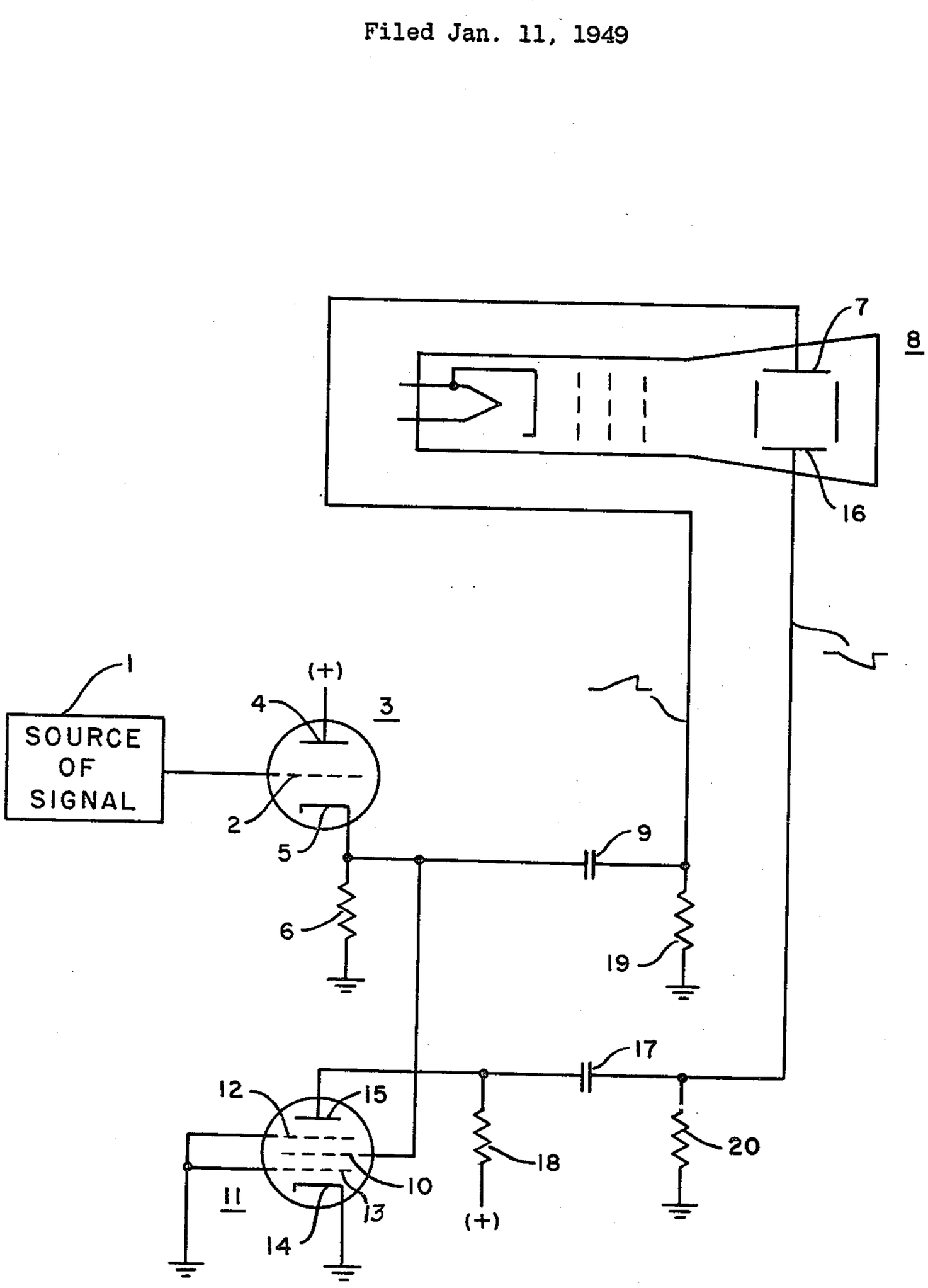

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PHASE INVERSION CIRCUITS FOR CATHODE-RAY TUBES

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3 Claims. (Cl. 315—26)

1

This invention relates to cathode ray tubes and more particularly to phase inversion circuits for cathode ray tubes.

In the past, circuits have been employed in connection with oscilloscopes or cathode-ray tubes of the electrostatic type in which the deflecting plates have been connected so that one plate of each set of deflecting plates is connected to the second anode or to ground. With such an arrangement, the input signal or quantity to be displayed on the screen of the oscilloscope or cathode-ray tube is applied to the other plate of the set. With this arrangement, defocusing of the electron beam is encountered, the extent of defocusing varying with the amount of deflection. In order to eliminate this undesirable condition, "push-pull" deflection may be used in which means utilizing the signal to be displayed is provided for driving one deflecting plate positive and the other plate negative but 180° out of phase with the potential at the first plate. With such a system, the average potential of the pair of plates remains substantially constant and as the potential at one plate rises, the potential is balanced by a decrease of potential at the other plate.

It is an object of this invention to provide new and improved means for preventing defocusing of the cathode beam in cathode-ray tubes.

It is another object of my invention to provide new and improved inverting means for use with cathode-ray tubes.

It is still another object of my invention to provide a new and improved inverter for use with cathode-ray tubes which is simple and which is reliable even at very high sweep speeds.

The features of my invention which I believe to be novel are set forth with particularity in the appended claims. My invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing in which there is shown a schematic diagram of a circuit embodying the principles of my invention.

The signals to be displayed, such as a source of sweep signal potential, indicated by the numeral 1, are applied to control electrode or grid 2 of a suitable electron discharge device 3 connected as a cathode follower and serving as a buffer and an impedance transformer. There is illustrated a tube of the triode type having an anode 4 connected to a suitable source of positive potential, and a cathode 5 connected to ground through a suitable cathode resistor 6. The potential ap-

2

pearing across cathode resistor 6 is applied in the usual manner to one deflecting plate 7 of cathode ray tube 8 through a suitable coupling capacitor 9.

In order to provide phase inversion, the output of discharge device 3 is also applied to screen electrode or grid 10 of electron discharge device 11 which is illustrated as being of the pentode type. The suppressor grid 12 as well as control electrode 13 and cathode 14 are connected to a predetermined potential such as ground. The anode 15 of discharge device 11 is connected to the other plate 16 of cathode ray tube 8 through a suitable coupling capacitor 17 and also to a suitable source of positive potential through a suitable load resistor 18, the value of resistance being chosen to match the output of device 11 to the output of device 3. Resistors 19 and 20 are connected between the output sides of coupling capacitors 9 and 17, respectively, and ground, so that the coupling capacitors 9 and 17 and resistors 19 and 20 not only provide for the feeding of potentials to deflecting plates 16 and 7 but also for isolating the centering potential.

Since the potential drop across resistor 6 increases as the sweep potential increases in amplitude, the potential applied to screen grid 10 increases and the potential at anode 15 decreases.

Since a screen grid 10 is normally expected to run positive and since a screen grid is a relatively insensitive grid, no voltage division of the driving signal is required. For this reason, the entire system runs at low impedance and is relatively free of high frequency loss problems due to stray capacitance. The output of discharge device 11 is made to match the output of the cathode follower by the proper choice of load resistance. By choice of a suitable tube with good screen grid transfer characteristics, very low waveform distortion may be secured.

In one circuit employing the principles of my invention, discharge device 3 was an electron discharge device known as type 6C4 and the electron discharge device 11 was of a type known as 6AK6. Cathode resistor 6 was 20,000 ohms, resistor 18 was 4700 ohms, and the source of positive potentials to which anodes 4 and 15 were connected through resistor 18 was 250 volts although either a single source or separate sources may be used.

While there has been described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the append-

ed claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim is:

1. In a system comprising a cathode ray tube having at least one pair of deflecting plates, a source of sweep signal potential, phase inverting means utilizing sweep signals for applying equal and opposite potentials to said deflecting plates including a first electron discharge device having a cathode and a control electrode, said first device being connected as a cathode follower, means for impressing said sweep signals on said control electrode, means for impressing the output of said first device on one of said deflecting plates, a second electron discharge device having an anode, a cathode, and a plurality of control electrodes, means for also applying the output of said first device directly to one of the control electrodes of said second device by means of a direct electrical connection of substantially no impedance, and means for applying the output of said second device to the other of said deflecting plates.

2. In a system comprising a cathode ray tube having at least one pair of deflecting plates, a source of sweep signal, phase inverting means utilizing sweep signals for applying equal and opposite potentials to said deflecting plates including a first electron discharge device having a cathode and a control electrode, said first device being connected as a cathode follower, means for impressing said sweep signals on said control electrode, means for impressing the output of said first device on one of said deflecting plates, a second electron discharge device having an anode, a cathode, and a plurality of control electrodes including a screen grid, means for also applying the output of said first device directly to the screen grid of said second device by means of a direct electrical connection of substantially no impedance, the other control electrodes of said second device being connected to a point of

predetermined potential means for applying the output of said second device to the other of said deflecting plates, and means for matching the output of said second device to the output of said first device.

3. In a system comprising a cathode ray tube having at least one pair of deflecting plates, a source of sweep signal phase, phase inverting means utilizing sweep signals for applying equal and opposite potentials to said deflecting plates including a first electron discharge device having a cathode and a control electrode, said first device being connected as a cathode follower, means for impressing said sweep signals on said control electrode, means for impressing the output of said first device on one of said deflecting plates, a second electron discharge device having an anode, a cathode, and a plurality of control electrodes including a screen grid, means for also applying the output of said first device directly to the screen grid of said second device by means of a direct electrical connection of substantially no impedance, the other control electrodes of said second device being connected to a point of predetermined potential, means for applying the output of said second device to the other of said deflecting plates, and means for matching the output of said second device to the output of said first device, the last mentioned means comprising a load resistance connected between the anode of said second device and a suitable source of positive potential.

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