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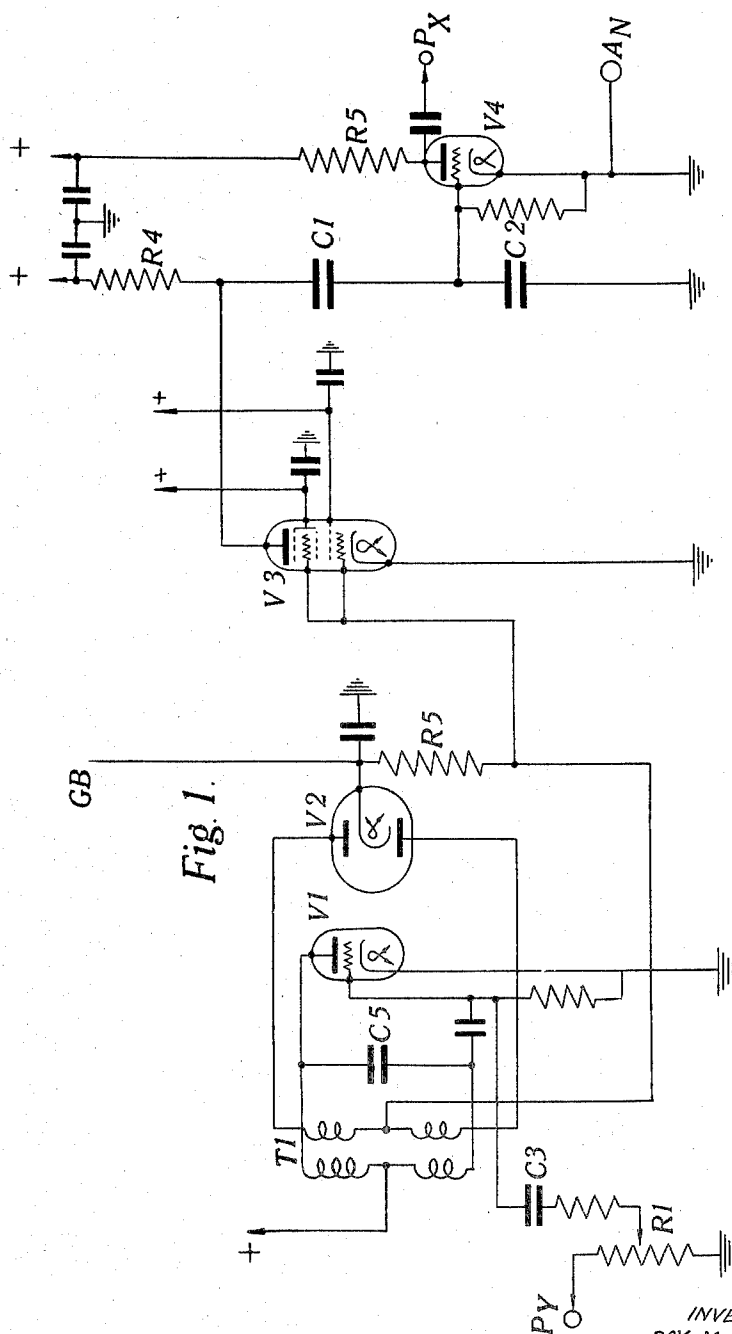
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2,215,776

TIME BASE CIRCUIT FOR CATHODE RAY TUBES

Filed Feb. 19, 1937

2 Sheets-Sheet 1



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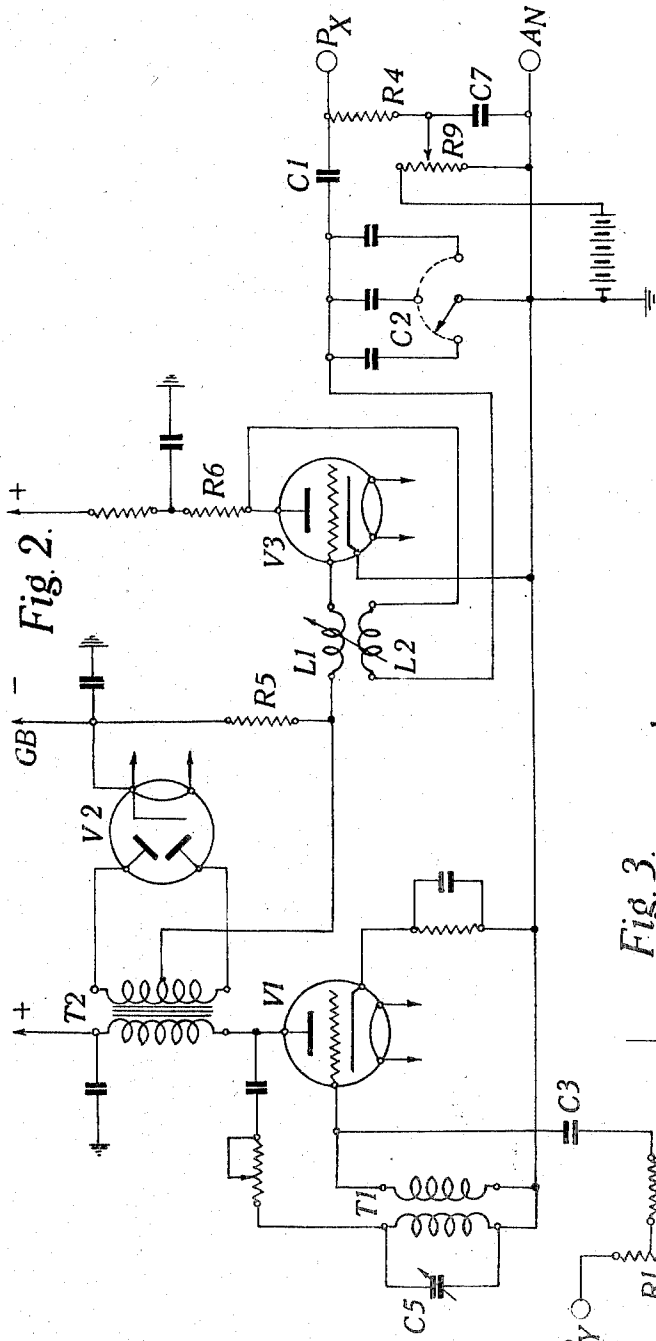


Fig. 2.

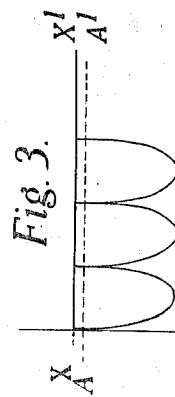


Fig. 3.

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TIME BASE CIRCUIT FOR CATHODE RAY TUBES

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3 Claims. (Cl. 250—36)

This invention relates to arrangements for controlling a cathode ray tube and more particularly for deflecting the beam of electrons across the screen in a definite time relation. In the use of cathode ray tubes as oscillographs and for television purposes it is required to cause the electron beam to be deflected during a certain period of time by an amount which varies linearly with time and then to return to its starting point as quickly as possible, the action being repeated at a frequency depending on the particular phenomena to be examined. A circuit for this purpose is usually called a time base circuit.

It is an object of this invention to obtain a time base circuit which is stable in frequency and causes the electron beam to be returned across the screen at the end of each traverse in as small a time as possible, and at regular and invariable intervals.

The current or potential causing a traverse of the electron beam across the screen of a cathode ray tube is usually obtained from a condenser which is charged at a controllable rate, the condenser being discharged periodically to cause the electron beam to fly back across the screen.

The condenser is usually connected continuously in a charging circuit and then discharged through a gas filled tube or a vacuum tube which is rendered conducting for a brief period. For operation at high frequencies it has been proposed to cause the condenser to discharge through a three electrode vacuum tube rendered conducting by means of impulses applied periodically from an oscillator producing a distorted wave form such as a so-called dynatron oscillator.

According to this invention the condenser is caused to discharge through a vacuum tube to the grid of which rectified sinusoidal oscillations are applied in negative phase.

In this manner great stability of frequency can be obtained, for a sinusoidal oscillator is much more stable as to frequency than the so-called relaxation oscillators on the multi-vibrator principle or than a dynatron oscillator.

The nature of the invention and the manner in which it is to be performed will be better understood from the following description taken in conjunction with the accompanying drawings in which Figs. 1 and 2 show two slightly different embodiments of the invention, whilst Fig. 3 is a curve for explaining the operation of these circuits.

Referring now to Fig. 1 condensers C_1 and C_2

are connected in series with resistance R_4 between a positive potential of 500 volts and earth. The potential across condenser C_2 is applied between the grid and cathode of a valve V_4 . One of the deflecting plates of a cathode ray oscillograph, denoted by the reference character P_x is connected to the anode of tube V_4 , the final anode of the cathode ray tube being connected to the cathode of tube V_4 as denoted by the reference character AN .

A point between resistance R_4 and condenser C_1 is connected to the anode of a multi-grid tube V_3 . Condensers C_1 and C_2 charge up through resistance R_4 until valve V_3 becomes conducting when they discharge through the tube V_3 . The potential across C_2 during the charging traverses the cathode ray across the screen and when condenser C_2 discharges the spot on the screen returns to its starting point.

By the present invention the condensers C_1 and C_2 are very rapidly discharged at regularly recurring intervals. As shown in Fig. 1 the valve V_3 is a multi-grid valve of the type often used as a frequency changer. As used in Fig. 1, two of the grids are connected in parallel to one end of a resistance R_5 , the other end of which is connected to a suitable source negative bias potential GB . One of these grids is that next to the cathode. Positive potential is connected to the grid next removed from the cathode, and also to the screen grid surrounding the grid connected in parallel to the first mentioned grid.

An oscillator valve V_1 has its grid and plate circuits coupled in such manner as to produce sinusoidal oscillations which are rectified by a full wave rectifier valve V_2 and applied across resistance R_5 in such a manner that the end of that resistance connected to the grids of tube V_3 is negative with respect to the other end. The effect of this is that the valve V_3 is rendered conducting only for a very brief period of time twice in each cycle of oscillation of the valve V_1 .

This will be clear from a consideration of Fig. 3. This shows voltages applied to the grids of valve V_3 as ordinates and time as abscissae. The line XX' represents the value of the bias voltage and the line AA' the value of the voltage at which valve V_3 ceases to become conducting. It will be seen that the curve shown is the rectified voltage of the oscillations produced by valve V_1 and that the valve V_3 is conducting only in the brief intervals of time when this curve is between the lines XX' and AA' . These time intervals may clearly be made as brief as is desired

by a suitable selection of the bias voltage GB. The intervals must clearly however be of sufficient length to enable the condensers C₁ and C₂ to discharge completely.

- 5 The use of a multi-grid valve with two grids connected in parallel to the resistance R₅ allows of these intervals being made a little shorter than if a three electrode valve is used, since with the controlling voltage applied to two grids in
10 parallel the change in anode current of the valve V₃ and therefore the change in conductivity of the anode-cathode discharge path for a given charge in applied voltage is increased. A vacuum tube of the pentode type may be used instead of the valve V₃ shown, the control volt-
15 ages being applied to the control grid and suppressor grid in parallel.

The arrangement shown in Fig. 2 is generally similar to that of Fig. 1. The condenser C₂
20 is replaced by three condensers any one of which may be selected for use by means of a switch. The resistance R₄ is connected in series with a condenser C₇ across the terminals P_r and AN and a variable part of resistance R₅ is included
25 in series with resistance R₄ in the charging circuit of condensers C₁ and C₂.

A three electrode valve is used as the valve V₃. The time required for condensers C₁ and C₂ to discharge through the valve V₃ is in this
30 embodiment decreased by including small inductances L₁ and L₂ in the grid and plate circuits of the valve. Each of these inductances preferably consists of 10 turns of 27/40 Litz wire on a one inch former. The coupling between the coils
35 should be variable but is by no means critical.

The oscillator V₁ is shown as a slightly different type from that shown in Fig. 1. The plate and grid circuits are coupled through coils T₁, a variable condenser C₅ serving to adjust the
40 frequency of the oscillations produced. The plate circuit of valve V₁ is coupled with the full wave rectifier by means of a second transformer T₂.

If it is desired to ensure that the sweep of the
45 cathode ray takes place in synchronism with the conditions applied to the other pair of deflecting plates in the cathode ray tube, synchronising signals are applied in either the arrangement shown in Fig. 1 or that shown in Fig. 2 to the grid of
50 the oscillator V₁. This may be done by connecting as shown the grid of valve V₁ to the terminal PY through condenser C₃ and resistance R₁. The terminal PY is connected to one of the other
55 pair of deflector plates in the cathode ray tube, to which, in the case of such a tube used to record a voltage varying with some quantity being examined, the latter voltage is applied. In the case of a cathode ray tube used as part of a
60 television receiver the synchronising signals re-

ceived from the transmitter are applied to the terminal PY.

It is clear that, in either of the embodiments described the time base voltages may be applied to the deflecting plates of the cathode ray tube in a balanced manner instead of the unbalanced manner shown, by using well known arrangements.

What is claimed is:

1. A time base circuit for use with a cathode ray tube, comprising a condenser, means for continuously charging said condenser, a vacuum tube, conductors connecting the output of said vacuum tube across said condenser, means for applying a rectified sinusoidal current to the input of said vacuum tube, whereby said vacuum tube may be periodically rendered conducting and said condenser may periodically discharge therethrough, said means last mentioned comprising a thermionic vacuum tube having coupled plate and grid circuits for producing sinusoidal oscillations, a full wave rectifier for said sinusoidal oscillations, and a resistance means connected between said rectifier and said input of said first mentioned vacuum tube.

2. A time base circuit comprising a condenser, means for continuously charging said condenser, a vacuum tube having a control grid, conductors connecting the output of said vacuum tube across said condenser, means for applying the potential across said condenser to a load circuit, means for supplying a rectified sinusoidal current, resistance means connected between said last mentioned means and said vacuum tube input for applying said rectified sinusoidal current to the input of said vacuum tube in such manner that an increase in the potential of said rectified current makes the grid of said vacuum tube more negative and decrease in the potential of said rectified current to substantially zero value makes the negative potential applied to the grid of said vacuum tube momentarily so low as to render said vacuum tube only momentarily conducting.

3. A time base circuit comprising a condenser, means for continuously charging said condenser, a vacuum tube, conductors connecting the output of said vacuum tube across said condenser and means for applying a rectified sinusoidal current to the grid of said tube whereby said vacuum tube may be periodically rendered conducting and said condenser may periodically discharge therethrough, said means last mentioned comprising a thermionic vacuum tube having coupled grid and plate circuits, means for applying synchronizing impulses to the grid of said thermionic vacuum tube, means for rectifying the output of said thermionic vacuum tube, and means for applying said rectified output to said first named vacuum tube in negative phase.

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