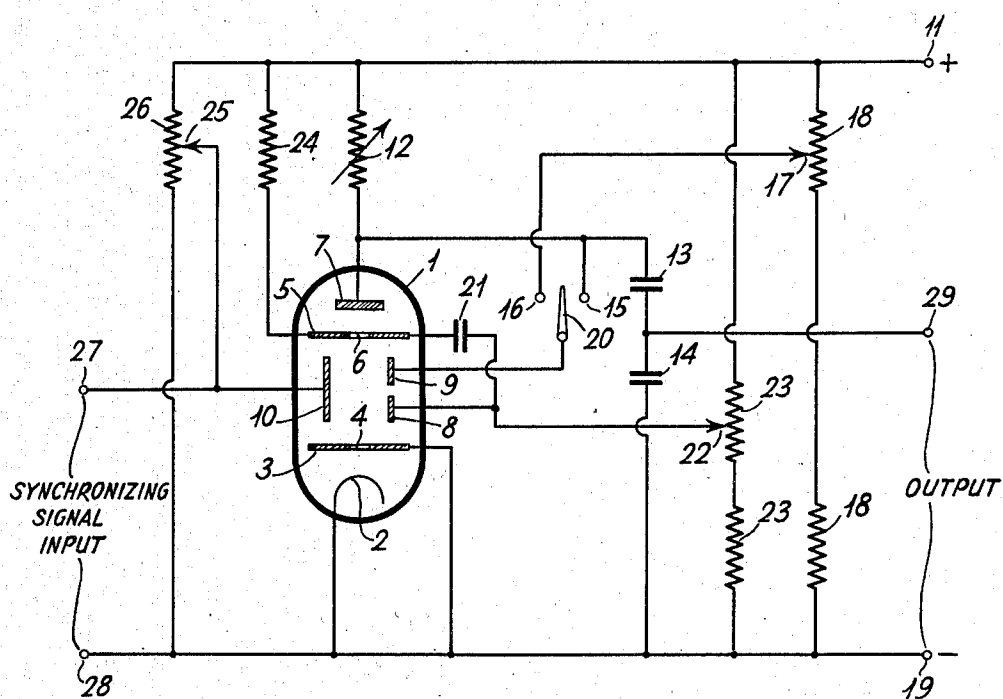


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OSCILLATOR

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This invention relates to electrical time base circuits and more particularly, though not exclusively, to time base circuits suitable for use for producing or controlling scanning action in television and like cathode ray tube apparatus.

Considerable difficulty is experienced with known time base circuits for use in television and like cathode ray tube apparatus in obtaining the required degree of constancy of frequency, various causes, notably changes in the ambient and operating conditions, tending to produce frequency drift. In order to meet this difficulty it is at present usual in television systems to lock the time base circuits rigidly in step by synchronizing signals of considerable amplitude. The necessity for the provision of powerful synchronizing signals is obviously a disadvantage and such signals may, moreover, result in distortion of the so-called television "raster" i. e., the scanning pattern.

The present invention seeks to provide time base circuits wherein a high degree of constancy of frequency is obtainable and which can be easily synchronized by synchronizing signals of relatively small amplitude, although, as will be seen later apparatus in accordance with this invention may be arranged to be controlled by powerful synchronizing signals such as are now ordinarily employed in television systems.

According to this invention an electrical time base circuit comprises a capacity, means for charging said capacity at a predetermined rate, an electron beam valve including two anodes or electron collector electrodes, means for so operating said valve that normally the electron beam therein passes to one of said anodes, means for utilizing a potential proportional to the instantaneous potential across said capacity for deflecting the electron beam in said valve, and means for utilizing the discharge space to the other anode of said valve for discharging said capacity periodically, the whole arrangement being such that when the voltage across said capacity arises to a predetermined value and/or when a synchronizing signal is received, the electron beam in the electron beam valve is deflected so as to be incident upon said other anode whereupon the discharge space to said other anode becomes conductive and discharges the capacity.

The invention is illustrated in the accompanying drawing which shows diagrammatically one embodiment of the invention.

Referring to the drawing there is employed an electron beam valve of somewhat special construction which will first be described. This elec-

tron beam valve 1 includes within an evacuated envelope an electron gun system of any known convenient kind (for example it may consist as shown of a cathode 2 and an associated electrode 3 having an aperture 4 through which a jet or beam of electrons is projected); a first anode 5 in the form of an apertured plate having an aperture 6 and positioned opposite the electron gun; a second anode 7 in the form of a plate situated behind the first anode, i. e., on the side thereof remote from the electron gun; and three deflector electrodes 8, 9, 10 two (8, 9) on one side and the third (10) on the other side of the electron beam path. The first and second deflector electrodes 8, 9 are side by side and opposite the third deflector 10, said first and second deflectors being at different distances from the gun and in a common plane at right angles to the parallel planes in which the two anodes 5, 7 lie and the third deflector 10 being in a plane parallel to the said common plane.

In the time base circuit shown and the above described electron beam valve 1, the positive terminal 11 of a source of potential (not shown) is connected through a resistance 12, which is preferably adjustable, to the second anode 7 and this anode is connected through two condensers 13, 14 in series to the cathode 2. The anode 7 is also connected to one contact 15 of a two-position switch having another contact 16 connected to a tapping point 17 (which may be adjustable) upon a potentiometer 18 shunted across the source of potential whose negative terminal is marked 19. The armature 20 of this switch is connected to the deflector 9 (which is nearer the two anodes 5, 7 than is the deflector 8) and the deflector 8 is connected through a coupling condenser 21 to the first anode 5 and is also connected to an adjustable tapping point 22 upon a second potentiometer 23 connected across the source of potential. The first anode 5 is connected through a resistance 24 to the positive terminal 11 of the source of potential. The third deflector 10 is connected to an adjustable tapping point 25 upon a third potentiometer 26 connected across the potential source, said third deflector 10 being also connected to a terminal 27 which constitutes one of the input terminals 27 and 28 for synchronizing signals, the other input terminal 28 being connected to the gun cathode 2. In use, approximately saw-tooth waves generated by the time base circuit may be taken at terminals 29 and 19 which are connected across the condenser 14. The whole arrangement is such that normally (that is, when there is no charge in the condensers

13, 14) the electron beam in the electron beam valve is incident upon the first anode 5 only, because the internal resistance between the electron gun and the second anode 7 is so very high that this discharge path is, practically speaking, non-conductive.

Suppose the switch arm 20 is on contact 15 connecting the deflector 9 to the anode 7 and the condenser 13. Then the operation of the device is as follows: current flows from the positive terminal 11 through the resistance 12 to charge the condensers 13 and 14, and these condensers will accordingly charge at a rate determined by the constants of the charging circuit. It will be noted that during this charging action (which corresponds to the longer face of a sawtooth wave) the electron beam is not incident upon the second anode 7, and accordingly there is no load across any part of the charging circuit. As the potential across the two condensers 13 and 14 rises, the potential applied to the deflector 9 also rises and accordingly the electron beam is increasingly deflected. When the charging has continued to a predetermined extent the electron beam has become deflected far enough for it to pass through the aperture 6 in the anode 5 and strike the anode 7. Accordingly the condensers 13 and 14 will be discharged through the electron beam. When the electron beam reaches the aperture 6 and leaves the first anode 5 for the second anode 7 the consequent cutting off of the current to the first anode 5 causes a positive pulse to be applied (through the coupling condenser 21) to the deflector 8 and this tends to maintain the beam on the second anode 7 until the positive voltage on the said deflector 8 has fallen away (in accordance with a substantially exponential law) sufficiently to enable the beam to become once more incident upon the first anode 5. When this happens current reappears in the circuit of the first anode 5 and accordingly the second deflector 8 receives a negative pulse which deflects the beam further back towards its original position. Thus the condensers 13 and 14 charge relatively slowly while the electron beam is incident on the first anode 5 and are discharged rapidly as soon as the electron beam strikes the second anode 7. Because there is no load across any part of the charging circuit during charging, successive chargings will occupy substantially the same time.

In practice the parameters of the circuit are so arranged that the voltage across condensers 13 and 14 rises almost to the predetermined value just before a synchronizing signal is due to be received so that the reception of a synchronizing signal (which is applied to the third deflector 10) produces the small amount of extra deflection necessary to cause the electron beam to pass through the aperture 6 in the first anode 5 to the second anode 7. Thus synchronizing signals of quite small amplitude are sufficient to produce reliable synchronization.

The circuit is readily adjustable for different operating conditions. Adjustment of the resistance 12 in the charging circuit adjusts the charging period while the various potentiometer tapings provide additional and obvious operating adjustments. Adjustment of the static potential applied to the third deflector plate 13 adjusts the amplitude of the "sweep".

If the above described circuit arrangement is desired to be employed with strong incoming synchronizing signals the switch arm may be moved to contact 16 in which the deflector plate

9 is connected to the tap 17 on the resistance potentiometer 18. With the switch in this position the circuit is no longer a self-operating time base circuit, that is to say, it will not generate sawtooth waves whether or not synchronizing signals are received, but can be "driven" by the signals.

When a circuit arrangement such as the above described is employed for synchronizing a television receiver of the kind in which picture signals and synchronizing signals are transmitted together in the same channel but with opposite senses or polarities, the combined synchronizing and picture signal wave may be applied directly without any preliminary separation, to the deflector 10, for, by suitably choosing the polarity or sense of the application, the result may be achieved that only the synchronizing signals will be of the correct sense or polarity to deflect the electron beam in the required direction to cause it to pass to the second anode 7. Thus when applied to such a television receiver the apparatus offers the advantage that the hitherto normally provided valve for separating picture signals from synchronizing signals may be dispensed with.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. An electrical time base circuit comprising a capacity, means for charging said capacity at a predetermined rate, an electron beam valve including two anodes or electron collector electrodes, means for so operating said valve that normally the electron beam therein passes to one of said anodes, means for utilizing a potential proportional to the instantaneous potential across said capacity for deflecting the electron beam in said valve, and means for utilizing the discharge space to the other anode of said valve for discharging said capacity periodically, the whole arrangement being such that when the voltage across said capacity rises to a predetermined value the electron beam in the electron beam valve is deflected so as to be incident upon said other anode whereupon the discharge space to said other anode becomes conductive and discharges the capacity.

2. An electrical time base circuit comprising a capacity, means for charging said capacity at a predetermined rate, an electron beam valve including two anodes or electron collector electrodes, means for so operating the said valve that normally the electron beam therein passes to one of said anodes, means for utilizing a potential proportional to the instantaneous potential across said capacity for deflecting the electron beam in said valve, means adapted to be operated by synchronizing signals for providing said beam with deflections supplementary to that caused by the instantaneous potential across said capacity and means for utilizing the discharge space to the other anode of said valve for discharging said capacity periodically, the whole arrangement being such that after the voltage across said capacity has built up to at least a predetermined minimum, reception of a synchronizing signal causes the electron beam in the valve to be deflected so as to be incident upon said other anode whereupon the discharge space to said other anode becomes conductive and discharges the capacity.

3. A circuit as claimed in claim 1 wherein the anode upon which the beam normally falls is an apertured anode situated in front of the second

anode between it and the electron gun of the valve, the electron beam passing to the second anode only when it is sufficiently deflected to pass through the aperture in the apertured anode.

4. A system for producing oscillations of sawtooth wave form comprising a discharge tube, means for producing a beam of electrons including a cathode and a first and second anode, a first deflecting electrode positioned between said cathode and said anodes, and at one side of the produced beam, a second and third deflecting electrode positioned between said cathode and said anodes and in a plane parallel to said first deflecting electrode, means for normally directing the produced beam against said first anode, a condenser connected between said second anode and said cathode, means for maintaining said third deflecting electrode at the charge potential of said condenser whereby the produced beam may be deflected in accordance with the charge of said condenser to cause the beam to impinge said second anode upon a predetermined charged condition to substantially instantaneously discharge said condenser, and means for maintaining said first and second deflecting electrodes positive with respect to said cathode.

5. An electrical time base circuit comprising a capacity, means for charging said capacity at a predetermined rate, an electron beam tube in-

cluding two anodes, means for operating said tube so that normally the electron beam therein is directed on to one of said anodes, additional beam deflecting means adapted to be controlled by synchronizing potentials, means whereby said synchronizing potentials and said capacity potentials operate to deflect the beam on to the other anode for substantially instantaneously discharging said capacity.

6. A system for producing oscillations of sawtooth wave form comprising a discharge tube including a cathode and a pair of anodes, a condenser, means for charging said condenser at a predetermined rate, means for producing an electron beam in said tube and normally directing the beam against one of said anodes, means for utilizing a potential proportional to the instantaneous potential across said condenser for deflecting the electron beam in said tube, means for utilizing the discharge space to the other of said anodes of said tube for discharging said capacity periodically, whereby when the potential across said condenser rises to a predetermined value the electron beam in the discharge tube is deflected so as to impinge upon said other anode to substantially instantaneously discharge said condenser.

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