

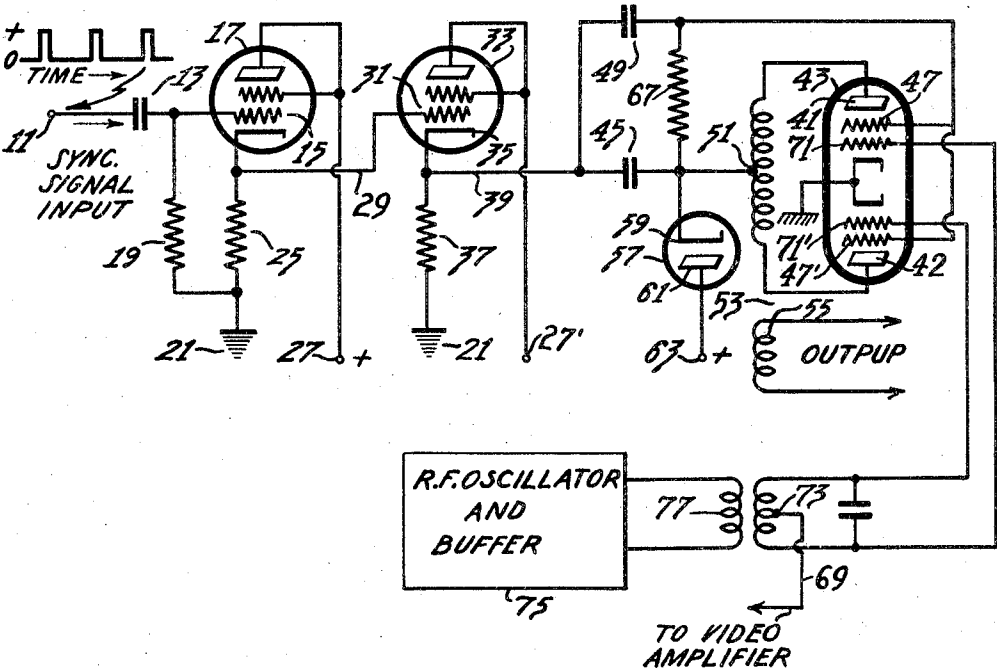
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TRANSMITTER APPARATUS

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TRANSMITTER APPARATUS

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This invention relates to television transmitter circuits, with particular emphasis being placed upon a circuit and system for more efficiently providing plate modulation of the output stage under the control of output sync or synthesizing signals.

In the past, provisions have been made for utilizing a cathode follower type of circuit to drive the plate voltage or an output power stage in a more positive direction to obtain high power outputs. Under such circumstances, however, it has been found that the output which is obtainable is dependent upon the maximum current obtainable from the cathode follower. Yet, even this did not provide an adequate amount of power under most circumstances because the current which was obtainable from the cathode follower in the prior art was usually limited by the plate load resistance of the preceding tube.

According to the present invention, provisions have been made whereby it is possible further to increase the peak current from the plate follower through the use of an additional cathode follower tube to drive the usual cathode follower serving to control the output tube. This arrangement is possible because it is so set up that current flows through these tubes at a maximum value for but a very short interval so that the plate dissipation of the driver tube is not exceeded.

According to the present invention, the sync driver tube is connected to receive controlling, synthesizing or sync pulses arriving thereupon in a positive sense. The sync driver then serves as a low impedance driving source for impressing the synchronizing signal upon the grid or input of the sync modulator tube in cathode follower fashion. The sync modulator tube, in turn, is connected to deliver its output in cathode follower fashion to the output tube. There is also associated with the output tube a capacity which is arranged to be charged through a suitable rectifier during the time interval that the sync pulses are removed in such a direction that the capacity charges practically to a value which is equal to that of the plate supply at the output from the sync modulated cathode follower connected tube and is such that when the controlling voltage is positive on the sync modulator, it forces its cathode practically to the plate voltage and tends to add thus to the voltage acquired by the condenser and so increase the output from the system.

In the light of the foregoing, it will be appreciated that one of the main objects of this invention is to provide in a more efficient manner for modulating an output stage for television transmitters in accordance with the controlling sync

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pulses and then to drive the output tube in such a way that exceedingly high peak current outputs are derived therefrom.

A further object of the invention is to provide a simplified modulation system for a television transmitter wherein it is possible to obtain exceedingly high short duration peak output currents.

Further objects of the invention are those of providing a more efficient and yet simplified modulation system for television transmitters and the like which overcome one or more defects of the prior art and which, at the same time, avoid the limitations heretofore placed upon such apparatus by the selection of the driver stages provided therefor.

Other objects and advantages will, of course, at once suggest themselves to those skilled in the art when the following specification is considered in conjunction with the accompanying drawing which schematically illustrates one form which the invention may assume.

Referring now to the drawings, sync impulses as used to synthesize television image production and which may have developed from any suitable form of sync generator are supplied at an input terminal 11. Purely by way of illustration, sync signals which exist as pulses extending in the positive direction are shown in diagrammatic form immediately above the input terminal 11. There pulses, which are of relatively large amplitude, as indicated, are fed by way of the condenser 13 to be applied to the grid or control electrode 15 of a sync driver tube 17. This tube has provided therewith the usual grid resistor 19 which connects at one end to the grid or control electrode 15 and at the other end to ground 21. Likewise, the cathode 23 of this tube connects to ground through the cathode output resistor 25.

Suitable plate voltage for operating the tube is provided from a source (not shown) having its positive terminal connected at the terminal point 27 and its negative terminal preferably connected to ground.

Output signals from the sync driver tube 17 are supplied across the cathode output resistor by way of the conductor 29 to the grid or control electrode 31 of the sync modulator tube 33. This tube also has its cathode 35 connected to one terminal of the cathode load or output resistor 37 of which the second terminal also connects to ground 21. Plate voltage for this tube is supplied at a terminal 27' from a source such as that connected at the terminal point 27.

The output signals from the sync modulator

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tube 33 are supplied in cathode follower fashion by way of the conductor 39 to the plates 41 and 42 of the output tube 43 (only partially shown herein) by way of the condenser 45. This same voltage is also applied to the screen grid electrodes 47 and 47' of the output tube 43 through the condenser 49.

The control voltages which are applied to the plates 41 and 42 as well as the screen electrodes 47 and 47' of the output tube 43 are supplied in push-push fashion through the connection to the midpoint of the primary winding 51 of a transformer 53 of which the secondary 55 connects to a suitable output or load circuit or further amplifiers (not shown).

The condensers 45 and 49 are adapted to charge through a diode 57 of which the cathode 59 is connected to one terminal of condenser 45 and of which the anode 61 connects to a terminal point 63 whereat positive voltage is applied. The resistor 67 connected between the anode connection 51 and the screen electrode 47 and 47' serves as a screen voltage cropping resistor.

Not only may the sync signals be applied to the output tube 43 in push-push fashion, as indicated, but the video signals developed in the system, as indicated at 69, may likewise be applied in push-push fashion to suitable inner grids 71 and 71' by way of the connection through transformer secondary 73 in purely conventional manner. A suitable radio frequency oscillator of any desired character and buffer arrangement, conventionally represented at 75, may be used to supply output signals by way of the transformer primary 77 to feed the RF voltages upon the inner grids 71, 71', along with the video signals.

In accordance with the arrangement thus disclosed, it will be seen that with the positive sync pulse being applied at the input terminal 11, the sync driver tube 17 has its grid driven highly positive so as to draw a heavy plate current for the duration of the sync pulse. With the cathode follower connection provided between the output of the sync driver tube 17 and the grid or control electrode 31 of the sync modulator tube 33, it will be appreciated that this latter tube also is driven far into the positive region at times when the sync pulse arrives at the input terminal 11. This permits the sync modulator tube 33 to deliver a very high peak current to the output tube 43. Even the duration of the peak pulse interval is short. Because of this short duration peak current pulse, the average currents flowing in each of the tubes 17 and 33 are quite reasonable and it is possible to so arrange the system that the sync pulse controls the driver tube in such a way that a control is had on the modulator tube while, at the same time, obtaining a high output where the control comes from a tube which is driven to cut off most of the time and the control sync pulse is positive on the grid of the modulator tube.

With respect to the arrangement shown for charging the condensers 45 and 49 through the diode 57, it will be appreciated that each of these condensers can charge during the time interval between successive sync pulses almost to a value which is equal to that of the supply connected to the terminal 63, because for periods of conduction, the diode offers relatively low resistance. Then, when the sync pulse is applied to the modulator tube grid 31 to cause a very high current to flow therethrough, it forces the cathode 35 of the modulator tube 33 to practically the

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voltage of the plate, and this voltage then obviously tends to add to the voltage to which the condensers 45 and 49 have been charged so as to become effective on the output tube 43.

The remaining connections of the output tube 43 have been omitted for reasons of simplicity of illustration, but purely by way of example and to show the general nature of the system hereinabove set forth, it may be suggested that the sync driver tube may be of the type known as the 6AC7. The sync modulator tube 33 may be of the type known as the 6V6. The output tube 43 may be of the double pentode variety, such as the push-pull RF beam power amplifier, commonly known as the 829B. Lastly, the diode may be part at least of a tube of the general type known as the 6X5. While the cathode resistors used to provide the cathode follower connections are not critical in value, it has been found convenient in practice to provide the resistor 25 as one of about 1500 ohms, while the resistor 37 is slightly larger and may be of the general order of 4000 ohms.

Having now described my invention, I claim:

1. A modulator circuit for modulating a television transmitter under the control of applied synthesizing impulses which comprises, in succession, a driving tube, a modulator tube and an output tube, a cathode output resistor for each of the driver and modulator tubes, means for connecting the modulator tube to the driver tube and the output tube to the modulator tube each in a cathode follower connection, means for supplying control pulse energy to the input circuit of the driver tube so that like polarity output controlling pulses are supplied upon the modulated electrode of the output tube, a condenser element included serially in the connection between the modulator tube and the output tube, a rectifier connected to charge the said capacity element in the time interval intervening between the application of successive synthesizing impulses to the driver tube, and means to render the rectifier inoperative to charge the condenser during the period of the impulse duration, whereby the voltage in the condenser effectively adds to the voltage applied to the output tube during periods of impulse duration and during periods of impulse interruption the charge in the condenser applied through the rectifier approaches the voltage normally applied to the rectifier.

2. A modulator circuit for pulse output transmissions which comprises in succession a driving tube, a modulator tube and an output tube, a cathode output resistor for each of the driver and modulator tubes, a cathode follower connection for connecting the modulator tube to the driver tube and across the cathode resistor thereof, a cathode follower connection for connecting the plate elements of the output tube to the cathode resistor of the modulator tube, means for supplying control pulse energy of positive polarity to the input circuit of the driver tube whereby the polarity of the controlling pulse upon the modulated plate of the output tube coincides with that applied to the input of the driver tube, a capacity element connected between the modulator tube cathode output and the output tube, a rectifier connected to charge the said capacity element in the time interval intervening between the application of successive control pulses to the driver tube, and means provided by the pulse signal flowing in each of the driver tube, the modulator tube and the output tube to render the rec-

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tifier inoperative to charge the capacity element during the period of the pulse duration, whereby the voltage in the capacity element effectively adds to the voltage applied to the output tube during periods of pulse duration and during periods of pulse interruption the charge in the capacity element applied through the rectifier approaches the voltage normally applied to the rectifier.

3. A circuit for modulating a television transmitter output tube which comprises, in succession, a driving tube, a modulator tube and an output tube each having at least a cathode, an anode and a control grid electrode, a cathode output resistor connected to the cathode of each of the driver and modulator tubes, a cathode follower connection for connecting the modulator tube control grid to the driver tube cathode and across the cathode resistor thereof, a cathode follower connection for connecting an anode electrode of the output tube to the cathode and across the cathode resistor of the modulator tube, means for supplying control pulse energy of selected polarity to the input circuit of the driver tube whereby the polarity of the controlling pulse applied to the anode of the output tube coincides with that applied to the input of the driver tube, a capacity element included serially in the con-

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nection between the modulator tube cathode output and the anode of the output tube, a rectifier connected to charge the said capacity element in one selected direction in the time interval intervening between the application of successive control pulses to the driver tube, and means provided by the pulse signal flowing in each of the driver tubes, the modulator tube and the output tube to render the rectifier inoperative to charge the condenser during the period of the pulse duration and during such period to cause the voltage in the capacity element effectively to add to the voltage applied to the output tube during periods of pulse duration and during periods of pulse interruption the charge in the capacity element applied through the rectifier so that the charge approaches the voltage normally applied to the rectifier.

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