

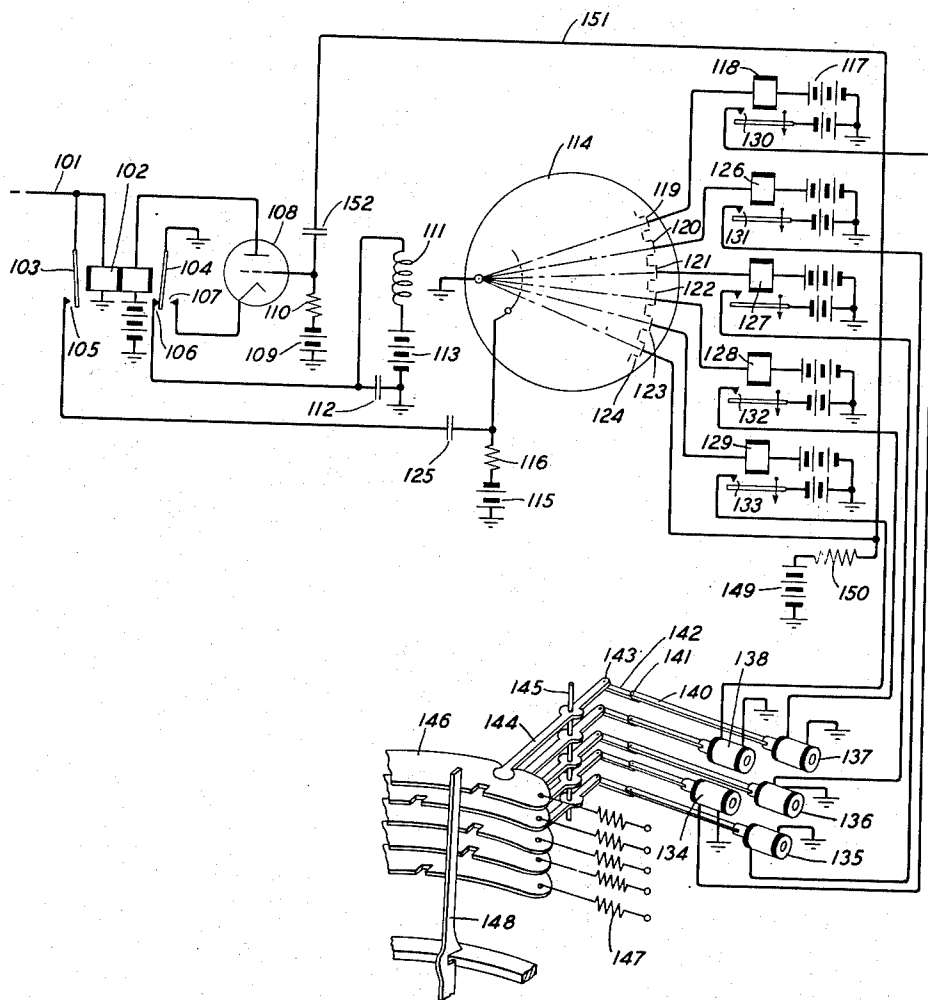
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SELECTING SYSTEM

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2,375,044

SELECTING SYSTEM

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This invention relates to selecting mechanisms and more particularly to an improved selecting arrangement for use primarily in communication circuits, although it is not so limited and may find wide application as a selector for many purposes, either in its present or modified form.

More specifically this is an improved selecting mechanism comprising a multianode electron beam tube having an improved control circuit. As presently arranged the tube and its control circuit may be considered as performing the usual functions of the well-known start-stop distributor in telegraph or teletypewriter systems.

An object of this invention is the improvement of selectors.

A more particular object of this invention is the improvement of selectors in communication circuits.

A further object of this invention is the improvement of start-stop distributors in telegraph and teletypewriter systems.

A feature of this invention is an improved control circuit for a multianode electron beam tube.

Another feature of the invention is an oscillating circuit in which a transient voltage is developed to control the movement of the electron beam in a multianode beam tube.

Another feature of this invention is a gas tube in the input circuit of the multianode electron beam tube to control the direction of certain of the pulses of a signal train to the input of the electron beam tube and to perform functions analogous to the stop functions in the usual rotary electromechanical start-stop distributor in a teletypewriter circuit.

These and other features of the invention will become apparent from the following description when read with reference to the drawing herein.

Refer now to the drawing.

Before proceeding with the detailed description of the operation of the circuit the condition of the circuit when idle will be described.

All of the apparatus shown on the drawing is assumed to be located at a teletypewriter receiving station. A telegraph channel 101 which may be of any of a number of forms extends to a distant receiving station either directly or through telegraph repeating equipment. The communication signals which are received over channel 101 comprise a train of seven signal impulses consisting of a start signal impulse followed by a permutation code combination of five character or function determining signal

impulses and a stop signal impulse. The start signal impulse is always a no-current impulse, each of the five following impulses is either a current or no-current impulse in accordance with the particular code combination and the last impulse is always a current impulse. Normally, when the channel is in condition for communication, both when it is idle and when it is in the so-called marking condition, direct current flows through conductor 101 and through the left-hand winding of relay 102 to ground energizing relay 102. In this condition the armatures 103 and 104 are actuated to the positions shown. Armature 103 is disengaged from its contact 105. Armature 104 engages its contact 106 and contact 107 is open. Positive battery is connected through the right-hand winding of relay 102 to the anode of tube 108 which may be either a special gas-filled tube or a secondary emission tube, more fully described below. Negative battery 109 is connected through resistance 110 to the grid of tube 108. Since contact 107, through which ground may be connected to the cathode of tube 108, is open, the tube 108 is not activated while the receiving circuit is awaiting the first or starting signal impulse.

Inductance 111, condenser 112 and battery 113 are connected so that they may form an oscillating circuit under control of grounded armature 104 and contact 106 which is connected to the junction between the inductance and the condenser. The inductance coil 111 serves as the deflecting coil for the electron beam in tube 114. It is mounted adjacent and external to the envelope of multianode electron beam tube 114 and is so disposed with relation to the tube that the magnetic field of coil 111 invades the space within the envelope between the grid and anodes of the tube and controls the movement of the electron stream when emitted by the cathode by reason of the intensity of the field. The coil is so disposed with relation to the paths between the cathode and anodes that the magnetic field of coil 111 is substantially at right angles to the beam when the beam is directed at anodes 121 and 122.

There are six anodes in tube 114. These anodes are equally spaced in alignment preferably horizontally at the end of the tube opposite that in which the cathode and grid are located.

The grid may be of any of a number of usual types but is preferably of spiral type. In front of the six anodes is a screen having apertures in alignment with the six anodes.

Multianode electron beam tubes are well

known in the art. Such tubes are described, for instance, in Patent 2,217,774 to A. M. Skellett, April 11, 1940, and a tube of this type suitably designed to operate to function as above described and to direct the electron stream and control its flow is contemplated as the tube element 114 of this disclosure.

Negative battery 115 is connected through resistance 116 to the grid of tube 114. Positive battery such as 117 is connected through the winding of a relay such as 118 individually to each of the five upper anodes of tube 114, such as anode 119. The magnitude of the negative potential 115 is such that while contact 105 remains open, no electron beam is established in tube 114 between the cathode and any of the anodes.

While armature 104 is in engagement with contact 106, both the left-hand and right-hand terminals of condenser 112 are grounded. Current flows from grounded positive battery 113 through inductance coil 111, contact 106 and armature 104 to ground. Inductance 111 is energized. The magnetic field of the inductance, as mentioned above, invades the envelope of the tube. For the waiting condition the magnitude of the magnetic field of inductance 111 is such that it would tend to direct a beam if emitted in a direction to the left of the first anode 119.

The operation of the circuit will now be described in detail. It was explained that, while the circuit was awaiting the reception of the first or starting signal impulse of a signal train, current flows through conductor 101 energizing the left-hand winding of relay 102 and maintaining armatures 103 and 104 in the position in which they are shown on the drawing.

The first signal impulse of each train is always a no-current impulse. In response to this the left-hand winding of relay 102 will be deenergized, releasing armatures 103 and 104. Contacts 105 and 107 will be closed.

The closing of contact 107 grounds the cathode of gas tube 108 which is immediately activated. Current flows through the right-hand winding of relay 102 to the anode of tube 108, from the anode to the cathode and through contact 107 to ground. The right-hand winding of relay 102 will be energized. The effect of the current in the right-hand winding of relay 102 opposes the effect of current in its left-hand winding and is dominant over the effect of the current in the left-hand winding when the current of succeeding current impulses of the signal train flows in the left-hand winding. When current signal impulses, among the following train of signal impulses for a particular permutation code combination, flow through the left-hand winding they tend to actuate the armatures 103 and 104 to the positions in which they are shown on the drawing, but since the effect of the current in the right-hand winding of relay 102 is dominant, armatures 103 and 104 will be maintained in engagement with contacts 105 and 107.

After contact 105 closes, the circuit incoming from conductor 101 is connected through a parallel branch which extends through armature 103, contact 105, and condenser 125, which connects to the junction between the top terminal of resistance 116 and the grid of tube 114.

When armature 103 is released in response to the reception of the first or starting pulse which, as has been explained in the foregoing, is a no-current pulse, the no-current starting pulse produces no effect upon the input circuit of tube 114. The disengagement of armature 104 from

contact 106, by disconnecting ground from the left-hand terminal of the condenser, permits the condenser to start charging and initiates the first portion of an oscillating voltage in the oscillating circuit to tend to deflect the beam toward the right. The time of this portion of an oscillation and the magnitude of the voltage and consequently the rate of movement of the beam are controlled by a choice of constants of the inductance 111, the condenser 112 and the voltage 113 so that the period of the swing of the beam is substantially equal to the duration of a signal train minus the time of release and reoperation of relay 102. Those of the elements of the signal train following the no-current start pulse which are current elements will effect a change of potential between the grid of tube 114 and ground so as to cause the emission of an electron beam in tube 114 which will be directed at a particular anode corresponding in position to the position of the particular current signal element in the train. When a signal element of a particular permutation combination is a no-current element, no beam is emitted. Each of the relays connected to an anode upon which a beam impinges will operate. Each relay, such as 128, which operates establishes a circuit from battery through a closed contact on the relay such as 132, and through the winding of a solenoid such as 137 to ground. Each solenoid which is operated actuates a bar such as 140 to the right. The bar 140 is connected at its left-hand end by means of a pin 141, to the right-hand end of the link bar 142, the left-hand end of which is attached by means of a pin 143 to the right-hand end of a lever 144, which is arranged substantially at right angles to the link bar 142. The lever 144 is rotatable in a limited arc about the vertical fulcrum 145. The lever 144 is attached at its left-hand end to a permutation code selecting vane which is normally actuated to the right by spring 147. When the solenoid is actuated, the vane 146 is actuated to the left against the tension of spring 147. Each of the other relays controls a particular vane corresponding to vane 146 in a similar manner. In response to the reception of a particular code combination the vanes, such as 146, will be set in such position that they will permit the entrance of a particular selecting bar such as 148 to effect a particular selection corresponding to the code combination. The relays are made slow to release. No relay releases until a selection is effected.

It was explained above that the seventh or last signal element of each signal train is always a current signal element. In response to this a beam will always be directed at anode 124. Current thereupon flows from positive battery 149 through resistance 150 and from anode 124 to the cathode of tube 114 which is grounded. A circuit which in effect is a potentiometer may be traced from positive battery 149 through resistance 150, conductor 151, condenser 152 and resistance 110 to negative battery 109.

The grid of gas tube 108 is connected to a point in this potentiometer circuit between condensers 152 and resistance 110. Tube 108 may be either a special gas tube with a closed grid such as is described in Patent 2,113,392 to Sydney N. Baruch, April 5, 1938, or it may be a so-called secondary emission tube such as is described in Patent 2,293,177 to A. M. Skellett, August 18, 1942. Such tubes while having certain of the characteristics of trigger tubes also have the

characteristic that the grid may control also the inactivation of the tube.

As a result of the impinging of the beam on anode 124 a transient condition is produced in the potentiometer circuit and a large negative potential is impressed between the grid of tube 108 and ground. As a result of this tube 108 is inactivated. The right-hand winding of relay 102 is thereupon deenergized.

Since the seventh or stop pulse is a current pulse, the left-hand winding of relay 102 is energized and as soon as the right-hand winding of relay 102 loses control, the armatures 103 and 104 will again be actuated to the positions indicated.

Selecting bar 143 is withdrawn under control of apparatus (not shown) forming part of the teletypewriter receiver which is well known in the art. Vanes 146 are restored to their original positions by the springs such as 147. The mechanism is then ready for the reception of the succeeding combination.

What is claimed is:

1. A multianode electron beam tube, an input circuit connected to said tube, means directly responsive to said input circuit for controlling changes in the position of the beam in said tube, said means comprising a beam deflecting inductance coil connected to a capacitance to form an oscillating circuit, and means connected to said input circuit responsive to the reception of a signal impulse for generating a variable voltage in said oscillating circuit to control the movement of said beam.

2. A multianode electron beam tube, an input circuit connected to said tube, means in said input circuit for controlling changes in the position of the beam in said tube, said means comprising a beam deflecting inductance coil connected to a capacitance to form an oscillating circuit, means connected to said input circuit responsive to the reception of a signal impulse for generating a variable voltage in said oscillating circuit to control the movement of said beam, an electron discharge device connected to said input circuit, and means connected to said device for controlling said oscillating circuit.

3. A teletypewriter signal receiving circuit, a telegraph signal receiving relay connected to the input of a multianode electron beam tube signal distributor in said circuit, a beam deflecting device connected to said distributor, said device consisting of a deflecting inductance coil, a condenser and a battery, means connected to said

device for establishing conditions tending to direct an electron beam at a particular anode in said distributor at a first time, and means directly responsive to a signal impressed on said relay for controlling said device to direct the beam in said tube at other anodes in said tube at a second time.

4. A telegraph channel connected to a teletypewriter receiving circuit for receiving a train of signal impulses followed by a stop signal impulse, a multianode electron beam tube in said circuit, means in said circuit responsive to the reception of the first signal of said train for connecting said channel to the input of said tube and directing the succeeding signals of said train to the input of said tube, means also in said circuit for directing an electron beam at a particular anode in said tube in response to the reception of said stop signal impulse by said circuit, and means comprising a second tube in said circuit responsive to the impinging of said beam on said particular anode for disconnecting said channel from the input of said electron beam tube.

5. A telegraph channel, a multianode electron beam tube, a telegraph signal receiving device, means responsive to the reception of the first of a train of signals by said device for connecting said channel to the input of said tube, and means responsive to the reception of the last of a train of signals by said tube for disconnecting said channel from said input.

6. A telegraph channel connected to a telegraph signal receiving device, a multianode electron beam tube, a beam deflecting coil adjacent said tube, means responsive to the reception from said channel by said device of the first of a train of telegraph signal impulses for impressing a transient voltage on said coil to control the direction of beams emitted by said tube, and other means responsive to the reception of said first impulse for directing succeeding impulses of said train to the input of said tube.

7. A start-stop permutation code telegraph receiving circuit comprising a multianode electron beam distributor tube, a beam deflector for said tube including means responsive to a start signal impulse for generating a transient beam deflecting voltage, and a beam restorer for said tube comprising means responsive to a stop signal impulse for generating a fixed beam directing voltage.

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