

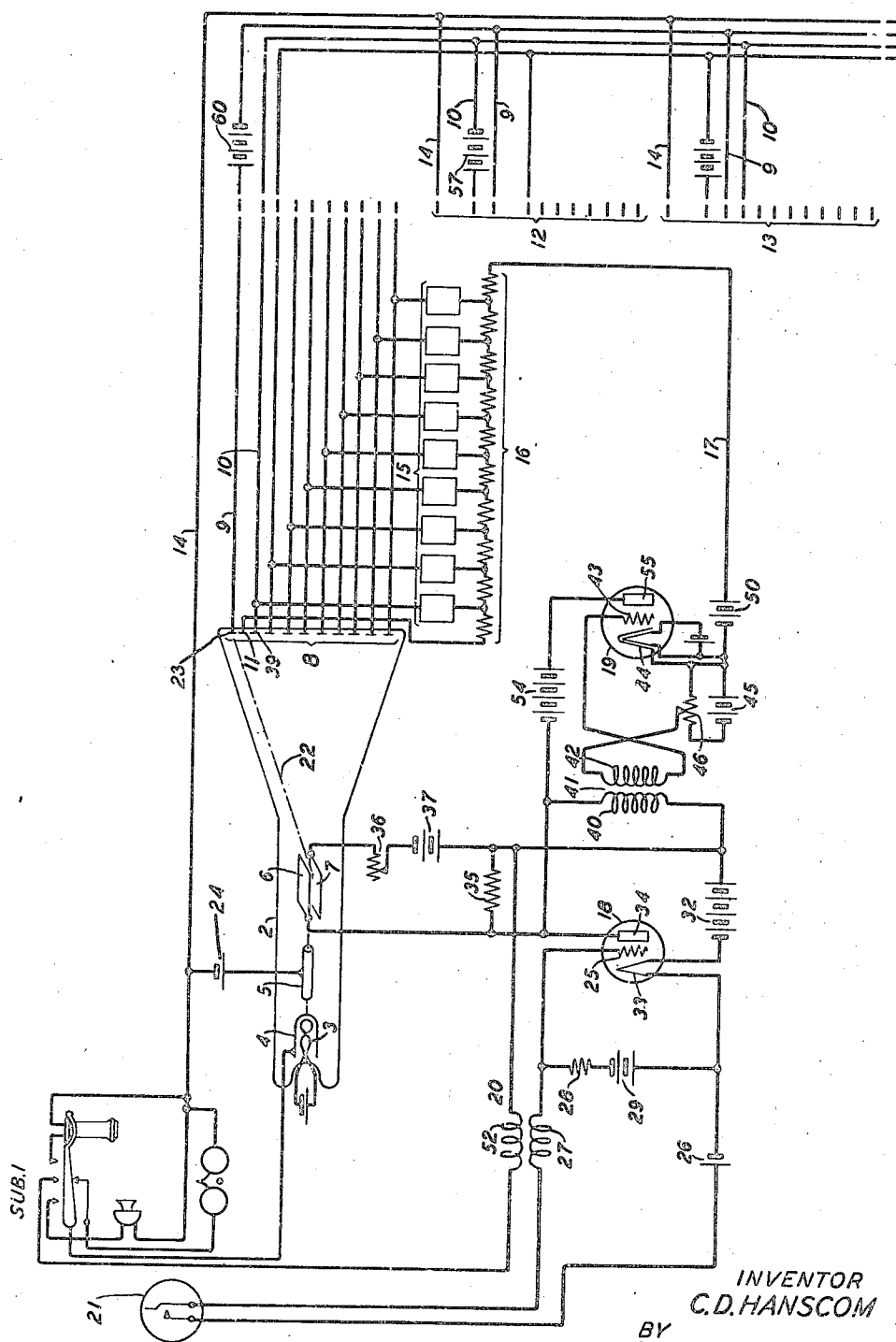
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SIGNALING SYSTEM

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SIGNALLING SYSTEM

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This invention relates to telephone systems and particularly to improvements in automatic telephone systems.

An object of the invention is to simplify and improve automatic telephone systems of the character in which connections are established over a path including the beam of an electronic device.

Heretofore systems have been provided in which a connection from one subscriber's line to any one of a plurality of other subscribers' lines has been established by deflecting the beam in a cathode ray tube to corresponding contacts at the end of the tube and using the beam as part of the talking path.

The present invention has been applied to an arrangement of this kind in which a cathode ray tube is employed as the selector for establishing telephone connections by the deflection of an electronic beam by dial pulses; and a feature thereof is the arrangement whereby the beam is maintained locked in a deflected position by a circuit over the beam and whereby the dial pulses causing the deflection are extinguished as soon as the deflection is accomplished.

The invention has been illustrated in the accompanying drawing which shows a calling subscriber's line and a cathode ray tube used as the selector employed in accordance with the principles of this invention.

Referring now to the drawing a subscriber's substation has been shown at 1 with the line terminating in the cathode ray tube 2 which is provided with the usual filament 3 connected to a suitable source of current for the production of an electron beam through the tube. This beam is employed as the selecting means and as a path for talking current as will hereinafter be described. The cathode element 4 is connected to the subscriber's line, and an anode 5 is provided to control and concentrate the beam of electrons as is well known in the art. The battery 24 is provided to impress a positive potential on anode 5 with respect to cathode 4. A pair of deflection plates 6 and 7 are provided in the tube in any well-known manner to deflect the beam onto the anode terminals shown located at the end of the tube and collectively marked with the numeral 8. To these terminals are connected individual conductors. The first conductor 9 represents one conductor of the first subscriber's line and the remaining conductors lead to other equipments of this kind for other subscribers' lines and are equally spaced with respect to each other, except the distance between the conductor 9 and the

second conductor 10. This distance represents, if the subscriber at 1 is considered as the first subscriber in a group of ten, two spaces so that when the beam is deflected to select the second subscriber it must be deflected two steps. The first step will point the beam onto a terminal 11 which is provided for holding the beam between pulses as will hereinafter be described. The corresponding terminals for the second subscriber terminate in the group designated with the reference character 12 and the corresponding terminals for a third subscriber terminate in the group designated with the number 13. Another conductor 14 is common to all groups of conductors leading to all of the subscribers' equipments.

The individual subscriber's conductors as for example, the group 8 terminating at the first subscriber's equipment are connected to individual filters marked as a group with the numeral 15 and provided to prevent voice currents from passing through the resistances 16 to the conductor 17 which is employed as will hereinafter be described in connection with the operations of the circuits.

Two discharge tubes 18 and 19 are connected through various circuits including sources of potentials and an induction coil 20, one winding of which is connected to a dial 21 for the sending of the impulses to deflect the beam to the proper terminal in the tube 2. The tube 19 may be of the gas-filled type, so that the anode discharge current continues to flow following the removal of the input signal.

A detailed description will now be made of the operation of this system in the selecting and establishing of a connection from the subscriber at 1 to one of the other nine of the group of ten subscribers. It should be noted that normally the electrons emitted from the cathode 4 provide a cathode ray beam 22 which is controlled by the anode 5 and normally maintained deflected by the potential difference between plates 6 and 7 to strike the terminal 23 so that calls incoming to subscriber 1 may pass over this beam as will hereinafter be described. With this in mind, if the subscriber at 1 removes his receiver from its switchhook, he closes the circuit between the element 4 and the anode 5 through the battery 24 to control the beam to establish a talking connection as will be described. If the subscriber then operates his dial 21 by closing a connection between the pulse contacts, it will be noted that on the first impulse the potential on the grid 25 of the tube 18 will be changed to become less

negative due to the connection of the battery 26 through the secondary winding 27 of the induction coil 20 across the resistance 28 and battery 29. This causes current to flow through the tube 18 over the output circuit from battery 32, filament 33, plate 34, resistance 35, back to battery 32. It will be observed that it is the connection through the potentiometer 36, the battery 37, and resistance 35 that normally maintains a potential difference between the plates 6 and 7 to maintain the beam 22 on terminal 23. On the other hand on the establishing of the circuit through the output circuit of tube 18, the potential between plates 6 and 7 is changed so that the potential on plate 6 becomes less positive in relation to the potential on plate 7. This change is sufficient to deflect the beam from the terminal 23 one step downwardly to strike the terminal 11. No selective connection will be established across the beam at this time as it takes two impulses to establish a connection to terminal 39 for establishing a connection to the second subscriber in the group of ten.

It should be explained at this point how the beam is maintained on a terminal after having been once set. The operations in this respect are as follows: A current through the output circuit of tube 18 also flows through the primary winding 40 of the induction coil 41. This causes a momentary impulse of current to flow through the secondary winding 42 of this induction coil 41 which has the effect of making the grid 43 less negative in relation to the potential of filament 44 as normally established by the battery 45 and potentiometer 46 in parallel and the connection through the secondary winding 42 of the induction coil 41 between the filament 44 and the grid 43. This momentary change of potential between these elements causes a current to flow through the output circuit of the tube for maintaining the potential difference now established between the plates 6 and 7 as follows: From filament 44, battery 50, conductor 17, resistances 16, second terminal 11, beam 22, element 4, contacts on the switchhook of subscriber 1, primary winding 52 of induction coil 20, resistance 35, battery 54, plate 55, back to filament 44. As the plates 6 and 7 are connected to opposite sides of resistance 35, the potential difference established between these plates will now be maintained by this circuit through resistances 16 so that the beam will be held on the terminal 11. The current through this circuit also establishes through the circuit including winding 27 of the inductance coil 20, a momentary impulse which is in opposition to the current passed through this circuit by the closing of the contacts at dial 21 and therefore extinguishes the pulse established by their contacts at 21 through the output circuit of tube 18. Thus the impulse that causes the beam to stop is quenched immediately to obviate the possibility of moving the beam a second step accidentally. The circuits now remain in this condition so that beam 22 is held on terminal 11 until the next impulse comes along.

When this takes place, that is, when the contacts of dial 21 are again closed, the potential difference between the plates 6 and 7 is again changed, and thus causes the beam to be deflected to strike terminal 39 whereupon the above-mentioned circuit through the tube 19 and resistances 16 is closed with the exception that a portion of this resistance is eliminated so that the beam will now be maintained on this terminal until the next impulse comes along. The

second impulse is extinguished by the momentary impulse through the winding 27. These operations are then repeated if additional impulses are sent and the potential on plate 6 is made less and less positive as the resistance through the circuit for maintaining the potentials decreases as additional units of the group 16 are eliminated.

The line potential filters shown at 15 are as stated for the purpose of preventing talking current from disturbing the holding circuits. There is one of these filters inserted in each line between the resistances 16 and the terminals associated therewith.

If it is assumed that only two impulses are sent, 15 the beam will remain on terminal 39 and a connection will therefore be established over the common conductor 14, the subscriber's telephone set 1, control element 4, beam 22, terminal 39 and the conductor 10, thus causing the selection of the second subscriber. This circuit is continued over the conductor 10 through talking battery 57. The conductor 10 terminates in the second subscriber's cathode ray tube at the first terminal corresponding to terminal 23 in tube 2. From there it is extended through the beam corresponding to beam 22, the element corresponding to element 4, through the called subscriber's ringer back over the common conductor 14. This causes the called subscriber's ringer to operate and when the called subscriber answers, the ringer is eliminated and a connection is completed for talking between the first and second subscribers. If the second subscriber had called the first subscriber, he would have dialed one impulse and established a connection through his tube, over conductor 9, through talking battery 60, beam 22, element 4, subscriber's ringer at station 1, common conductor 14, back to the second subscriber's equipment, over the elements and beam of the tube corresponding to tube 2 to conductor 9. In a similar manner connections may be established from any subscriber to any other in the system disclosed in this drawing which comprises as stated a group of ten subscribers' lines.

What is claimed is:

1. In a signaling system, a cathode ray tube, a plurality of anodes in said tube, means for deflecting the cathode ray in said tube from one anode to another, and means operative over said ray for maintaining the ray deflected on an anode after having been deflected by said first means to said anode and until said first means again deflects the ray to a succeeding anode.
2. In a signaling system, a cathode ray tube, signaling circuits, a plurality of anodes in said tube, means for transmitting momentarily succeeding impulses, means for deflecting the cathode ray in response to succeeding impulses from one anode to another to select said signaling circuits, and means for maintaining the ray deflected on an anode between impulses.
3. In a signaling system, a cathode ray tube, a plurality of anodes in said tube, an impulse transmitter, means for deflecting the cathode ray in said tube from one anode to another in response to succeeding impulses from said transmitter, and means for maintaining the deflected ray in the deflected position on an anode after the impulse having deflected it to said anode ceases and until the ray is again deflected by another impulse to another anode.
4. In a signaling system, a cathode ray tube, a plurality of anodes in said tube, an impulse transmitter, means for deflecting the cathode ray in

said tube from one anode to another in response to succeeding impulses from said transmitter, means for operating said deflecting means to maintain said ray deflected between impulses and for extinguishing said impulses as soon as they have deflected the ray.

5. In a signaling system, a cathode ray tube, a plurality of anodes in said tube, an impulse transmitter, means for deflecting the cathode ray in said tube from one anode to another in response to succeeding impulses from said transmitter, and circuit means including the ray for operating said deflecting means to maintain said ray deflected and for extinguishing said impulses as soon as they have deflected the ray.

6. In a signaling system, a cathode ray tube, a plurality of anodes in said tube, means for deflecting the cathode ray in said tube from one anode to another, a circuit closed over said ray when deflected to an anode for maintaining said ray deflected on said anode until again deflected to another anode, and a communication circuit established over said cathode ray.

7. The combination in signaling system of an electron discharge tube having a plurality of electrodes and means for producing an electron discharge, a plurality of telephone lines connected respectively to said electrodes, means for progressively deflecting the electron discharge from one electrode to the next to select a desired one of said telephone lines, circuit means including the electron discharge for maintaining said discharge on each successive electrode to which it is deflected, and circuit means including said electron discharge for establishing a talking connection with the selected one of said telephone lines.

8. In a signaling system, a cathode ray tube, a plurality of anodes in said tube, an impulse transmitter, means for deflecting the cathode ray in said tube from one anode to another in response to succeeding impulses from said transmitter, a discharge tube, means for actuating said discharge tube in response to succeeding impulses from said transmitter, and means responsive to the actuation of said discharge tube and including said cathode ray for extinguishing said impulses as soon as they have deflected the ray and for operating said deflecting means to main-

tain said ray deflected on the anode to which it has been deflected by a preceding impulse until a succeeding impulse is received.

9. In a cathode ray tube, deflection plates in said tube, a plurality of anodes in said tube, an impulse transmitter, a discharge tube, a circuit between said impulse transmitter and said discharge tube for the actuation of the discharge tube in response to impulses from said transmitter, an output circuit from said discharge tube to said deflection plates for deflecting the cathode ray from one anode to another in succession in response to impulses from said transmitter, a second discharge tube, an input circuit for said second discharge tube associated with the output circuit of said first discharge tube for actuating said second discharge tube each time said output circuit is actuated, an output circuit for said second discharge tube including the cathode ray for maintaining the deflection of the ray as deflected by a preceding impulse and for quenching said preceding impulse as soon as said output circuit of said second discharge tube becomes effective until a succeeding impulse is received to deflect the ray to a succeeding anode.

10. In a signaling system, a cathode ray tube having deflection plates, a calling signaling circuit associated with said tube, a plurality of anodes in said tube, a signaling circuit associated with each anode, an impulse transmitter, means including a discharge tube and the deflection plates operative in response to succeeding impulses from said transmitter to deflect the cathode ray from one anode to another to select a signaling circuit and connect it to the calling signaling circuit over said ray, a second discharge tube associated with said first discharge tube and deflection plates responsive to the actuation of said first discharge tube by an impulse from said transmitter for maintaining the cathode ray deflected on the anode to which it has been deflected and for extinguishing the impulse that caused said deflection, said maintaining of the ray on a particular anode being effective until the first discharge tube and deflection plates respond to a succeeding impulse to deflect the ray to a succeeding anode.

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