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DISTRIBUTOR DEVICE

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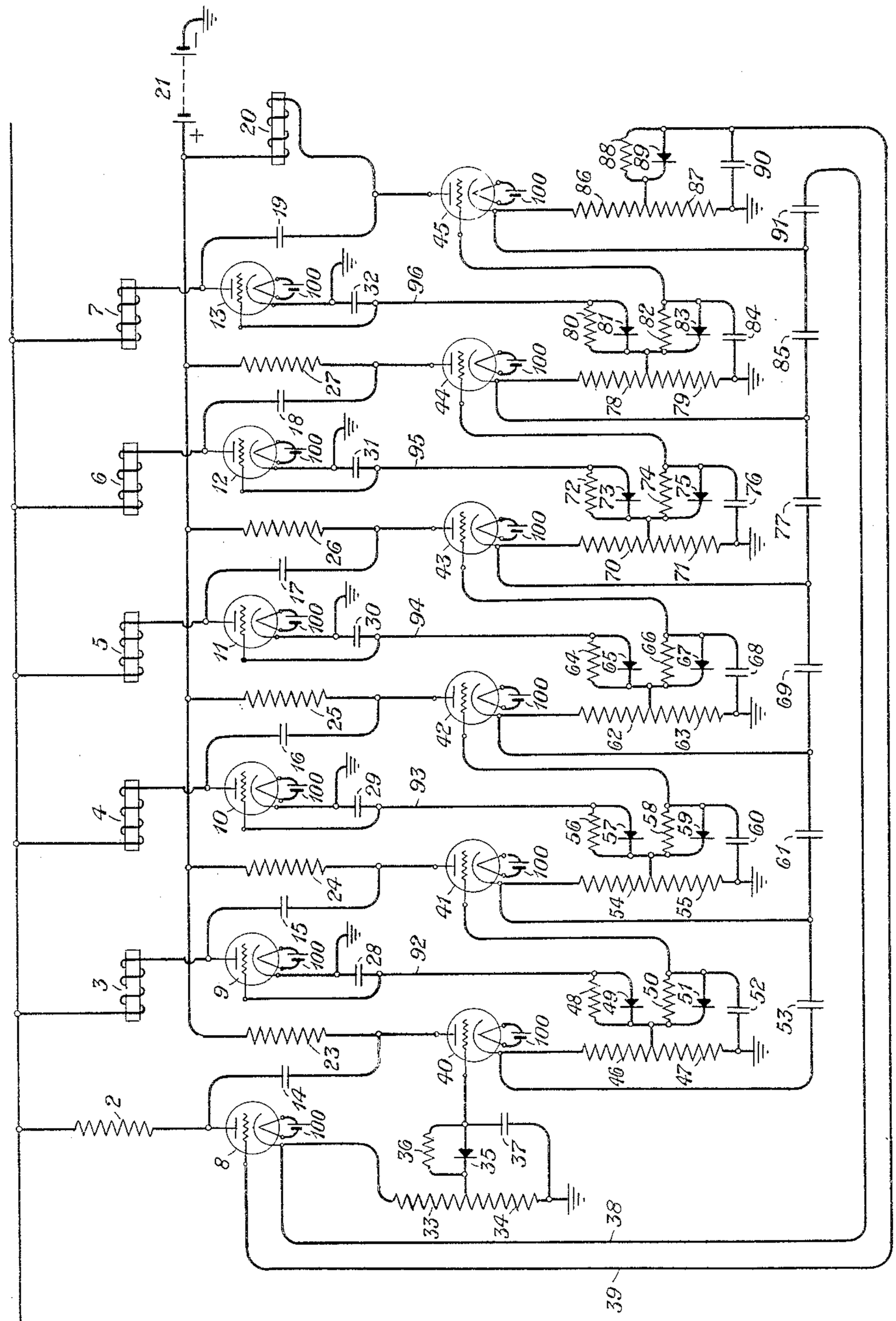

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DISTRIBUTOR DEVICE

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This invention relates to signaling systems and, more particularly, to improved arrangements for the reception of signals transmitted over such systems.

The arrangements of the invention provide a novel distributor of the start-stop type suitable for the operation of telegraph printers which are well known in the art. In the distributor device of this invention gas-filled discharge tubes and circuits therefor are utilized for controlling the electromagnet armatures operating the code bars and the printing mechanism. Accordingly, the distributor device of the invention has the advantage that it requires very few mechanical moving parts. Accordingly, the maintenance needed for a device of this type will be lessened and the speed of operation will be increased. Other objects and features of the invention will appear more fully from the detailed description hereinafter given.

The invention may be more fully understood from the following description, together with the accompanying drawing, in which is shown a circuit diagram embodying a preferred form of the invention.

In the drawing is shown a telegraph line **1** over which signals are being transmitted for reception by the distributor device of the invention. The distributor device comprises the magnets **3**, **4**, **5**, **6** and **7**. These are the electromagnets which operate the code bars of telegraph printers well known in the art. These magnets are controlled by the operation of a first series of gas-filled discharge tubes **9**, **10**, **11**, **12** and **13**. This first series of gas-filled tubes is in turn controlled by the operation of a second series of gas-filled discharge tubes **40**, **41**, **42**, **43** and **44**. A starting tube **8** is provided which in response to a start signal will start a cycle of operation of the second series of tubes **40**, **41**, **42**, **43** and **44**. The tubes in the second series are arranged to operate sequentially with predetermined intervals and control the ability of the tubes of the first series to operate in response to the incoming signals. A further tube **45** is provided which may control the printing magnet **20**. The tubes utilized may be of the so-called positive-grid type in which the grid must be positive with respect to the cathode before an arc can strike to the anode, but this is merely a matter of convenience as this eliminates the need for negative bias grid batteries. In utilizing the distributor of the invention it is necessary that marking signals should be made by applying positive battery to line **1**, while negative battery or an open circuit must be used for spacing signals.

The operation of this device may be understood from the following description of one operating cycle. Initially suppose that there is an arc established in tube **45**, but that all other tubes are in the non-arcing condition. Current will be flowing from a local direct current source **21** through the printing electromagnet **20**, arc path of tube **45**, resistances **86** and **87** to ground and thence back to the grounded terminal of source **21**. Reference character **100** indicates the source of cathode heating energy for all tubes. While this has been shown as a separate battery for convenience in the disclosure, in most cases it would, of course, be preferable to use a common source.

The flow of current through the resistances **86** and **87** raises their common junction to a positive potential with respect to ground and this will cause condenser **90** to charge up slowly due to the flow of current through resistance **88**. Rectifier **89** is so connected as to oppose the passage of current in a direction tending to charge the ungrounded terminal of condenser **90** to a positive potential. After a predetermined interval, fixed by the values of condenser **90**, resistance **88** and the voltage drop across resistance **87**, the charge in condenser **90** will be sufficient to raise the grid of tube **8** to such a value that an arc can strike therein. But no arc will strike until the positive marking "start" impulse is sent out over line **1** from the transmitting terminal. When this occurs a surge will be transmitted from the cathode of tube **8** over conductor **38** and through condenser **91** which will momentarily make the cathode of tube **45** positive with respect to its anode, thus suppressing the arc therein. As soon as current ceases to flow in resistance **87** condenser **90** will discharge through rectifier **89**, but this will not affect the arc in tube **8**. After current has passed through resistances **33** and **34**, connected between ground and cathode of tube **8**, for a sufficient period, the drop in resistance **34** will have charged condenser **37** through resistance **36** to a sufficiently high voltage so that an arc will strike in tube **40**, which occurs immediately, current being supplied from source **21** through resistance **23** to and through the arc path of tube **40** and thence to ground through resistances **46** and **47**. The surge transmitted from the anode of tube **40** through condenser **14** when the arc struck in **40** will lower the anode potential of tube **8** to a value negative with respect to the cathode, until condenser **14** recharges. This in-

terrupts the arc in tube 8. But the voltage drop across resistance 47 charges condensers 52 and 28 through their respective leak resistances 50 and 48. After a predetermined interval the grid of tube 9 is sufficiently positive to permit an arc to strike therein and operate code bar magnet 3, if a marking signal be sent at this time. But if no signal be sent, electromagnet 3 will not be energized and the No. 1 code bar will remain in its normal position to which it was restored after printing the preceding character, as electromagnet 20 released when the arc in tube 45 was broken. After a second interval, predetermined by making resistance 50 larger than resistance 48, or condenser 52 larger than condenser 28, or both, the grid of tube 41, connected to condenser 52, will become sufficiently positive to cause an arc to strike therein. This tube will extinguish the arc in tube 9, if any, by the negative surge transmitted from its anode to that of tube 9 when the arc struck, while a positive surge transmitted from the cathode of tube 41 through condenser 53 to the cathode of tube 40 will extinguish the arc in the tube last named.

The flow of current from source 21 through resistance 24, to and through the arc path of tube 41, and via resistances 54 and 55 to ground will, as before, cause a voltage drop across resistance 55, which will charge condenser 29 through resistance 56, over conductor 93, and which will also charge condenser 60 through resistance 58. When the arc was stopped in tubes 9 and 40 condensers 52 and 28 discharged quickly through rectifiers 51 and 49, respectively, so that these tubes will now remain inoperative until the next cycle. But, as before, condenser 29 charges more rapidly than 60, due to the circuit constants used, so that tube 10 will have a positive grid bias and be in a position to pass current and operate code bar magnet 4 if a marking signal be sent at this time. As soon as condenser 60 acquires sufficient charge an arc will strike in tube 42, which will extinguish the arc in 41 by the positive surge transmitted from the cathode of tube 42 through condenser 61. A negative surge will also be sent from the anode of tube 42 to the anode of tube 10, through condenser 16, extinguishing the arc, if any, in tube 10. Condensers 29 and 60 will discharge through rectifiers 57 and 59 as soon as the arc in tube 41 is extinguished.

When the arc strikes in tube 42 current will flow from source 21 through resistance 25 to the anode of tube 42, and through the arc path to resistances 62 and 63 and thence to ground. As before, condensers 30 and 68 will charge from the voltage drop across resistance 63, through resistances 64 and 66. Condenser 30 will reach a voltage permitting the arc to strike in tube 11 if a marking signal be received at this time, and later, when sufficient charge has collected in condenser 68, an arc will strike in tube 43, which will extinguish the arc in tube 42 by the positive surge transmitted through condenser 69 from the cathode of tube 43 and will also extinguish the arc in tube 11, if any, by the negative surge through condenser 17. The arc current of tube 43 is supplied from source 21 through resistance 26 and after passing through the tube, to ground through resistors 70 and 71. Condensers 68 and 30 will discharge through rectifiers 65 and 67 as soon as the arc is extinguished in tube 42. But the positive potential applied to condensers 31 and 76 through resistances 72 and 74 from the drop across resistance 71 will charge these condensers at a predetermined rate such that first the grid of tube 12 will become sufficiently positive to permit an arc to strike, if a marking signal be then received, while after a predetermined interval the charge on condenser 76 will be sufficient to permit an arc to strike in tube 44. By the action of condensers 77 and 18 this will extinguish the arc in tube 43 and also in 12, if a marking signal had been received.

As before, the flow of arc current in tube 44 from source 21 through resistance 27, and thence through the arc of tube 44 to ground through resistances 78 and 79, will start to charge condensers 32 and 84 by the drop across resistance 79, through resistances 80 and 83. Condensers 31 and 76 will have discharged through rectifiers 72 and 75 immediately upon the stopping of the arc in tube 43. Condenser 32 will reach a voltage sufficient to allow a marking signal to cause an arc to strike in tube 13 and actuate the fifth code bar through electromagnet 7 before condenser 84 acquires sufficient charge to permit the arc to strike in tube 45. But after a predetermined interval the arc will strike in tube 45 and, as before, this will extinguish the arc in tube 44 by the action of condenser 85, and also the arc, if any, in tube 13, by the action of condenser 19. Condensers 32 and 84 will at once discharge through rectifiers 81 and 83 when the arc stops in tube 44.

The striking of the arc in tube 45 energizes the print magnet 20 and causes the teletypewriter equipment to print the letter required by the code bars actuated, which is in turn determined by which of the tubes 9 to 13, inclusive, received marking signals while their grids were at a potential sufficiently positive to permit arcs to strike. But the striking of the arc in tube 45 completes the cycle described.

A brief consideration will show that the cycle goes on to the point where tube 8 is in a position to strike an arc, and tube 8 alone of the tubes receiving anode current from the line. Thus the cycle will stop when tube 45 has been passing current for a predetermined interval until the line 1 receives another marking impulse as a start signal from the transmitting terminal.

The timing between the various steps of the complete cycle is determined by the values of resistance and capacity in the grid circuits, such as resistance 58, capacity 60, for example. These should be so adjusted that a cycle is completed in slightly less time than the cycle at the transmitter, so that there will be a slight pause for each start impulse. The length of time during which a marking signal can be received depends on the relative timing of the grid circuits of the signal tube and the next control tube, for example, signal tube 10 and control tube 42.

While the gas-filled tube distributor device of this invention has been shown as utilized to control the electromagnets of a printer, this is for purposes of illustration only. It is to be understood that the gas-filled tube distributor device could be used to operate other signaling devices or signaling circuit arrangements in response to signals sent over the line from a similar transmitting distributor.

While the invention has been shown as illustrated in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A signal line, a plurality of signaling devices connected to said line, a first series of gas-filled discharge tubes corresponding to said signaling devices, each of the tubes of said series having their anode-cathode circuits arranged to directly serially include corresponding ones of said signaling devices, a second series of gas-filled discharge tubes corresponding to the tubes of said first series, circuit arrangements for the tubes of said second series so arranged that said tubes will operate and release sequentially with predetermined intervals, and circuit arrangements controlled by the operation and release of the tubes of said second series for conditioning the corresponding tube of said first series for operation whereby the tubes of said first series may operate in response to signals transmitted over said line.

2. A signal line, a plurality of signaling devices connected to said line, a first series of gas-filled discharge tubes corresponding to said signaling devices, each of the tubes of said series having their anode-cathode circuits arranged to directly serially include corresponding ones of said signaling devices, a second series of gas-filled discharge tubes corresponding to the tubes of said first series, and circuit arrangements controlled by each of the tubes of said second series when operated to condition the corresponding tube of the first series for operation, to release the next preceding tube of the first series, to release the next preceding tube of the second series and after a predetermined interval to operate the next succeeding tube of the second series.

3. A signal line, a plurality of signaling devices connected to said line, a first series of gas-filled discharge tubes corresponding to said signaling devices, each of the tubes of said series having their anode-cathode circuits arranged to directly serially include corresponding ones of said signaling devices, a second series of gas-filled discharge tubes corresponding to the tubes of said first series, circuit arrangements for the tubes of said second series so arranged that said tubes will operate and release sequentially with predetermined intervals, and circuit arrangements controlled by the operation and release of the tubes of said second series for conditioning the corresponding tube of said first series for operation whereby the tubes of said first series may operate in response to signals transmitted over said line, an auxiliary gas-filled discharge tube connected to said line, means whereby said auxiliary tube will be operated when a start signal is transmitted thereover, and circuit arrangements controlled by the operation of said auxiliary gas-filled tube for starting a cycle of operation of the tubes of said second series.

4. A signal line, a plurality of signaling devices connected to said line, a first series of gas-filled discharge tubes corresponding to said signaling devices, each of the tubes of said series having their anode-cathode circuits arranged to directly serially include corresponding ones of said signaling devices, a second series of gas-filled discharge tubes corresponding to the tubes of said first series, circuit arrangements for the tubes of said second series so arranged that said tubes will operate and release sequentially with predetermined intervals, and circuit arrangements controlled by the operation and release of the tubes of said second series for conditioning the corresponding tube of said first series for operation whereby the tubes of said first series may operate in response to signals transmitted over said line, an auxiliary gas-filled discharge tube connected to said line, circuit arrangements whereby said last-mentioned tube will be operated when a start signal is transmitted over said line, means controlled by the operation of said auxiliary gas-filled tube for starting a cycle of operation of the tubes of said second series, means controlled by the operation of the first tube of said second series for releasing said auxiliary gas-filled tube, and means controlled by the completion of a cycle of operation of the tubes of said second series for conditioning said auxiliary tube for operation by a start signal transmitted over said line.

5. A signal line, a plurality of signaling devices connected to said line, a first series of gas-filled discharge tubes corresponding to said signaling devices, each of the tubes of said series having their anode-cathode circuits connected to corresponding ones of said signaling devices, a second series of gas-filled discharge tubes corresponding to the tubes of said first series, circuit arrangements for the tubes of said second series so arranged that said tubes will operate and release sequentially with predetermined intervals, and circuit arrangements controlled by the operation and release of the tubes of said second series for controlling the ability of the tubes of said first series to operate in response to signals transmitted over said line, a first auxiliary gas-filled discharge tube connected to said line, circuit arrangements whereby said last mentioned tube will be operated when a start signal is transmitted thereover, means controlled by the operation of said first auxiliary tube for starting a cycle of operation of the tubes of said second series, means controlled by the operation of the first tube of said second series for releasing said first auxiliary gas-filled tube, a second auxiliary gas-filled discharge tube operated after a predetermined interval by the operation of the last tube of said second series, means controlled by the operation of said second auxiliary tube for conditioning said first auxiliary tube for operation when a start signal is transmitted over said line, and means controlled by the operation of said first auxiliary tube for releasing said second auxiliary tube.

6. A signal line, a plurality of signaling devices connected to said line, a first series of gas-filled discharge tubes corresponding to said signaling devices, each of the tubes of said series having their anode-cathode circuits connected to corresponding ones of said signaling devices, a second series of gas-filled discharge tubes corresponding to the tubes of said first series, circuit arrangements for the tubes of said second series so arranged that said tubes will operate and release sequentially with predetermined intervals, and circuit arrangements controlled by the operation and release of the tubes of said second series for controlling the ability of the tubes of said first series to operate in response to signals transmitted over said line, a first auxiliary gas-filled discharge tube connected to said line, circuit arrangements whereby said last-mentioned tube will be operated when a start signal is transmitted over said line, means controlled by the operation of said first auxiliary tube for starting a cycle of operation of the tubes of said second series, means controlled by the operation of the first tube of said second series for releasing said first auxiliary gas-filled tube, a second auxiliary gas-filled dis-

charge tube operated after a predetermined interval by the operation of the last tube of said second series, means controlled by the operation of said second auxiliary tube for conditioning said first auxiliary tube for operation when a start signal is transmitted over said line, means controlled by the operation of said second auxiliary tube for releasing the last tubes of said first and second series, and means controlled by the operation of said first auxiliary tube for releasing said second auxiliary tube.

7. A signal line and a start-stop distributor connected thereto, said distributor comprising a plurality of electromagnets connected to said line for operating code bars of a printer, a first series of gas-filled discharge tubes corresponding to said electromagnets, each of the tubes of said series having their anode-cathode circuits connected to corresponding ones of said electromagnets, a second series of gas-filled discharge tubes corresponding to the tubes of said first series, circuit arrangements for the tubes of said second series so arranged that said tubes will operate sequentially with predetermined intervals, and circuit arrangements controlled by the operation and release of the tubes of said second series for controlling the ability of the tubes of said first series to operate in response to signals transmitted over said line, a first auxiliary gas-filled discharge tube connected to said line, circuit arrangements whereby said last mentioned tube will be operated when a start signal is transmitted thereover, means controlled by the operation of said first auxiliary tube for starting a cycle of operation of the tubes of said second series, means controlled by the operation of the first tube of said second series for releasing said first auxiliary gas-filled tube, a second auxiliary gas-filled discharge tube operated after a predetermined interval by the operation of the last tube of said second series, means controlled by the operation of said second auxiliary tube for conditioning said first auxiliary tube for operation when a start signal is transmitted over said line, means controlled by the operation of said first auxiliary tube for releasing said second auxiliary tube, and a print magnet controlled by the operation of said second auxiliary tube for effecting the printing of the signal required by the code bars actuated by the operation of said electromagnets.

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