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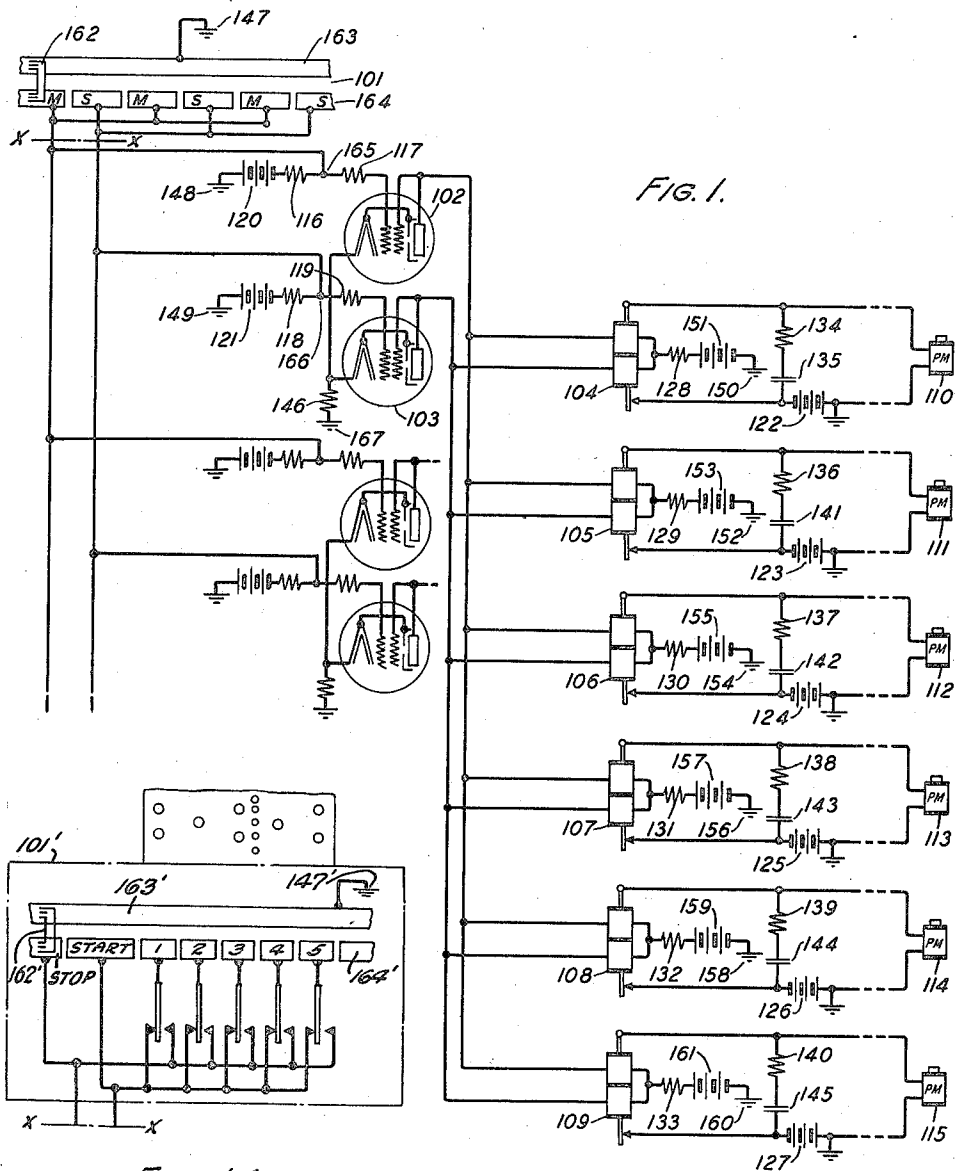


FIG. 1A.

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TELEGRAPH TRANSMITTING SYSTEM

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9 Claims. (Cl. 173-73)

This invention relates to telegraph systems and particularly to a device for transmitting telegraph signals from a single telegraph transmitter to a large number of telegraph receivers simultaneously. Various devices for accomplishing this purpose are well known in the communication industry. The invention herein is an improved means for performing this function.

An object of this invention is improved transmission of telegraph communication from a single transmitter to a plurality of receivers.

In the operation of telegraph and teletypewriter systems it frequently becomes necessary to transmit communication signals to a large number of outlying points from a common sender as in the distribution of news, stock quotations, police alarms, etc., by means of wire networks or radio telegraph networks. In such cases it is desirable that a single transmitting source, or multiple sender as it is known in the art, be used to serve as many connected lines as possible, without impairment of the transmitted signals beyond permissible limits and without overloading the common transmitting device beyond its operable current carrying capacity. It is obvious that as the number of lines with which the common sender is connected may be increased, in an operable system, the number of such senders required is reduced. In the testing of lines also, it is desirable for reasons of economy to make it possible to interconnect as many lines as possible to a common signaling source.

A feature of this invention is a single telegraph sending device controlling the grid potential of a plurality of high vacuum tubes.

A further feature of this invention is an arrangement wherein a plurality of high vacuum tubes arranged in pairs are connected to the output of a transmitter distributor and one tube of each pair is used for transmitting marking signals and the other tube of each pair is used for transmitting spacing signals in a telegraph transmission circuit.

A further feature of this invention is a pair of high vacuum tubes having their output circuits connected to corresponding windings of a plurality of polar relays arranged in a parallel group. Each of said relays has two windings, one in series with the output circuit of each of said pair of tubes.

These and other features will be made apparent in the detailed description and claims hereinafter.

Fig. 1 of the drawing shows a single transmitting device controlling the grid potential of a pair of high vacuum tubes, to the output of which tubes are connected a group of polar relays each of which transmits into a telegraph circuit. The conventional transmitter distributor, arranged to send a series of pulses of equal length, is indicated as the common transmitter of this figure. Fig. 1A shows an alternative transmitter distributor arrangement for that part of Fig. 1 above the line XX. In this figure, a widely known tape controlled start-stop transmitter distributor arranged to send Baudot code signals is shown according to the usual convention.

In the drawing, biasing negative battery is normally connected between the grid and cathode of each tube and positive battery to the anode of each tube so that neither tube is conducting. The circuits for this condition may be traced as follows: For tube 102 grid the circuit may be traced from ground 148 to the positive pole of battery 120, through 148 to the positive negative pole, through resistance 116, junction point 165 and resistance 117 to the grid of tube 102. For tube 103 grid, the circuit may be traced from ground 149, to the positive pole of battery 121, through said battery to the negative pole, through resistances 118 and 119 to the grid of tube 103. The output circuits for the tubes may be traced from ground 150, to the negative pole of battery 151, through said battery to the positive pole and through resistance 128 to a parallel circuit. One branch of said parallel circuit extends through the top winding of polar relay 104 to the anode of the tube 102. The second branch extends through the bottom winding of polar relay 104 to the anode of tube 103. The cathodes of tubes 102 and 103 are connected in parallel through resistance 146 to ground 167. The grids of tubes 102 and 103 are each sufficiently negative with respect to their cathodes, for this condition, so that neither one is conducting. The conducting brush 162 sweeps across the rings of distributor 101, bridging the gap between solid conducting ring 163 and the successive conducting segments of ring 164 which are alternately marked M, for mark, and S, for space. When brush 162 bridges the gap between solid conducting ring 163 and the first conducting M segment on ring 164, a circuit may be traced from ground 147, through ring 163, brush 162 and the first, or left-hand segment M, to junction point 165 in the biasing path for tube 102 heretofore traced. This

grounds biasing battery 120, at the right-hand terminal of resistance 116 and impresses ground potential, through resistance 165, to the grid of tube 102. This overcomes the biasing potential and tube 102 becomes conducting, permitting a current flow in its plate circuit heretofore traced through the top winding of relay 104, across the space between the anode and cathode of tube 102 and through resistance 146 to ground 167. The top winding of relay 104 is energized so that its armature is actuated to the right to engage its cooperating contact and transmit a marking signal over the loop connected to said armature to the distant receiving magnet 110. The circuit for this may be traced from ground, through battery 122, the closed contact and armature of relay 104, the top conductor of the loop circuit to the distant station, through the winding of receiving magnet 110 and the bottom loop conductor back to ground at the central station.

Resistance 134 and condenser 135, shunting the armature and contact of polar relay 103 are connected in the circuit to provide contact protection against sparking as the armature makes and breaks with its cooperating contact.

When the brush 162 leaves the first conducting M or marking segment on ring 164, it sweeps across a small insulated gap between said M segment and the succeeding conducting S or spacing segment. During this interval ground is disconnected from the grid of tube 102 and tube 102 becomes non-conducting. When brush 162 engages the first S, or spacing segment, a circuit may be traced from ground 147, through ring 163, brush 162 and the first S segment, to junction point 166 in the biasing path heretofore traced to the grid of tube 103. This grounds biasing battery 121 at the right-hand terminal of resistance 118 and impresses ground potential through resistance 119 on the grid of tube 103. This overcomes the biasing potential and tube 103 becomes conducting, permitting a current to flow in its plate circuit, heretofore traced, through the bottom winding of relay 104, across the space between the anode and cathode of tube 103 and through resistance 146 to ground 167. The bottom winding of relay 104 is energized. The effect of this is to disengage its armature from its contact. This opens the loop circuit heretofore traced, transmitting a spacing signal to the distant receiving magnet 110. When brush 162 has passed over the first S segment of ring 164, ground is disconnected from the grid of tube 103 and the biasing battery 118 again becomes effective to stop conduction through the plate circuit of tube 103. As brush 162 sweeps over the succeeding alternate M and S segments, the cycle is repeated. Assuming that relay 104 is properly adjusted, unbiased marking and spacing signals are transmitted to the distant receiving magnets.

A number of circuits similar to the top loop circuit described are connected in multiple to the output of tubes 102 and 103. These circuits which are connected from plate batteries 153, 155, 157, 159 and 161, extend through their respective resistances 129 to 133, and through the top and bottom windings of relays 105 to 109 to the anodes of tubes 102 and 103, respectively. These relays operate simultaneously with relay 104 to control their distant respective receiving magnets 111 to 115 connecting and disconnecting batteries 123 to 127 from the respective loops. Resistances 136 to 140 and condensers

140 to 145 provide protection for their corresponding contacts.

Six relay circuits have been shown multiplied to the output of the one pair of tubes 102 and 103. The number of circuits which may be so connected is dependent on the ratio of the output current of each tube to the operating current required for a winding. If, for instance, the output current of a tube is 60 milliamperes and each winding requires 10 milliamperes, the top windings of six relays may be connected in parallel to the output of one tube and the bottom windings of six relays may be connected in parallel to the output of a second tube. In the drawing, one pair of tubes only, shown connected to the distributor 101, is arranged with a complete output circuit. The one pair shown and their connections are intended to be illustrative of the manner in which a plurality of pairs of tubes and their output circuits may be connected to a distributor. All of the grids of the marking signal tubes would be connected together and also all of the grids of the spacing signal tubes. The number which may be connected is dependent on the current which may be passed through a distributor satisfactorily without excessive commutation trouble, and the current drawn by the grid circuit of each tube. In one type of distributor in general use at present it has been found satisfactory to pass a current of 60 milliamperes. If one milliamperes is required by the grid circuits of the tubes, 60 pairs of tubes may be connected to one distributor and, for the conditions assumed, one distributor and 60 pairs of tubes will serve 360 receiving magnets. Attention is called to the arrangement of the polar relays in the output circuit, wherein not more than one winding is in series in any circuit. This is an advantage afforded by the present invention, as it is not necessary, with the arrangement described herein, to connect successive polar relays in series, with the attendant signal impairment, in order to obtain a satisfactory output from one transmitting device. However, it is possible, at the sacrifice of some signal quality, to connect transmitting relay windings in series with the windings of relays 104 to 109 up to the limit of the allowable signal quality impairment.

The invention will be used in testing as a means of transmitting substantially perfect signals from a single transmitting source to a large number of telegraph receiving circuits. Its most important commercial use, however, will probably be as a telegraph message broadcasting device. When used in this capacity, alternate marking and spacing signals are not transmitted. Instead the message to be broadcast is first recorded on a tape which is thereafter fed through a well-known cam-controlled contacting device cooperating with the transmitting distributor in a well-known manner to overcome the bias on either tube 102 or 103 in accordance with the particular combination of a five-unit code corresponding to the character to be transmitted. With this arrangement, as shown in Fig. 1A, each of five successive segments of ring 164' is connected individually to an armature on the contacting device. Each armature cooperates between an individual pair of opposed contacts associated therewith. All of the contacts on the same side of said armatures are multiplied together and connected to junction point 165. All of the contacts on the opposite side of said armatures are multiplied together and connected to

the junction point 166. The position of each armature is controlled in sequence in a well-known manner by a cam, to engage one or the other of its cooperating contacts in accordance with the punchings in the message tape. The solid ring 163' is grounded as in the drawing. As brush 162' sweeps over ring 163' and the segments of ring 164', ground is connected through each segment in succession to the junction point 165 or 166 in accordance with the code punched in the tape instead of alternately. In addition to the five elements comprising the character, a start signal is transmitted by connecting ground through ring 163', brush 162' and a segment located immediately before the first of the five character segments directly to junction point 166 to transmit a space signal as a start signal. Ground is also connected through ring 163', brush 162' and a segment located immediately after the segment for the last element of the character, directly to junction point 165 to transmit a marking signal at the end of each character as a stop signal. For the broadcasting of messages, essentially, the cam contacts and distributor cooperate to connect ground in accordance with the punched code characters to the grids of the marking or spacing tubes 102 or 103.

What is claimed is:

1. In a telegraph system, a single telegraph signal transmitter, a first and a second high vacuum discharge device and a plurality of polar relays, a first and a second input circuit connecting said first and second discharge devices to said transmitter, a first and a second output circuit, each comprising a winding on each of said relays connecting said discharge devices to said relays, means for transmitting marking signals through said first output circuit only, and means for transmitting spacing signals through said second output circuit only.

2. In a telegraph system, a transmitting distributor, a first circuit connecting said distributor to the input of a first high vacuum discharge device, a second circuit connecting said distributor to the input of a second high vacuum discharge device, a first output circuit connecting said first device to a first winding on a polar relay, and a second output circuit connecting said second device to a second winding on said relay.

3. In a direct current telegraph system, a single telegraph signal transmitter, a pair of high vacuum discharge tubes connected to said transmitter, a plurality of telegraph receiving channels connected to the outputs of said pair of tubes, and means for operating said receiving channels substantially in unison in response to the operation of said transmitter.

4. In a telegraph system, a telegraph signal transmitter, a plurality of vacuum tubes arranged in pairs connected to said transmitter, means in the circuits connecting each of said pairs of tubes to said transmitters for conditioning a first tube in each of said pairs to conduct marking signals only, and means in said circuits for conditioning the second tube in each of said pairs to conduct spacing signals only.

5. In a telegraph system, a plurality of polar relays, a first and a second winding on each of said relays, means for connecting said first windings in parallel to the output of a first high vacuum discharge device, and means for connecting said second windings in parallel to the output of a second high vacuum discharge device.

6. In a telegraph system, a plurality of polar relays, individual groups of said plurality having individual relays of each group with corresponding windings arranged in parallel to form two series circuits through each of said groups, a plurality of pairs of high vacuum tubes, one pair of each plurality associated with each of said groups, the output circuit of one of said tubes of each pair connected to the first of said series circuits and the output circuit of the other of said tubes of each pair connected to the second of said series circuits.

7. In a telegraph system, a single telegraph transmitter arranged to transmit code messages, a plurality of groups of telegraph receiving channels and individual circuits each comprising a pair of high vacuum discharge tubes connecting each of said groups of said receiving channels to said transmitter.

8. In a telegraph system, a single telegraph transmitter, a plurality of telegraph receiving channels, an individual one-way telegraph circuit connecting said transmitter and said plurality of receiving channels comprising a pair of high vacuum discharge devices one of which devices responds to a marking signal and the other of which responds to a spacing signal transmitted by said transmitter.

9. In a direct current telegraph system, a broadcasting circuit comprising a single transmitter connected through a pair of high vacuum discharge devices to a plurality of telegraph receiving channels, means in said circuit, responsive to marking signal means in said transmitter, for energizing one of said tubes of said pair to transmit a marking signal to said plurality of channels simultaneously, and means in said circuit responsive to spacing signal means in said transmitter for energizing the other of said tubes of said pair to transmit a spacing signal to said plurality of channels simultaneously.

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