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METHOD OF AND APPARATUS FOR SIGNALING IN HIGH SPEED TELEGRAPH SYSTEMS

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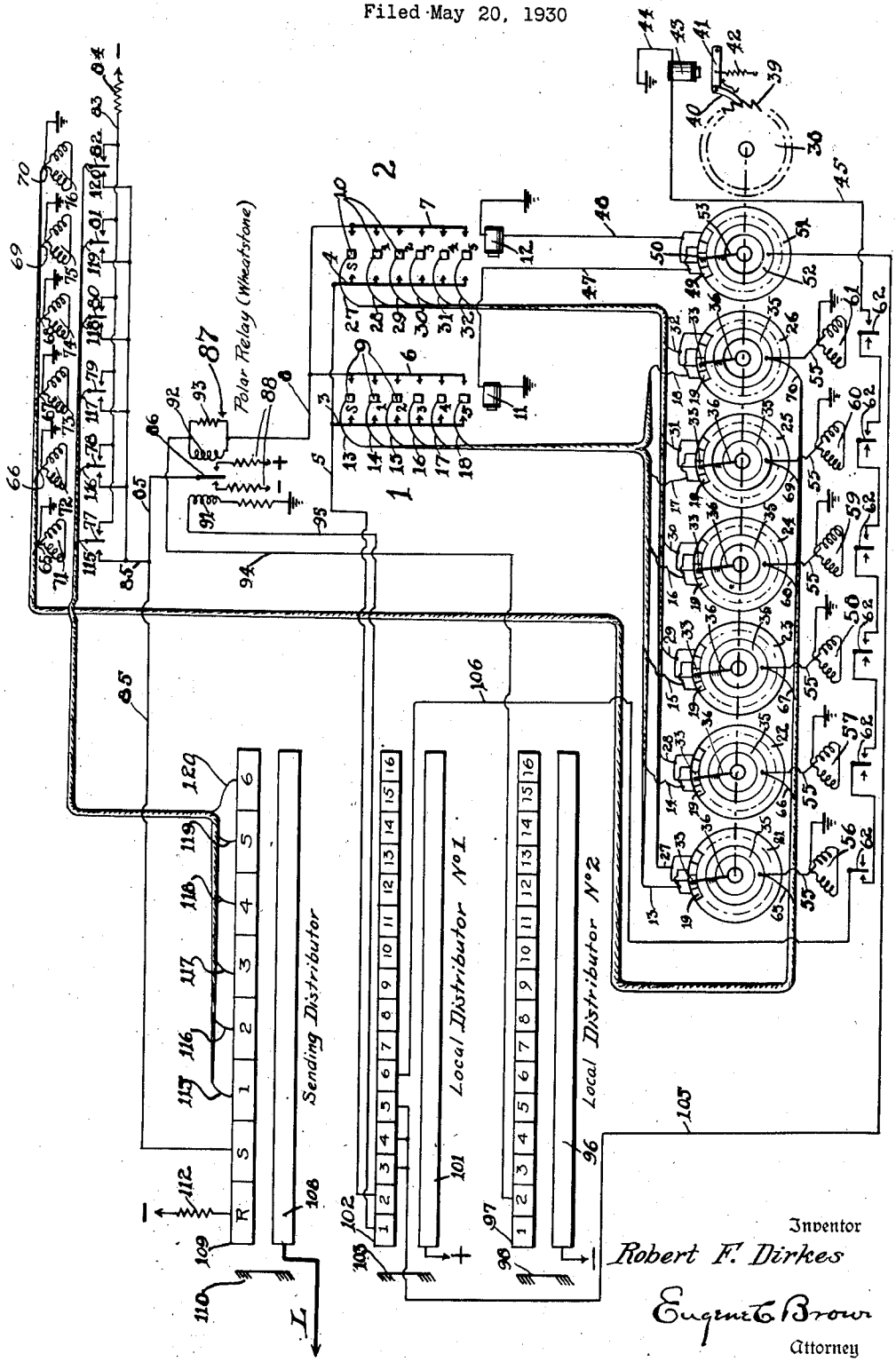

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METHOD OF AND APPARATUS FOR SIGNALING IN HIGH SPEED TELEGRAPH SYSTEMS

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My invention relates to apparatus for and methods of signaling and more particularly to high speed telegraph systems.

As is well known to those versed in the art, high speed telegraph systems and receivers have been developed to such a point that they are capable of operation at a greater speed than the transmitting operator can prepare a message for transmission. As a result, the sending operator cannot completely avail himself of the high speed at which the circuit may operate, that is, one operator cannot make use of all the line time available. However, when traffic is very heavy, it is particularly important that the signaling circuit be used at its maximum efficiency.

Accordingly an object of my invention is to provide a novel method of and means for using all of the line time of a signaling circuit available and at maximum efficiency.

I have discovered that in the case of high speed telegraph systems, maximum efficiency of the signaling circuit may be obtained by providing two or more transmitters for each circuit, each transmitter being supplied with tape prepared by an individual operator so that when the code combinations of impulses stored up on one tape by one of the operators has been transmitted over the circuit, the circuit may be switched to transmit stored up code combinations of impulse conditions stored up on another tape by another operator.

A further object of my invention is to provide novel means for switching a signaling circuit from one to another transmitter.

Still a further object of my invention is to provide novel means whereby an operator may control the switching of a signaling circuit from his transmitter to another transmitter.

In the simplex operation of printers, a distributor and a printer are employed. The printer is brought to a rest or idle position by the transmission of a steady current of marking polarity and is started into operation by the transmission of one pulse of spacing polarity called the start pulse.

A further object of my invention is to provide for the transmission of a steady marking impulse when it is desired to idle the receiving simplex printer without stopping the rotating members at the transmitting station.

A further object of my invention is to provide novel means for transmitting a stop or idle impulse while maintaining the transmitting distributor in rotation.

Heretofore an overlap in transmitters has been provided by employing two chains of relays, one of which is energized in accordance with the operation of the transmitting contacts to in turn transfer its setting to the second set of relays. While the second set of relays controls the transmission of the code combination, the first set of relays are reoperated in accordance with the new setting of the transmitting contacts. This is quite a complicated construction.

According to my invention, I provide a simplified overlap in the transmitter by arranging to make the transmitting contact effective only for momentary intervals during the transmitting period. Accordingly, an object of my invention is to provide novel overlap means in a transmitter.

A further object of my invention is to provide a transmitter in which the contacts are operated in accordance with a code combination while the transmitter is nonoperative and the transmitter is thereafter rendered operative.

According to a preferred embodiment of my invention I provide electrical switching means for switching the distributor element at the transmitter station from one transmitting element to another similar element, each of which is operated by an individual operator. Thus, two or more operators transmit through the same distributing element and thereby actuate the same circuit media of the same telegraph receiver, but in succession. The amount of time that each operator applies for transmitting through the circuit media may be readily governed by the operator himself. Thus, the switch-over operation may be performed manually by an operator when practically all of the message which he has stored up has been transmitted, or it may be performed auto-

matically after the transmission of a predetermined number of messages.

In the simplex circuit of recent developments, operating high speed tickers have been developed to a point where they will operate to print 500 to 600 characters per minute. It becomes obvious that no one operator could transmit that many characters in a minute and that it would take at least two operators or more to make maximum use of the signaling line time.

The various features and objects of the invention will be more fully understood upon reference to the following detail description taken in connection with the accompanying drawing, while the scope of the invention will be particularly pointed out in the appended claims.

In the drawing, the figure shown is the circuit diagram of the circuit and apparatus employed in a preferred embodiment of my invention.

A plurality of transmitters 1 and 2 are shown diagrammatically. Although tape transmitters are shown, storage transmitters may be employed if desired. The transmitters 1 and 2 are provided with spacing bus bars 3 and 4, respectively, connected in parallel to a conductor 5 and marking bus bars 6 and 7, respectively, connected in parallel to a conductor 8. The transmitters 1 and 2 are also provided with a set of tongues 9 and 10, respectively. The tongues, such as 9, of the transmitter 1, are operable in engagement with the bus bars 3 and 6 in various combinations in accordance with the perforations of the tape (not shown) of the transmitter in a manner well known to those versed in the art. Stepping magnets 11 and 12 are provided, one for each of the transmitters for stepping the tape following the transmission of each code combination of impulse conditions.

The tongues 9, of the transmitter 1, are connected over individual conductors 13 to 18, inclusive, to individual contact segments 19 of switching devices 21 to 26 which form part of a seven level automatic telephone switch as used in ordinary automatic telephony. Similarly, the tongues 10 of the transmitter 2 are connected over individual conductors 27 to 32, inclusive, to individual contact segments 33 of the switching devices 21 to 26. Each of the switching devices 21 to 26 is provided with a solid ring 35 and a brush 36 which is adapted to bridge the solid ring 35 either with a contact segment 19 or a contact segment 33.

The brushes 36 are fixed to a common shaft which is arranged to be operated step by step by a pawl and ratchet mechanism. This mechanism comprises a ratchet wheel 38 mounted on the common shaft and having teeth 39 engaged by a pawl 40. The pawl 40 is pivoted on an armature 41 which is normally held in retracted position by means of a spring 42. An electromagnet 43, which controls the armature 41, is grounded over conductor 44 and has its opposite terminal connected to conductor 45.

The tape-stepping magnets 11 and 12 are each connected to ground at one terminal thereof and at the opposite terminal are connected over conductors 47 and 48, respectively, to individual contact segments 49 and 50 of a switching device 51. The switching device 51 is provided with a solid ring 52 and a brush 53 fixed to the shaft which carries the brushes 36.

The brushes 36 are so positioned on their common shaft that they are, at any given time, all in engagement with their respective contact segments 19, or all in engagement with their respective contact segments 33. The brush 53 is so positioned on the shaft that it is in engagement with a segment 49 when the brushes 36 are in engagement with their respective segments 19 and it is in engagement with a segment 50 when the brushes 36 are in engagement with their respective segments 33. As will appear more clearly hereinafter, when the brushes 36 are on their respective segments 19, the transmitter 1 is associated with the main transmitting line whereas when the brushes 36 are on their respective segments 33, the transmitter 2 is associated with the main transmitting line.

The solid rings 35 of the distributors 21 to 26 are connected over individual conductors 55 to individual polar relays 56 to 61 each of which in turn controls an individual armature 62. The relays 56 to 61 are of the type generally known as Potts relays. The right hand contact of each of relays 57 to 60 is connected to the armature of the next succeeding relay. The left hand contact of relay 56 is connected to the armature of the next succeeding relay 57.

The contact of relay 61 in turn is connected to conductor 45 for controlling the energization of magnet 43 in a manner to be described in more detail hereinafter. The energizing circuit of the magnet 43 is controlled in accordance with a predetermined code combination of impulses transmitted through the switching devices 21 to 26 and functions, as will be described hereinafter, to rotat the brushes 36 for disassociating the operating transmitter from the system and for associating the next transmitter with the system.

The solid rings 35 of switching devices 21 to 26, in addition to the conductors 55, are provided with conductors 65 to 70 which extend to individual polar relays 71 to 76, respectively. These relays are also of the type generally known as Potts relays. The code combinations of impulse conditions stored in the transmitters are transmitted through the switching devices 21 to 26 and over the conductors 65 to 70 to variably oper-

ate the relays 71 to 76, as will be described in detail hereinafter. The relays 71 to 76 are provided with individual armatures 77 to 82, respectively, which operate between right and left hand contacts. The right hand contacts of these armatures 77 to 82 are connected in multiple and over the conductor 83 and resistance 34 to the negative side of battery. The left hand contacts are connected in multiple over conductor 85 to the armature 86 of a Wheatstone polar relay 87. Armature 86 is operable between its left and right hand contacts connected to negative and positive batteries, respectively, over resistances 88. The armature is controlled by two windings 91 and 92. The winding 92 is connected in multiple with the resistance 93 and is connected at one terminal to the marking buses 6 and 7 of transmitters 1 and 2 over conductor 8 and its other terminal is connected over conductor 94 to the second segment on a distributor designated local distributor No. 2. The winding 92 functions to control the transmission of the start impulse under control of local distributor No. 2 in a manner to be described hereinafter. The winding 91 has one terminal connected to ground and its other terminal connected over conductor 95 to the first segment on a distributor designated local distributor No. 1 and cooperates with winding 92 for controlling the transmission of the necessary synchronizing impulse. The solid ring 96 of local distributor No. 2 is connected to the negative side of battery and is successively bridged with the segments of the segmented ring 97 by the brush 98 as it rotates.

The solid ring 101 of local distributor No. 1 is connected to positive battery and is bridged with the segments of the segmented ring 102 by the brush 103 as it rotates. As explained above, the first segment of the segmented ring 102 is connected over conductor 95 to the winding 91 of the Wheatstone polar relay 87. Segment 2 of ring 102 in turn is connected over conductor 5 to the spacing bus bars 3 and 4 of transmitters 1 and 2. Segments 3, 4 and 5 of ring 102 are connected in multiple over conductor 105 to the solid ring 52 of switching device 51 for controlling the energizing circuits to the tape stepping magnets 11 and 12 periodically once for each revolution of the distributor brush 103. Segment 6 of the segmented ring 102 is connected over conductor 106 to the armature 62 of relay 56. When relays 56 to 61 are energized in accordance with a predetermined code combination, the armature 62 of relay 56 is in engagement with its left hand contact and the armatures 62 of relays 57 to 61 are in engagement with their right hand contacts. As a result, an energizing circuit is completed for the stepping magnet 43 to operate switching devices for disassociating the transmitter then in operation and associate another transmitter for operation.

In addition to the two local distributors No. 1 and No. 2, a third distributor designated sending distributor, is provided, comprising a solid ring 108 connected to the signaling line L over which the code combinations of impulse conditions are to be transmitted and successively bridged with the segments of the segmented ring 109 by a brush 110. It will be understood that the brushes 98, 103 and 110 are mounted upon a single shaft and rotate in unison. The brush 110 as it wipes over the rest segment R of the segmented ring 109, which is connected to negative battery over a resistance 112, impresses the normal stop current on the signaling line L. The next or starting segment S is connected over conductor 85 to the left hand contacts of armatures 77 to 82 and in multiple to the armature 86 of the Wheatstone relay 87 for the purpose of transmitting a stop or negative impulse over the signaling line L even while the distributor brush 110 is in rotation, as will be described in more detail hereinafter.

The segments 1 to 6 on the segmented ring 109 are connected over individual conductors 115 to 120 to the armatures 77 to 82 of the transmitting relays 71 to 76 for transmitting code combinations of impulse conditions over the signaling line L in accordance with the setting of the transmitting relays, as will now be described in connection with the operation of this system.

Operation

With the brushes 36 of the automatic switches 21 to 26 in engagement with their respective contact segments 33, as shown, circuits for relays 56 to 61 and relays 71 to 76 are completed over the brushes 36 and conductors 27 to 32 to the tongues 10 of the transmitter 2. Accordingly the transmitter 2 now controls the selective energization of relays 56 to 61 and relays 71 to 76 in accordance with the positions assumed by the tongues 10.

It will be assumed for the purpose of illustration that the selection for the letter Y has been set up on the transmitter 2. The tongues 1, 3 and 5 have been moved to engage the marking bus bar and the tongues S, 2 and 4 have been moved to engage the spacing bus bar.

The distributor brushes 98, 103 and 110 are rotating continuously as explained above. When, therefore, the brush 98 in its rotation, engages segment 2 on the ring 97, a circuit is completed for the right hand winding 92 of the Wheatstone polar relay 87, the circuit extending from negative battery over the solid ring 96 of local distributor No. 2, brush 98, segment 2 of ring 97, conductor 94 through the winding 92 of the Wheatstone polar relay 87, conductor 8 to the mark-

ing bus bars 6 and 7 of both the transmitters 1 and 2. Inasmuch as tongues 1, 3 and 5 of transmitter 2 are resting on the marking bus bar 7, negative battery is extended over these tongues and over conductors 28, 30 and 32 through the brushes 36 of switches 22, 24 and 26 to relays 57, 59 and 61 and in multiple over the conductors 66, 68 and 70 to relays 72, 74 and 76. Wheatstone polar relay 87 is energized and moves its armature 86 into engagement with its right hand contact. Relays 57, 59, 61, 72, 74 and 76 are energized to move their armatures into engagement with their right hand contacts. Concurrently with this circuit, positive current flows over the solid ring 101, brush 103, segment 2 of ring 102 and over conductor 5 to the spacing bus bars 3 and 4 of the transmitters 1 and 2. Inasmuch as tongues S, 2 and 4 of the transmitter 2 are in engagement with the spacing bus bar 4, this positive current will be extended over conductors 27, 29 and 31 to the relays 56, 58 and 60 and in multiple to relays 71, 73 and 75. Relays 56, 58, 60, 71, 73 and 75 are energized to move their armatures into engagement with their left hand or spacing contacts.

It will be noted that the right-hand or marking contacts of the relays 71 to 76 are connected to the negative side of battery and that the left hand or spacing contacts, through the operation of the Wheatstone polar relay 87, are connected to positive battery. It will also be noted that the segment S of the sending distributor is connected to positive battery over the armature 86. As described above, the armatures 77 to 82 are connected to individual segments 1 to 6 of the sending distributor. As the brush 110 wipes over the segment S a start impulse of positive polarity is transmitted from positive battery over armature 86, conductor 85, start segment S, brush 110, ring 108 and signaling line L. Thereafter, as the brush 110 wipes over each of the segments 1 to 6, the code combination in accordance with the setting of armatures 77 to 82 will be transmitted over the signaling line L.

When the brush 110 is wiping over the start and first segment of the sending distributor, the brush 103 wipes over segments 3, 4 and 5 of local distributor No. 1 establishing a circuit from positive battery over solid ring 101, brush 103, conductor 105, ring 52 and segment 50 of the switch 51 and over conductor 48, through stepping magnet 12 to ground. The stepping magnet 12 is energized and removes the tongues of the tape (not shown) from the perforations therein and prepares to step the tape one step in the manner well known in the art in connection with perforated transmitting tapes. When the brush 103 moves from segment 5 to segment 6, the magnet 12 is deenergized and the tape is stepped to the next position while the feelers move into the succeeding group of perforations in accordance with the next code combination to be transmitted. This has no effect at this time, however, due to the fact that the spacing and marking bus bars 4 and 7 are not connected to battery at this time.

Attention is directed at this time to the novel arrangement of the transmitter in which the tape feelers are first operated through the perforations in the tape and positive and negative polarity is thereafter applied to the marking and spacing bus bars once per revolution of the distributor. This permits of a very simple overlap without the necessity of an extra bank of relays, as has heretofore been employed in connection with an overlap at the transmitting station.

A further result of movement of brush 103 over segment 6 of local distributor No. 1 is to impress positive battery upon the conductor 106. This is for the purpose of performing a switching operation to another tape transmitter under certain conditions, as will be explained more fully hereinafter. In the present case, however, this has no effect inasmuch as the circuit over conductor 106 is broken at one of the armatures 62.

As the brushes 98, 103 and 110 continue to rotate, the code combination of impulses is transmitted now, as explained above, brushes 98 and 103 having no effect during this portion of the cycle.

At the end of the cycle the brush 110 wipes over the segment R and thereby transmits a resting or stop impulse of negative polarity over the signaling line L to the receiving printer. At this time, brush 103 is wiping over segment 1 of local distributor No. 1 and a circuit is completed over conductor 95 for the winding 91 of the Wheatstone polar relay 87. As a result of the current flowing through the winding 91, armature 86 is operated to engage its left hand contact and negative current is again impressed over conductor 85 to the start segment S.

As the brushes continue to rotate and brush 103 engages segment 2 of local distributor No. 1, positive battery is again impressed upon the spacing bus bars 3 and 4. At the same time negative current again flows over brush 98 and segment 2 of local distributor No. 2 and over conductor 94 through the relay winding 92 and over the circuit described above. Relay 87 is again energized and operates the armature 86 to engage its right hand contact applying positive battery to the conductor 85. It will be noted that this switching of the armature 86 occurs before the brush 110 engages the segment S of the sending distributor so that the negative current at the left hand contact of armature 86 is not impressed upon the signaling line L.

As is well known to those versed in the art of printing telegraphy, in the simplex opera-

tion of printers it is the accepted method to rest or idle a printer by sending to it a steady current of marking polarity and to start a printer in operation by sending to it one pulse of spacing polarity called the start pulse. The system herein explained to which my invention is applied provides for such sending of steady marking battery when it is desired to idle the receiving simplex printers, without stopping the rotating distributing member.

Let it be assumed that neither transmitter 1 or 2 is in operation for transmitting code combinations. None of the tongues of the transmitters will be in engagement with the marking or spacing bus bars. Accordingly, when the brush 98 engages segment 2 of local distributor No. 2, no circuit will be completed for the Wheatstone polar relay 87 as was the case when transmitter 2 was in operation. Inasmuch as relay 87 is not energized, armature 86 will remain in engagement with its left hand contact and consequently negative current will be applied to the start segment S and also to segments 1 to 6 over the armatures 77 to 82, irrespective of which contact these armatures engage since both the right hand and left hand contacts are now connected to negative battery. Accordingly, a stop impulse is impressed over the signaling line L to maintain the remote receiving printer in a stop condition while the distributor at the transmitting station continues to rotate and the transmitters thereat are not in operating condition.

During the continued rotation of the distributor brushes 98, 103 and 110, the above described cycle of operation is repeated, that is, first the energization of relay winding 91 and thereafter the energization of relay winding 92 to extend positive battery over armature 86 and the impression of negative polarity on bus bars 6 and 7 and positive battery on bus bars 3 and 4. Whenever, during any cycle of operation of the distributors the transmitter which is idle becomes operative again and one of the feelers engages the marking bus bar, the energizing circuit for the Wheatstone polar relay 87 is completed and the start impulse is impressed upon the signaling line L. Thereafter operations continue as hereinbefore described.

Let it be assumed now that the transmitter 2 is to be disassociated from the signaling line and the transmitter 1 is to be associated with said line. A predetermined code on the tape in transmitter 2 will energize the relays 56 to 61 in such a combination that the armature of relay 56 is operated to engage its left hand contact and the armatures of relays 57 to 61 are operated to engage their right hand contacts.

When now, the brush 103 wipes over segment 6 of local distributor No. 1, positive battery is extended over conductor 106 and over the first armature 62 and its left hand contact and the other armatures 62 and their right hand contacts in series, over conductor 45, through the winding of the stepping magnet 43 and conductor 44 to ground. The stepping magnet 43 becomes energized and operates its armature 41 to set the pawl 40 forward one tooth on the ratchet wheel 38.

When the brush 103 moves off segment 6, magnet 43 is deenergized and the spring 42 operates the pawl 40 to step the switching mechanism one step. Brushes 36 are thus moved to the next succeeding segment, thus disassociating the transmitter 2 from the signaling line and associating the transmitter 1 with the signaling line. Code combinations of impulses, prepared by the operator associated with transmitter 1, will thereafter be transmitted until the code setting is such as to again complete an energizing circuit for the stepping magnet 43 whereupon the switching operation again occurs to disconnect the transmitter in operation and connect another transmitter.

The invention has been described in connection with the well known rotating distributor provided with a simplex circuit for operation of high speed tickers which employ an eight-unit code consisting of a start impulse, six selection pulses and a rest pulse. It will be clear to those skilled in the art, that the invention may be applied to any system which uses rotating distributor devices.

Although only two transmitters have been shown for purpose of illustration, it will be obvious that any number of transmitters may be applied to this system. Moreover, although the invention has been illustrated in connection with simplex printers employing start and rest impulses, the invention is equally applicable when the receiving telegraph printer is not of this type and does not employ start and rest impulses. In that case no provision has to be made for transmitting a long pulse of marking polarity to maintain the printer idle, but on the contrary, it will only be necessary to transmit the selection impulses which may be five or six in number.

It is obvious that numerous changes may be made in the details set forth without departure from the essentials of the invention as defined in the claims. Thus, in place of relays 56 to 61, I may take advantage of the tape lever arm which is operated in accordance with the slack of the tape for controlling the switching operation whenever the tape becomes almost taut. I may, if desired, also utilize a separate impulse transmitted invariably after a predetermined number of code combinations have been sent, for operating the switching mechanism.

What I claim is:

1. In a communication system, a plurality of transmitting units, a distributor and means

operating within a character cycle period for switching said distributor automatically from one to the other of said transmitting units.

2. In a communication system, comprising a distributing means and a plurality of transmitting means, the method of operation which comprises switching the distributing means from one of said transmitting means to another in accordance with a predetermined code combination transmitted by the operating transmitting means, setting up a code combination upon the selected transmitter while it is inert, momentarily applying a potential source to said transmitter and simultaneously storing potentials poled in accordance with said code combination, and transmitting through said distributing means impulses corresponding to said stored potentials.

3. In a communication system, a plurality of transmitters, a distributor, means whereby said transmitters when in operation transmit code combinations of impulse conditions and switching means controlled by a predetermined one of said code combinations of a transmitter in operation for disconnecting said transmitter from said distributor and connecting another transmitter to said distributor.

4. In combination, a distributing means, a plurality of code transmitting means, and a switching means responsive to code combinations of impulses transmitted by one of said transmitting means for switching said distributor from one transmitting means to another.

5. In combination, a distributing means, a plurality of transmitting means, and switching means responsive to code combinations of impulses transmitted through said distributing means for automatically switching said distributing means from one of said transmitting means to another.

6. In a communication system, a continuously rotating distributor, a transmitter connected thereto, means for setting up a code combination upon the transmitter while it is inert, storing means connected to said transmitter, means for momentarily applying a potential source to said transmitter, and simultaneously storing potentials poled in accordance with said code combination in said storing means, and means for transmitting through said distributor impulses corresponding to said stored potentials.

In testimony whereof I affix my signature.

ROBERT F. DIRKES.