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COMMUNICATION SYSTEM

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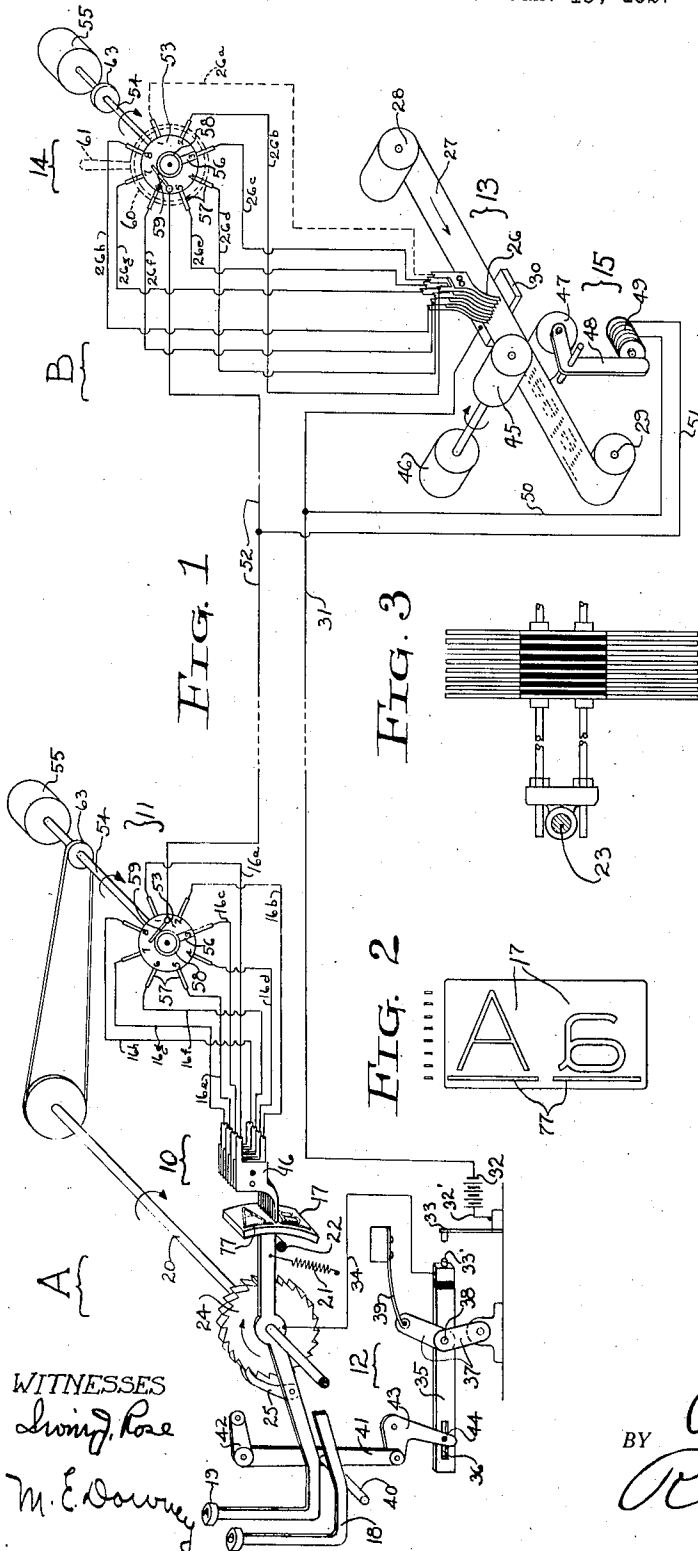


FIG. 1

FIG. 2

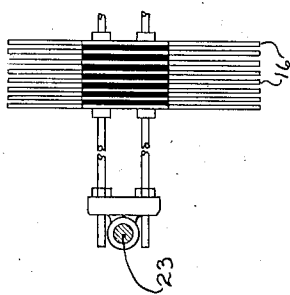


FIG. 3

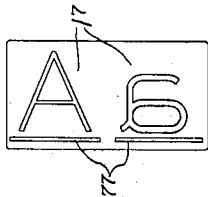


FIG. 4

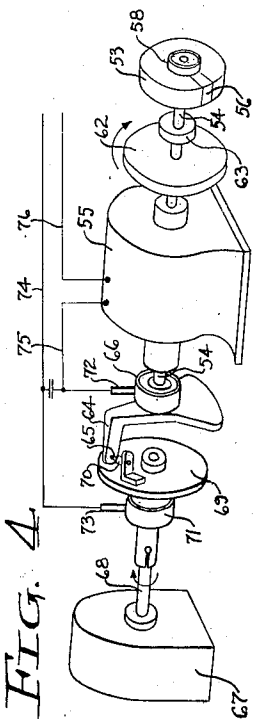
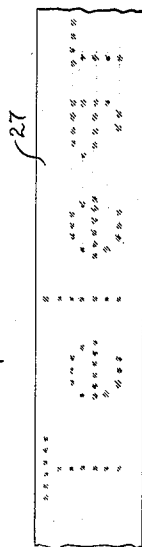


FIG. 5



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COMMUNICATION SYSTEM.

Application filed January 15, 1927. Serial No. 161,364.

The invention relates to communication systems and more particularly to that type of system for producing visible characters at a distance.

5 An object of the invention is to provide a communication system in which a plurality of character-forming impulses are transmitted simultaneously at one station and received simultaneously at another station to
10 record the characters formed by such impulses.

Another object of the invention is to provide a transmitter for such system including a plurality of contactors adapted to engage a
15 conducting character and to produce simultaneous character-forming impulses by the relative passage of the contactors over the character.

A further object is to provide a receiver
20 for said system including a group of contactors co-operating with a moving sensitized tape for simultaneously forming different portions of the same characters on said
25 tape in response to impressed impulses.

A further object is to provide simple and effective means for regulating and determining the relative velocity of the transmitter contactors and their co-operating conducting characters.

30 A further object is to provide simple and novel means for actuating the receiving tape only when characters are received and for suitably spacing the recorded characters on the tape.

35 A further object is to provide a transmitter in which the transmission of impulses occurs during the return of an actuator to normal position.

40 A further object is to provide simple and effective synchronizing means to permit transmission of a plurality of different impulses over the same line conductors.

45 A further object is to provide convenient means for determining and correcting out-of-phase relations between the synchronizing means.

A further object is to perfect details of construction generally.

50 The invention further consists in the several features hereinafter set forth and more particularly defined by the annexed claims.

In the accompanying drawings, Fig. 1 is a schematic diagram of a communication system embodying the invention;

Fig. 2 is a face view of one of the conducting characters in the transmitter; 55

Fig. 3 is a top plan view of one of the transmitter contactor groups;

Fig. 4 is a perspective detail view of one of the synchronizing devices; and 60

Fig. 5 is a fragmentary enlarged detail view of the sensitized receiving tape.

In these drawings, the letter "A" designates a transmitting station and the letter
"B" a receiving station. The transmitting 65

station "A" comprises generally an impulse-forming device 10, a synchronizing device 11, and a transmission controlling circuit-closer 12; while the receiving station "B" comprises generally an impulse-recording 70

device 13, a synchronizing device 14 and a tape-controlling device 15. The impulse-forming device 10 consists in general of a plurality of banks of contactors 16, each bank being adapted to contact with one or
75 more conducting characters 17 when the contactors and the characters are moved relatively to each other in a wiping motion.

In the present instance, the contactors 16 are indicated to be stationary while the characters 80 17 are formed as raised conducting surfaces or type faces on adjacent ends of levers or bars 18 terminating at their other ends in keys 19. If desired, the conducting characters need not be raised, but may be imbedded
85 in and flush with an insulating surface. The series of levers or bars 18 are loosely pivoted intermediate their ends on a shaft 20 rotatable at a constant speed, and each lever or bar 18 is urged by a spring 21 to a normal position against a stop 22. The keys 19 may be conveniently arranged in a key-board resembling that of a typewriter or calculating machine. Each type face 17 may include corresponding upper and lower case letters, 95 or other pair of characters, which are selectively co-operable with the adjacent bank of contactors 16 by shifting the contactor assembly on supporting guides 23, as seen in Fig. 3. This shifting of the contactor assembly may be accomplished by a shifting key (not shown) as commonly provided in typewriter construction. 100

The constant speed shaft 20 carries a plurality of ratchet wheels 24 (one being 105 shown) and each lever or bar 18 pivotally carries a pawl 25 engageable with the periphery of the ratchet wheel to determine a uni-

form rate of travel of the lever to normal position after its manual displacement produced by depression of the key 19. When the keys are not being operated, the ratchet wheels slip idly past the pawls, and the same is true when the keys are depressed, so as not to interfere with the variable speed of manual depression of the keys. By means of this construction, the levers or bars 18 are held to a constant angular velocity on their return to normal position.

The impulse-recording device of the receiving station includes a group of contactors 26 to correspond with the contactors 16 of the impulse-forming device 10, and these contactors 26 extend transversely of a sensitized paper tape 27 adapted to be unwound from a supply spool 28 and rolled onto a take-up spool 29. The contactors 26 bear on the tape 27 and the tape in turn bears on an electrode plate 30 immediately below the contactors, so that the passage of current between the contactors and the electrode plate will serve to discolor the tape. The electrode plate 30 is connected by a conductor 31 which forms a line conductor leading to one terminal of a battery 32, or other source of current, at the transmitting station. The other terminal of the battery is connected by a conductor 32' to a contact 33 of the transmission circuit-closer 12, and a contact 33' movable with respect to the contact 33 and co-operating therewith is connected by a conductor 34 forming a common return to the series of conducting characters 17. The contact 33 may, if desired, be resiliently mounted.

The purpose of the circuit-closer 12 is to render the line circuit effective at only such times when the contactors 16 are passing over a character upon the return of the corresponding lever or key bar 18 to normal position. This operation of the circuit-closer may be produced in various ways and in the present instance is accomplished by providing a toggle action on one of the contacts and a lost motion between the contact and the key bars 18. The contact 33' is carried at one end of a bar 35, the other end of which is provided with a slot 36, and a pair of toggle levers 37 are connected at their pivotal junction 38 to the bar 35. The toggle levers are influenced by a flat spring 39, which serves to break the joint between the levers in either one position or the other and thereby retain the contact bar 35 in alternative extreme positions. A rod 40 extends beneath the bank of key bars 18 and is secured at its ends to links 41 suspended at their upper ends on rock levers 42. At their lower ends the links are operatively connected to one arm of a bell crank lever 43, and the other arm of the bell crank lever is provided with a pin 44 projecting into the slot 36 of the bar 35. Upon the depression

of any key bar, the link 41 will be displaced downwardly, thereby oscillating the bell crank lever 43 and after some lost motion displacing the bar 35 carrying the contact 33'. When the key approaches its lower limit of depression, the toggle links 37 pass over center and the spring 39 thereupon influences the further forward displacement of the bar 35 to cause the engagement of the contact 33' with the contact 33. At this time the contactors 16 have passed idly over the character 17 and are ready to begin their operative passage over the character upon the return of the key bar to normal position. During such return, the contacts 33 and 33' remain in engagement by reason of the lost motion connection between the bell crank 43 and the slotted end of the bar 35, until the key has almost reached its normal position, at which time the toggle levers are again actuated and drawn over center by the bell crank 43 to cause the further rearward displacement of the bar 35, thereby effecting the separation of the contacts 33 and 33'. Before the instant of separation, however, the contactors 16 have entirely passed over the co-operating conducting character 17 to produce character-forming impulses, as hereinafter described.

The sensitized tape 27 is moved intermittently, as hereinafter described, by means of a friction roller 45 driven from a suitable constant speed device 46. When movement of the tape is to be effected, an idler roller 47 on the opposite side of the tape is brought into engagement with the tape to thereby cause sufficient friction between the tape and driving collar to effect movement of the tape. In the present instance, the idler roller 47 is shown to be mounted on one arm of a bell crank 48 while the other arm forms an armature adapted to be attracted by an electro-magnet 49, one terminal of which is connected by a conductor 50 to the line conductor 31, and the other terminal by a conductor 51 to a second line conductor 52.

Each bank of contactors 16 at the transmitting station for each character corresponds serially with the bank of contactors 26 at the receiving station. While each contactor 16 at the transmitter may be directly connected to its corresponding contactor 26 at the receiver, this is not feasible for long distance transmission since an excessive number of line conductors would be required. To obviate this disadvantage, the synchronizing devices 11 and 14 are provided. For simplicity of manufacture, these may be of similar construction and are shown in each instance to include a rotary insulating disk 53 mounted on a shaft 54 driven at constant speed by a suitable motor 55. The insulating disk 53 carries a contact segment 56, and a plurality of brushes 57, 13

equal in number to each bank of contactors 16, are arranged about the periphery of the disk to make successive contact with the contact segment 56. A collector ring 58 is connected to the contact segment 56 of each disk 53, and brushes 59 each bearing on one of the collector rings are connected to opposite ends of the line conductor 52. The contactors 16 are connected serially to respective brushes 57 of the synchronizing device 11 by conductors 16^a to 16ⁿ inclusive, while the contactors 26 are connected serially to respective brushes 57 of the synchronizing device 14 by conductors 26^a to 26ⁿ inclusive. The brushes 57 of the synchronizing device 14 at the receiving station are preferably arranged in a rotatable brush holder 60 provided with a handle 61 by which phase relations may be corrected, if necessary, as hereinafter described.

A suitable type of synchronizing device is illustrated in Fig. 4 in which the motor 55 is an electric motor. The projecting armature shaft 54 carries at one end portion the insulating commutator disk 53 provided with the contact segment 56. A fly wheel 62 is preferably mounted on the shaft to obtain steadiness of rotation, and an auxiliary driving member 63, such as a pulley or gear, may also be mounted on the shaft. At the opposite end portion the projecting armature shaft 54 carries an arm 64 upon which is mounted a contact 65 connected to a collector ring 66. A clock or other suitable constant speed device 67 is provided with a projecting shaft 68 in axial alignment with the armature shaft 54 and rotatable at an appropriate speed. The shaft 68 carries an insulating disk 69 upon which is mounted a contact 70 connected to a collector ring 71. The contact 70 co-operates with the contact 65 and abuts thereagainst in a radial plane on the same radius of rotation, the contact 70 being a follower contact. The disk 69 preferably has a frictional driving engagement with the shaft 68 and is capable of being axially displaced on the shaft to place the contacts 65 and 70 out of register for disconnecting the clock and the motor. Brushes 72 and 73 bear, respectively, on the collector rings 66 and 71, and, in the present instance, one of the brushes is connected to a supply main 74 and the other connected by a conductor 75 to one terminal of the motor windings, the other terminal of the motor windings being connected to the other supply main 76.

In the operation of the synchronizing device, the clock shaft 68 rotates at a constant angular velocity and in so doing the clock contact 70 engages the motor contact 65 and establishes a motor circuit maintaining the motor in operation. As the motor tends to increase its speed slightly above that of the clock shaft, the contacts 65 and 70 will sepa-

rate, thereupon opening the motor circuit to prevent further acceleration, so that such increase in speed is merely incipient, and the contacts then reclose to again supply current to the motor windings. The inertia 70 of the fly wheel 62 on the motor shaft serves to insure smooth operation and to minimize acceleration of the motor. The motor speed is thereby accurately governed so that synchronization will be maintained at both the receiving and transmitting stations. With such synchronizer construction, the electric motor does not influence the accuracy of the clock even though variable amounts of power are delivered by the motor. Instead 80 of including the governor contacts directly in the load circuit of the motor, they may be employed to control the effective field current of the motor and thereby hold the motor speed constant.

The constant speed shaft 20 in the transmitter is shown to be driven from the synchronizing device 11 through a reduction drive, and in a like manner the tape-actuator 45—46 may be driven from the synchronizing device at the receiving station. The shaft 20, however, may be driven by any suitable constant speed means independent of the synchronizer, as the speed of rotation may be varied within limits without effecting the legibility of the received characters. In a similar manner, the tape actuator 45—46 may be driven independently of the synchronizer without impairing the legibility of the characters recorded on the tape. 100

In order to provide for the movement of the sensitized tape 27 only when characters are to be transmitted, each type face 17 is provided with a contact rib or strip 77 extending either along the base of the character, as shown in Figs. 1 and 2, or above the top of the character and in either case projecting beyond both ends of the character. One of the terminal contactors 16 for each character is adapted to make contact with the rib or strip 77 before the remaining contactors engage the character, so that a preliminary current will flow in the line, as hereinafter described, to energize the electro-magnet 49 and thereby displace the idler roller 47 into engagement with the tape for initiating the movement of the tape and accelerating it to its normal velocity before the reception of the character-forming impulses. The dotted line conductor 26^a at the receiving station corresponds with the contactor 16 co-operating with the tape-controlling rib 77, and may be omitted, if desired, together with its connected contactor 26 resting on the tape. 115

To place the system in operation the synchronizing devices 11 and 14 are started in rotation, as are also the constant speed shaft 20 of the transmitter and the constant speed tape-actuator 45—46 of the receiver. The 125 130

successive operation of the keys 19 in correspondence with the message to be transmitted then results in the transmission of character-forming impulses in the following manner. The depression of each key causes the idle passage of the corresponding character 17 over the co-operating group of contactors 16, so that when the key has reached its lowermost position, the character is ready to commence its operative passage over the contactors. When the key approaches its lowermost position, the circuit-closer 12 including the contacts 33 and 33' is actuated, as heretofore described, to complete one of the line conductors. The key bar 18 then returns to normal position under urge of its spring 21 and at a constant velocity determined by the engagement of its pawl 25 with the constant speed ratchet wheel 24 on the shaft 20. During this movement the conducting character 17 brushes over the contactors 16, which causes a current to flow from the battery 32, through the conductor 32' and now closed contacts 33 and 33', through conductor 34, through type face or character 17, through the contactors 16 as they contact with different parts of the conducting character, successively through the conductors 16^a to 16^b and connected brushes 57 for small time intervals, through the contact segment 56 of the synchronizer disk 53, collector ring 58, brush 59, line conductor 52, brush 59 of the receiving synchronizer 14, collector ring 58 thereof, contact segment 56, successive brushes 57, successive conductors 26^a to 26^b inclusive, successive contactors 26, through the sensitized tape 27, electrode plate 30, and thence through the other line conductor 31 to the other terminal of the battery 32. At the same time, part of the integrated line current is diverted through the conductors 50 and 51 to energize electro-magnet 49, thereby retaining the roller 37 in engagement with the tape and permitting the tape actuator 47 to effect the movement of the tape. In order to start the tape in operation before the character-forming impulses proper are transmitted, one of the contactors 16 makes preliminary contact with the contact rib or strip 77 on the type face, so that the electro-magnet 49 will be energized before the character is formed on the tape. In the operation of the system, the synchronizing devices 11 and 14 are so adjusted that current flows momentarily and simultaneously through conductors 16^a and 26^a, thence momentarily and simultaneously through conductors 16^b and 26^b, and so on. In this manner, the contactors 16 are successively active and the corresponding contactors 26 in the receiver are similarly active in the same succession. The sensitized paper tape is then discolored by the passage of current to produce characters, as seen in Figs. 1 and 5, corresponding to those trans-

mitted by depressing the keys 19 of the transmitter.

Should the synchronizing devices 11 and 14 become out-of-phase for any reason, such condition would be evidenced by a transposition of portions of the characters on the tape end for end, that is, the upper portions of the characters would be transposed to the lower portions, or vice versa, and this may be readily remedied by moving the handle 61 of the synchronizer brush gear at the receiving station in the proper direction to re-establish synchronism. The speed of the tape actuator 45—46 may be variable within limits as the only influence of variable speed on the recorded characters is either to extend the characters or contract them, as the case may be. In a similar manner, the velocity of the type faces or characters 17 in their operative travel is subject to variation within limits, as the only effect of variable velocity is to extend the recorded characters or contract them, as the case may be, without impairing their legibility. The contact rib or strip 77, in addition to its tape-controlling function, also serves to determine the spacing of the recorded characters and may, if desired, be of variable length according to its associated character. In this manner characters, such as "I", "i" and "l" may be given less space on the tape than such characters as "M" and "W". The use of the tape-controlling rib on the character 17 is not absolutely essential as the tape may receive the message while travelling continuously at a constant speed. The uniform velocity of the type faces on their relative passage over the co-operating contactors 16 may be accomplished in other ways than illustrated, as for instance, by frictional retarding means.

The invention provides a communication system of relatively simple character by which messages may be visibly recorded at a distance at a good speed and without restriction as to configuration of the characters.

What I claim as new and desire to secure by Letters Patent is:

1. In a communication system, the combination of a plurality of contactors arranged in a row, a conducting character adapted to be passed relatively over said contactors to constitute therewith impulse-forming circuit-closer means, and velocity-limiting means for determining a substantially constant relative velocity between said conducting character and said contactors.

2. In a communication system, the combination of a plurality of contactors arranged in a row, a conducting character adapted to be passed relatively over said contactors in opposite directions to constitute therewith impulse-forming circuit-closer means, and means for rendering said circuit-

closer means effective only in one direction of relative travel of said character with respect to said contactors.

3. In a communication system, the combination of a plurality of contactors arranged in a row, a reciprocable conducting character adapted to be passed over said contactors to constitute therewith impulse-forming circuit-closer means, and means for determining a uniform rate of travel of said character in one of its directions of movement.

4. In a communication system, the combination of a plurality of contactors arranged in a row, a pivotally mounted member having a conducting character thereon movable in an arcuate path and adapted to be passed relatively over said contactors to constitute therewith impulse-forming circuit-closer means, and means for moving said character relatively over said contactors at a substantially uniform velocity.

5. In a communication system, the combination of a plurality of contactors arranged in a row, an oscillatory pivotally mounted member having a conducting character thereon adapted to pass over said contactors to constitute therewith impulse-forming circuit-closer means, and means for rendering said circuit-closer means effective only in one direction of travel of said character.

6. In a communication system, the combination of a plurality of contactors arranged in a row, an oscillatory pivotally mounted member having a conducting character thereon adapted to pass over said contactors to constitute therewith impulse-forming circuit-closer means, and means for manually actuating said pivotally mounted member, and means for determining a substantially uniform rate of travel of said character over said contactors.

7. In a communication system, the combination of a plurality of contactors arranged in a row, a pivotally mounted member having a conducting character thereon adapted to pass over said contactors to constitute therewith impulse-forming circuit-closer means, means for manually displacing said pivotally mounted member on an idle stroke, means for returning said pivotally mounted member to normal position on a working stroke, and means for determining a substantially uniform rate of travel of said character over said contactors on the working stroke.

8. In a communication system, the combination of a plurality of contactors arranged in a row, a conducting character adapted to be passed relatively over said contactors to constitute therewith impulse-forming means, manually-operated means for effecting the relative passage of said character over said contactors on an idle stroke, means for effecting the relative return

passage of said character and contactors to normal position on a working stroke, and means for determining a substantially constant relative velocity between said conducting character and said contactors on the working stroke.

9. In a communication system, the combination of a plurality of contactors arranged in a row and displaceable in a group to alternative positions, and a reciprocatory member having a pair of conducting characters thereon adapted to selectively pass over said contactors to constitute therewith impulse-forming circuit-closer means.

10. In a communication system, the combination of a movable tape, a plurality of responsive elements arranged in a row transversely of said tape and collectively adapted to effect the recording of characters on the tape in accordance with impressed impulses, and tape-actuating means operative to place said tape in intermittent motion during the recording of said characters for providing pauses in the tape travel between the recording of characters.

11. In a communication system, the combination of a plurality of contactors arranged in a row, a conducting character adapted to be passed relatively over said contactors to constitute therewith impulse-forming circuit-closer means, a recording receiver having a connection with said circuit-closer means, and a contact co-operating with one of said contactors to form therewith a circuit-closer effective in advance of the production of character-forming impulses to place said receiver in responsive condition.

12. In a communication system, the combination of a plurality of contactors arranged in a row, a reciprocable conducting member movable over said contactors to constitute therewith impulse-forming circuit-closer means, and means for rendering said circuit-closer means effective only in one direction of travel of said contactor.

13. In a communication system, the combination of a character element, and a plurality of responsive elements arranged in a row and movable relatively over said character element in both of opposite directions and each co-acting with different portions of said character element to constitute therewith means for forming transmissible character-defining impulses, and means for rendering said impulse-forming means effective only in one direction of relative travel of said responsive elements with respect to said character.

14. In a communication system, the combination of a plurality of contactors arranged in a row, a conducting character movable relatively over said contactors to constitute therewith impulse-forming circuit-closer means, means for translating im-

pulses produced by said circuit-closer means including a movable tape, and means for intermittently moving said tape including a second circuit-closer means operable upon the relative movement of said character with respect to said contactors and in advance of the formation of the character-defining impulses.

15. In a communication system, the combination of a plurality of contactors arranged in a row, a conducting character movable relatively over said contactors to constitute therewith impulse-forming circuit-closer means, means for translating impulses produced by said circuit-closer means including an intermittently movable tape, and means operable during the relative movement of said character with respect to said contactors for controlling the intermittent movement of said tape.

16. In a communication system, the combination of a plurality of contactors arranged in a row, a conducting character adapted to be passed relatively over said contactors to constitute therewith impulse-forming circuit-closer means, a recording receiver having a connection with said circuit-closer means, a contact member associated with the character and co-operating with one of said contactors for engagement therewith in advance of the production of character-forming impulses, and means including said last-named circuit-closer for placing said receiver in responsive condition in advance of the transmission of character-forming impulses.

In testimony whereof, I affix my signature.

ROYAL LEE.